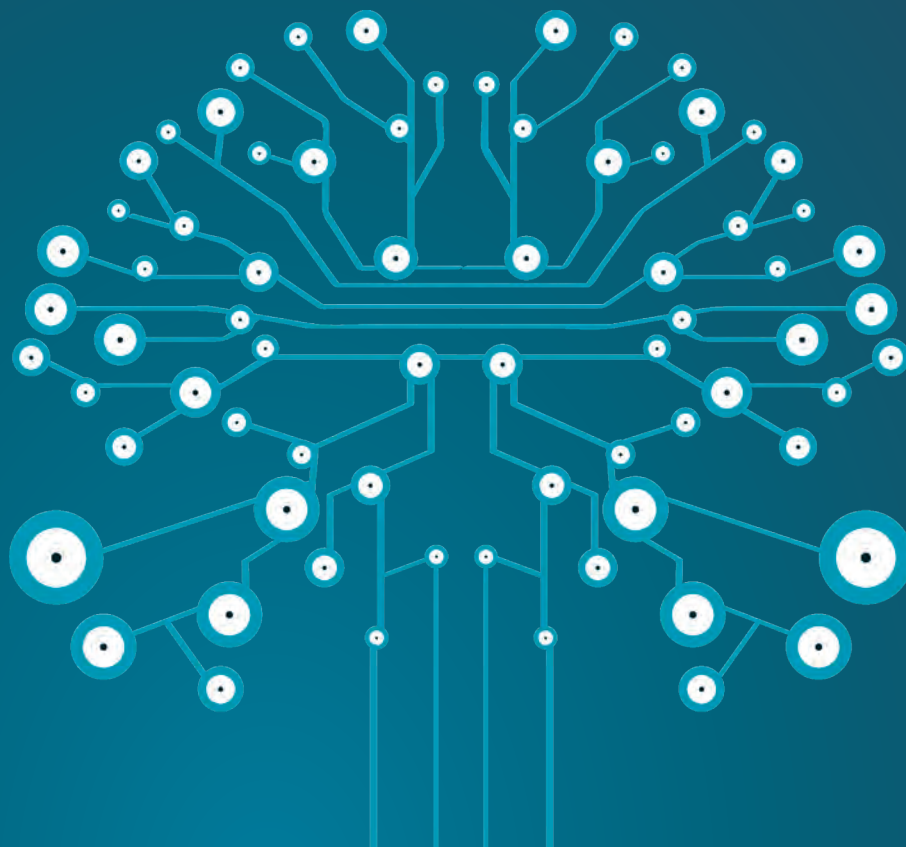




VIRTUAL AND AUGMENTED REALITY IN JUSTICE: USES AND ISSUES

3RD CYBERJUSTICE EUROPE 2025 CONFERENCE
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The **Actes** collection offers written proceedings of various events (conferences, seminars, workshops, etc.) organized by the Robert Badinter Institute, formerly the Institute for Studies and Research on Law and Justice.

It records the enriching exchanges between speakers and participants on topics that bring together perspectives from both the professional and research communities.

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Official opening

Hanne JUNCHER

Director of the Security, Integrity and Rule of Law
Directorate (Council of Europe)

Francesco DEPASQUALE

President of the European Commission for the
Efficiency of Justice (CEPEJ)

Karim BENYekhlef

Director of the Cyberjustice Laboratory (in video)

Valérie SAGANT

Director of the Robert Badinter Institute

Hanne JUNCHER: Ladies and Gentlemen, distinguished participants, welcome to the Cyberjustice Europe Conference 2025 on the topic *Virtual Reality and Augmented Reality in Justice: Uses and Issues*. This event has been organised jointly by the Council of Europe's European Commission for the Efficiency of Justice (CEPEJ), the Robert Badinter Institute (IRB Institut Robert Badinter) and the Cyberjustice Laboratory of Montréal. It is supported by the University of Strasbourg.

We are grateful for this opportunity to collaborate for the third time with such exceptional centres of excellence, after the conferences of 2023 on *The New Landscape of Cyberjustice: between Information, Misinformation, Regulation and Democracy* and the conference of 2016 on *Modernised Justice Systems in Line with Human Rights*. I would like to thank Directors Valérie Sagant and Karim Benyekhlef for mobilising, from Paris and Montréal respectively, this impressive line-up of researchers.

Immersive technologies in justice are no longer speculative — they already exist in focused, practical forms. Across Europe, courts and law-enforcement bodies are already using immersive tools in very concrete ways: 3D crime-scene reconstructions to understand distance and perspective¹ ; controlled virtual

modules for judicial training² ; and supportive environments for vulnerable victims preparing for court³ . These are real, operational examples — far removed from the 'metaverse' hype.

These technologies work best when they are limited in scope, transparently designed, and rooted in the fundamentals of justice: fairness, accountability, equality of arms, and meaningful human judgment. Their strength lies not in replacing the human decision-maker, but in giving judges, prosecutors, and victims an additional layer of understanding. The benchmark is always the European Convention on Human Rights – in particular the right to a fair trial under Article 6.

This broader tradition also includes work carried out across the Organization⁴ on immersive and virtual environments — from the recommendations of the Parliamentary Assembly and those of the Committee of Ministers to the work of Council of Europe Steering Committee on Media and Information Society (CDMSI) as well as recent studies on metaverse related risks — which forms part of the wider context

1. <https://bit.ly/41eZSBL>

2. <https://bit.ly/4lZTUEQ>

3. <https://bit.ly/4sN9mQk>

4. See, for example, the Committee of Ministers' Recommendation on restorative justice in criminal matters CM/Rec(2018)8 t, the Committee of Ministers' Recommendation on rights, services and support for victims of crime (CM/Rec(2023)2), the Committee of Ministers' guidelines on electronic evidence in civil and administrative proceedings (CM(2018)169), the Consultative Council of European Judges' Opinion No. 26, 'Moving forward: the use of assistive technology in the judiciary', the CEPEJ 'Guidelines on Videoconferencing in Judicial Proceedings'.



From left to right: Valérie SAGANT, Hanne JUNCHER and Francesco DEPASQUALE.

for today's discussion, even if our focus here is strictly on justice-sector applications.

It should be underlined that the Council of Europe's role in this emerging field of virtual and augmented reality is not to slow innovation, but to define where it is useful, where it is risky, and where it simply does not belong. The *Framework Convention on Artificial Intelligence and Human Rights, Democracy and the Rule of Law* ("the Framework Convention") sets the human rights baseline for public authorities, as this sole international convention on Artificial Intelligence governance is technology neutral. In addition, the Framework Convention's supplement tools – the HUDERIA Methodology and Model – help justice systems assess immersive tools in context: what problem they solve, what risks they introduce, and how to deploy them responsibly.

Today's approach is different: we will examine practical applications of virtual and augmented reality to explore how they can enhance the justice system, and how they can make justice more accessible.

The use of virtual reality to prepare victims and witnesses for court hearings, for crime scene reconstruction, the integration of augmented reality during trials and remote hearings or for restorative justice are only some examples of situations to consider, in order to assess the challenges and opportunities of the interaction between the virtual and the legal world,

looking notably at the relevant legal, ethical and governance aspects.

The Council of Europe does not provide a specific legal framework on the use of virtual reality. However, I believe that the principles set out in the Framework Convention could serve by analogy as useful guidelines – alongside the rights set out under the *European Convention on Human Rights*: respect for human rights; human dignity and individual autonomy; equality and non-discrimination; respect for privacy and personal data protection; transparency and oversight; accountability and responsibility; and reliability.

More precisely, any digital or immersive technology used in courts must respect human rights, notably the right to a fair trial under Article 6 of the *European Convention on Human Rights*. This requires the right balance between technical innovation and the principles of independence, impartiality and adversarial proceedings.

For instance, as outlined in the very recent *Handbook on Human Rights and Artificial intelligence* adopted by our Steering Committee for Human Rights (CDDH), the principle of equality of arms suggests the parties to a case must be aware of the role of an artificial intelligence system in the proceedings, the criteria for its operation and the possible impact on the outcome of the case. The right to adversarial proceedings is likely to require the ability to challenge

an artificial intelligence system's scientific validity, biases, and potential errors. However, intellectual property rights and trade secret laws may restrict access to privately owned proprietary artificial intelligence systems used by law enforcement authorities.

In this regard, specific sensitive questions could arise, for example, how can the risk of bias be minimised so that immersive evidence does not disproportionately influence perception?

If biometric and behavioural data is processed, how can compliance with the Council of Europe *Convention for the Protection of Individuals with regards to Automatic Processing of Personal Data* be ensured?

How to prevent exclusion and the digital divide, ensuring equal access to immersive technology for all parties, and therefore keep procedural fairness?

How to properly verify participants in virtual environments to prevent impersonation or fraud?

How to ensure that immersive tools remain explainable and auditable to uphold trust and legal certainty?

We also have several Council of Europe tools – from guidance on restorative justice and victims' support to electronic evidence, assistive technologies and videoconferencing – that were developed before immersive technologies existed. Some of them may need to be revisited, simply because virtual and augmented reality introduce forms of perception, presence and evidence that these earlier frameworks did not have to consider⁵.

These questions do not arise in isolation. They point to a broader institutional responsibility: ensuring that courts, practitioners, and the wider justice ecosystem are equipped to understand and appropriately handle such emerging tools. Because virtual reconstructions blend empirical data with modelling assumptions and can exert strong psychological effects, they demand not only technical standards but also informed professional judgment.

This is precisely where judicial training institutes, academic partners, and justice professionals must step in — to clarify the nature of these tools, develop common safeguards, and cultivate the competencies needed to use

immersive environments in a way that strengthens, rather than distorts, the administration of justice.

As these technologies evolve, the challenge is not to predict the future, but to ensure we shape it in a way that remains worthy of public trust. Technology has the potential to improve the justice system. It is crucial that we remain curious about new technology and committed to improving our justice systems continuously. Today's discussion will undoubtedly bring us closer to achieving this goal, and I wish you all fruitful exchanges. Thank you very much!



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Hanne JUNCHE

Francesco DEPASQUALE: Dear colleagues in law and friends, it is a pleasure to welcome you all today, as President of CEPEJ. We are honoured to host this event in partnership with two exceptional institutions: the Robert Badinter Institute, with its profound legacy of human rights and justice reform, and the Cyberjustice Laboratory of the Université de Montréal, one of the world's leading centres of research and experimentation in the digital transformation of justice. Each of these institutions brings a distinct and invaluable perspective.

The Robert Badinter Institute reminds us that justice must always remain anchored in human dignity, fundamental rights, and democratic values. It represents a tradition of legal thought that constantly asks how justice can evolve without losing its essence. The Cyberjustice Laboratory, on the other hand, has spent years pushing the boundaries of what is technologically possible. Through research, prototypes, simulations, and experimentation, it offers a unique window into how digital tools — including immersive technologies — can reshape judicial processes. Bringing these two worlds together — the philosophical and the experimental — is exactly what today's conference aims to achieve.

⁵. See above, n. 4

The use of virtual and augmented realities in justice raises fascinating possibilities — immersive reconstructions of events, new methods of training for judges and prosecutors, enhanced visualisation of evidence, and more accessible interfaces for litigants. But they also raise the inevitable questions that accompany every profound technological shift: questions about fairness, equality, reliability, and the preservation of fundamental rights. This is precisely where CEPEJ's work becomes essential.

While CEPEJ has not yet produced instruments specifically dedicated to virtual or augmented reality, it has developed a solid and structured framework that guides Member States in dealing with emerging digital tools, including immersive ones. Let me briefly recall the most relevant documents.



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Firstly, the *European Ethical Charter on the Use of Artificial Intelligence in Judicial Systems*, adopted by the CEPEJ in 2018, remains a cornerstone.

Its principles — respect for fundamental rights, non-discrimination, data quality and security, transparency, and the need for human control — apply across the full spectrum of digital innovation. Any consideration of virtual or augmented reality in judicial settings must be examined through this ethical lens.

Secondly, CEPEJ has produced several important guidelines linked to the digitalisation of justice⁶, including:

- the Guidelines on how to drive change towards Cyberjustice (CEPEJ (2016)13),

- the Guidelines on videoconferencing in judicial proceedings as well as on Remote Hearings (2021), and

- the Guidelines on the centrality of the user in legal proceedings in civil matters and on the simplification and clarification of language with users (CEPEJ (2021)1).

All three texts touch directly on issues that arise again with virtual reality and augmented reality: accessibility for all users, safeguarding procedural rights, ensuring quality of digital environments, and managing the profound organizational changes introduced by technology.

Thirdly, the CEPEJ's work on judicial time management, quality of justice, and court performance indicators also provides a relevant foundation. These instruments remind us that any technological innovation must serve the ultimate goals of timeliness, clarity, and trust in judicial proceedings.

Fourthly, the CEPEJ's comparative evaluations — the CEPEJ Evaluation Report on European Judicial Systems — now devotes increasing attention to digital transformation. They offer solid data on how Member States integrate new technologies, including experimental ones, into their courts.

And finally, there is the Cyberjustice Resource Centre, which offers an essential bridge between innovative research and practical implementation. By gathering, analysing, and disseminating knowledge on digital transformation projects across multiple jurisdictions, the Centre provides actual implementations of methodologies, and technological developments in the field of cyberjustice. It serves as a shared repository of lessons learned — helping justice systems better understand what works, what does not, and how emerging tools, including immersive technologies, can be integrated responsibly.

Individually, each of these tools addresses core principles. Taken together, they form a coherent framework: one that is technologically open, but anchored in rights, proportionality, and transparency.

As virtual and augmented reality becomes more technically accessible, justice systems will inevitably explore their use — whether to assist fact-finding, strengthen training, help

6. <https://bit.ly/4blXMGi>

vulnerable witnesses, or simplify access to justice. What matters is that we proceed with clarity, guided by evidence, respecting the values that define our democratic systems.

And that is why today's conference is so timely. It brings together distinguished academics and legal practitioners to consider not just what these immersive technologies can offer, but how they can be integrated responsibly. I look forward to today's exchanges, and to the reflections that will help ensure that innovation in justice remains fully aligned with the principles upheld by the Council of Europe and the work of the CEPEJ.

I firmly believe that for artificial intelligence to reflect our values, it is us, over here, who have to lead and ensure its development and implementation, and not allow third parties to lead, and this Conference reflects this belief of mine, and therefore I really congratulate once again the Robert Badinter Institute and the Cyberjustice Laboratory of the Université de Montréal, not to mention the University of Strasbourg, for organizing this Conference. Once again, thank you for this great opportunity to learn from you all and thank you.

Karim BENYEKHLIF: Good morning to all of you. I am very pleased to open this Cyberjustice Europe 2025 conference dedicated to a topic that, until now, has remained surprisingly under the radar in the scientific community: virtual and augmented reality in the justice system. Surprisingly under the radar, given that these technologies dominate public debate, even though these immersive processes are already penetrating many sectors. Industry, healthcare, education and now, tentatively but surely, the justice system itself. I would like to thank our European partners for organizing this meeting and all the teams who have made it possible to bring together researchers, practitioners, and experts from various disciplines.

For several years now, we have been observing what I would call a curious asymmetry. Artificial intelligence dominates the media, political, and economic spheres, sometimes to the point of caricature, while immersive technologies remain on the margins, as if they were still the stuff of science fiction. Yet one needs only to watch a 3D simulation or put on a headset to grasp that they are no longer a fantasy.



Karim BENYEKHLIF

Virtual reality changes our perception of reality, shapes how we relate to space and emotions. It can make us more vulnerable, boost empathy, alter or enhance memory, or change our understanding of a courtroom scene. Basically, it directly affects our way of being in the world. It would be, to say the least, unwise to think of it as just a gimmick.

The history of technology always teaches us the same thing. We minimize its effects until the day we realize that it has already reconfigured our practices. Historian Elisabeth Eisenstein wrote about this in relation to printing: six centuries after Gutenberg, we still do not fully understand its consequences. But let us be modest. We will not understand in a single conference how immersive technologies will permanently transform the justice system. But we can and must grasp the issues at stake and outline the possible lines of force. This vigilance is even more important because justice is not a sector like any other. It cannot rely on industrial logic or the speeches of consultants, who often move faster than they think.

For some time now, interdisciplinarity has become a watchword that is often swung around like a slogan, without anyone stopping to ask whether the aim is to gain a better understanding of a phenomenon or simply to follow a trend. Sometimes, these calls to go beyond disciplinary boundaries seem to echo a familiar refrain, that of a certain technological solutionism that confuses speed with foresight. That is not what we are doing here. We have no fascination with technology; we have an intellectual responsibility. This responsibility begins with a

simple idea, which I would like to state clearly: more than ever, the academic community must address the societal challenges posed by immersive technologies to identify the best use for them.

But this search for best practice does not mean surrendering it to engineers. It requires their collaboration, of course, sincere and ongoing collaboration, but certainly not the delegation of legal powers.

As Mireille Hildebrandt of the Université libre de Bruxelles ("Free University of Brussels") writes about generative artificial intelligence, it is not a question of allowing one discipline to colonize another. On the contrary, it is a question of testing techniques in light of the requirements of the law, and not the other way around. This is precisely what we are seeking to do at the Cyberjustice Laboratory. We aim to understand technological developments without abandoning our legal methods, our epistemology, or the very function of academia in overseeing technology.

To this end, we are developing our own technical prototypes in the laboratory, using the most advanced immersive technologies. The aim is not to celebrate innovation for its own sake, but to observe empirically its effects on judicial processes to rigorously identify those uses that are truly relevant and, equally importantly, those that should be discarded. In other words, experimenting to better understand and understanding to better regulate. This question of regulation is not theoretical, it is political. It touches on the sovereignty of the judicial system, because ultimately, can we seriously imagine a justice system dependent on immersive technologies designed according to commercial logic that we do not control?

As technology enthusiasts often say, whoever controls the standards controls the market. And whoever controls the market imposes their values, even when they claim not to have any. That is why thinking about immersive realities also means thinking about what should remain in the hands of the sovereign: the organization of justice, the definition of its rules, and the protection of fundamental rights.

Virtual reality can help victims and witnesses prepare, train professionals, and reconstruct complex scenes with unprecedented accuracy, as demonstrated by the workshops offered today by teams in Zurich, Caen, and London. But



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Karim BENYEKHFLEF

it can also influence a judge's perception, simulate a story that never happened, too well, or produce a visual truth that is more convincing than the legal truth.

Here again, we have both remedies and poisons, to use Bernard Stiegler's expression, a *pharmakon*. We are here to distinguish together what is a remedy and what is a poison. To analyze existing uses, to question their effects on fundamental rights, to reject technical illusions, and to identify with clear mindedness what can truly strengthen access to justice.

Our program is rich and brings together speakers who have precisely this ability to think about technology without naivety. Thank you for being here and, above all, for engaging in a reflection that does not allow its priorities to be dictated by trends or industrial imperatives.

I wish you all a stimulating and critical day, and one that, we hope, will be equal to the transformations we must anticipate.

Valérie SAGANT: Madam Director, Mister President, dear Karim, ladies and gentlemen. Thank you for your involvement, as well as for the partnership and cooperation we have built together. Thank you also to the Secretary General of the CEPEJ for welcoming us to this place, which embodies and brings to life human rights at the European level, which means so much to all those involved in law and justice in Europe and, I believe, beyond, throughout the world.

I am delighted to be here at this conference, the theme of which has been presented in more detail by Karim Benyekhlef. We will have an impressive panel of speakers, as well as a space

for demonstrating a few technologies. This will give you an idea of how they are used, even if time is rather limited.

As you pointed out, this conference is the third of its kind since 2016. It firmly emphasizes research results and a research-based approach to cyberjustice in a broad sense. It is not a question of discussing or promoting projects or ideas, but rather of analyzing and assessing their potential impact and operational practices. It is also a question of looking ahead to what remains prospective and speculative, and which we do not yet know exactly how to approach.

This link between professional practices, public policy, and research results is truly part of our Institute's DNA. We also strive, in collaboration with the Montréal Cyberjustice Laboratory, to analyze major trends, emerging phenomena,



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On this occasion, a panel of young researchers organized by the Chaire LexUM, from the University of Montréal, will take place this afternoon. We felt it was important to give young researchers the opportunity to present their work here and engage with more experienced researchers and practitioners.

I would like to conclude by inviting all participants, both online and in person, to feel free to widely share the need for knowledge in this area. Karim reiterated the importance of extremely rigorous research on these subjects, without fascination or fear. Virtual realities, the use of immersive tools, and other technologies must be thoroughly scrutinized by researchers, in conjunction with practitioners and institutions of law and justice.

Some of you come from fields that are somewhat more distant. Nevertheless, these experiences are undoubtedly very useful, and we still meet as an Institute that funds and promotes research despite the difficulties in mobilizing research on the subject. I would therefore like to take this opportunity to invite you to make it known that there are needs in this area.

Thank you very much.



and how people are embracing them.

The Robert Badinter Institute, as you pointed out, is named after the man who championed the values of the rule of law and human justice in France. He was also deeply convinced of the role of science and research in this area. This is one of the reasons why our Institute bears the name of Robert Badinter, whom we kept in mind during the creation of this structure.

Presenting a wide variety of practices is also the purpose of this jointly organized conference. Sixteen countries are represented by researchers or professionals, and we want to subject these experiments to a critical examination by the research community.

Opening plenary

Immersive worlds

Chair: **Harold ÉPINEUSE**

Deputy Director of the Robert Badinter Institute

Antonio CAPOBIANCO

Professor at the Geometric and Graphical Computing Team, University of Strasbourg (France)

Fredric I. LEDERER

Chancellor Professor of Law and Director of the Center for Legal & Court Technology (CLCT) at William & Mary Law School. (United States)

Mel SLATER

Professor of Computer Science at the University of Barcelona and Co-Director of the Event Lab (Spain)

Harold ÉPINEUSE: Welcome to everyone attending this day of joint reflection at the Council of Europe, as well as those of you who are following us online. My name is Harold Épineuse, Deputy Director of the Robert Badinter Institute, and I will be chairing this Opening Plenary Session of our conference on the uses of virtual and augmented reality in the justice system.

I would like to take this opportunity to thank our partners, particularly the CEPEJ, its Secretary Muriel Décot, and her entire team for allowing us to hold these discussions in such a prestigious setting. I would also like to thank my

colleagues in Montréal and Paris for designing this event and organizing it with the Council of Europe. Finally, I would also like to thank all the representatives of the CEPEJ member States, who have kindly agreed to come a day early ahead of their plenary meeting, to join a very diverse audience of practitioners, academics, and students, which we are delighted about.

Joining me to kick off discussions on this topic are three experts who I would like to thank you for accepting our invitation. Antonio Capobianco, you are a professor and researcher at the University of Strasbourg, the venue for this panel, and hold a PhD in computer science. Your work focuses on human-machine interaction in virtual reality contexts, a topic that will be discussed throughout the day.

Mel Slater, you are a distinguished researcher at the Institute of Neuroscience at the University of Barcelona and co-director of the Event Lab. I should point out that your work on virtual reality dates to the early 1990s. You are therefore a pioneer in this field, and we are obviously delighted to have you with us.

Finally, Fredric Lederer, you are a Chancellor Professor of Law at William & Mary Law School, in Virginia, USA, but you are also, and above all, the founder and director of the Center for Legal and Court Technology (CLCT), during the same time-period. This is why I would also like to introduce you as a pioneer in courtroom experimentation, having tested a multitude of technologies for over thirty years in collaboration with practitioners. You have also been a lawyer,



Harold ÉPINEUSE



Antonio CAPOBIANCO



Fredric I. LEDERER



Mel SLATER

prosecutor, judge, and legal reform expert for several organizations and, like the other panelists, you have published several very interesting books and articles on the impact of technology.

Gentlemen, I have introduced you briefly, but to begin with, could you tell us more about what in your career made you interested in immersive worlds, in what context, and what triggered it?

Antonio CAPOBIANCO: Good morning and thank you for the invitation. For me, it was a career accident that led me to virtual reality. I wrote a thesis in computer science specializing in human-computer interaction, and when I was recruited in Strasbourg, there was a desire in my lab to develop this research topic. As I am an open-minded and curious person, I immediately threw myself into the adventure and have stayed there ever since. What interests me in human-computer interaction is not so much the machine as the human being, and in virtual reality, contrary to what one might think, the human being plays an essential role.

Harold ÉPINEUSE: Thank you very much for that insight. Mel and Fred, same question: can you tell us what got you interested in this topic in the early 1990s?

Mel SLATER: I used to study computer graphics in the 1980s. And in 1991, I attended a conference called the SIGGRAPH and was invited to try out a virtual reality device. At first, I was a little disappointed because all I could see were pixels. Then someone asked me to move my head. As soon as I did, I found myself somewhere else. I was in the room, then I moved and saw a lake below me. I thought it was fascinating. So, I decided to change my line of research and focus on this field, to understand this feeling of presence, of being in another place, that virtual reality induces, and the potential benefits that come with it.

Fredric I. LEDERER: I have the honor of being a member of the faculty at William and Mary, one of the oldest universities in the United States, the second oldest, in fact. We began our work when we became intrigued by a question: how to best use technology to improve legal systems.

Our guiding principle is to improve the administration of justice through appropriate

technologies. The key word here is *appropriate* as some have already pointed out, which translates into the question of how humans can relate to this technology. It is a matter of understanding what is useful, what is not, and why.

I imagine that my presence here today is due to the fact that our court, located in our law school, is considered to be the most technologically advanced court in the world. And one of our responsibilities is precisely to make mistakes. The more mistakes we make, the more time, effort, and money can be saved for courts around the world.

Harold ÉPINEUSE: Now that we have a better understanding of your professional background, I suggest we get to the heart of our topic. I think the opening remarks did a good job of presenting both the context and the challenges involved in thinking about immersive worlds. This is something we cannot afford to ignore as practitioners, decision-makers, and even as students, who are the practitioners and decision-makers of tomorrow, possibly faced with the development of virtual and augmented reality applications.

Hanne reminded us of the need to embed technologies in the fundamentals of justice, democracy, and the rule of law, where all the legal and practical instruments of the Council of Europe are, of course, of great help to us.

Francesco emphasized that alongside the possibilities offered or that may be offered by immersive worlds — as with technologies in general — questions arise. It is added value of the CEPEJ to tackle these head-on, in a dialogue between member States and experts, as demonstrated by the various instruments published by the organization.

Karim, for his part, reminded us of our intellectual responsibility, today and tomorrow, pointing out that technological issues are not just technical, engineering, or legal issues, but require interdisciplinary dialogue, which is our mission at the Robert Badinter Institute to promote beyond all kinds of boundaries.

Valérie concluded and passed the torch to us, also highlighting the importance of research for the purposes of forward-looking dialogue such as the one we are launching today at the European level.

So, to begin with and get straight to the heart of the matter, I think it is essential to understand

exactly what we are talking about. What exactly are these technical devices of virtual reality and augmented reality, and what is the purpose of immersive worlds? What is the relationship between the real and the virtual when using these technologies?

I will now give the floor to Antonio, who will offer us some explanations and insights into these technologies, which we will be discussing throughout the day.

Antonio CAPOBIANCO: Indeed, we need to define what we mean when we talk about virtual reality. In fact, in the scientific community, this term is being used less and is gradually being replaced by the term *extended reality*. This emphasizes the idea that what we are talking about is a set of technologies with different characteristics, capabilities, and properties that we want to exploit for specific purposes by taking advantage of their unique features.

The scientific community refers to a *virtual reality continuum* to position these different technologies according to their specific properties while maintaining the idea of technical continuity. I have tried to represent this in a simplified way in this illustration (Fig. 1).

You can see, at the top left, a user sitting in front of a screen wearing headphones. In a way, this is already virtual reality, since part of their

sensory abilities are already covered by the perception of a digital world.

Nowadays, when we talk about virtual reality, we immediately think of headsets. But this is only a fairly recent development in these technologies. The history of virtual reality techniques has gone through several phases of development. We have moved on from the use of immersive walls, i.e., very large screens that project three-dimensional images. Two two-dimensional images are being overlapped, one for each eye, with synchronized active glasses that reproduce and simulate the phenomenon of binocular vision.



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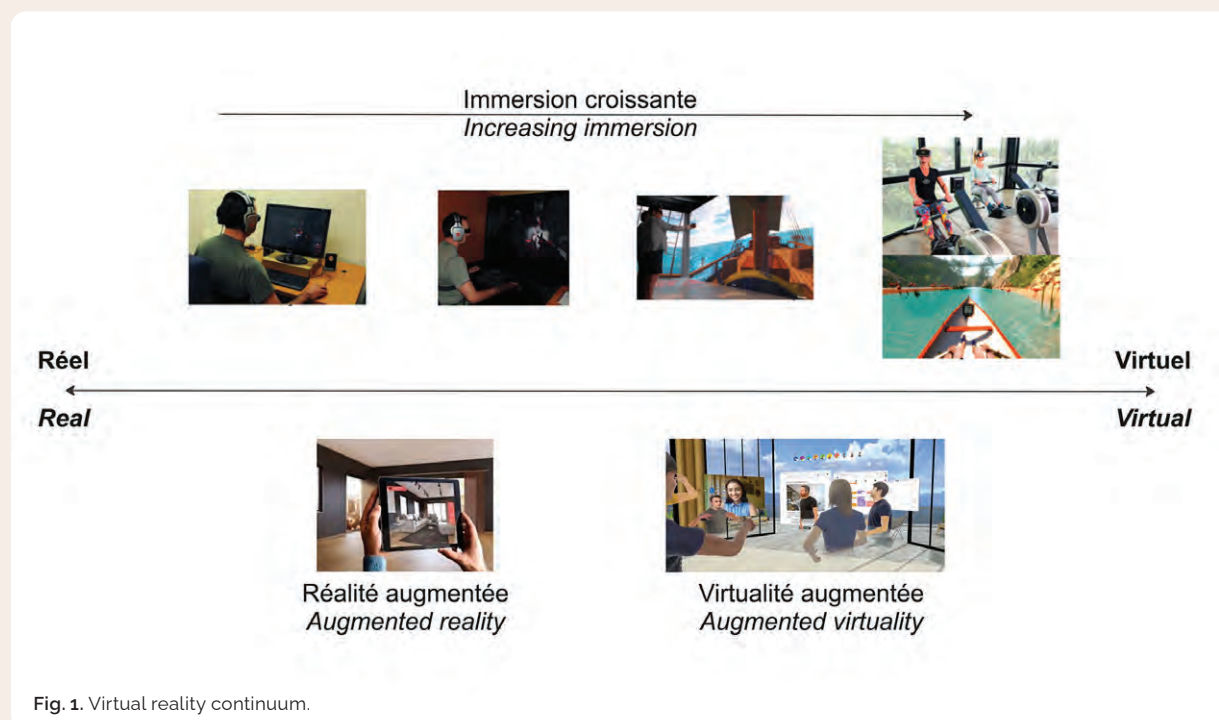


Fig. 1. Virtual reality continuum.

There are devices consisting of several large screens, known as *caves*, which are immersive rooms whose walls are projection screens. This allows users to be physically present in a simulated environment that surrounds them and with which they can interact, manipulate, and explore freely.

More recently, and this has mainly developed because of the commercial strategy of Facebook, now Meta, we have seen an explosion in the use of virtual reality headsets. These have become widely available and are now inexpensive. The reason they are so widely used is that virtual reality headsets offer the highest possible degree of *immersion*, as the field of vision is completely covered.

In a cave, you have a 360-degree image around you, but you can still perceive your physical body within the environment. In a virtual reality headset, you no longer perceive your body. You only perceive the world that is reconstructed in 3D. The user is represented by what is called an *avatar*, a virtual body that is provided to them. Representing the user with an avatar offers a whole range of very interesting opportunities, particularly for applications in education and healthcare.

Finally, in this image, below the line connecting the real and virtual, we find augmented reality technologies, which you may have experienced on your smartphones or tablets, that allow the real and virtual to merge. Augmented reality refers to the superimposition of digital elements onto the physical world. Conversely, it is also possible to create "augmented virtuality" by visually reintroducing elements from the physical world into a virtual environment. The latest virtual reality headsets feature added a set of cameras that capture the outside world to display selected elements in the virtual environment.

All these technologies belong to the same family, and to varying degrees, they are all virtual reality. There is no fundamental difference between these technological solutions.

Each of these technologies offers a different degree of immersion. What we refer to as *immersion* should not be confused with what video game enthusiasts call immersion. For the latter, immersion refers to being caught up in the environment, forgetting reality, and being subjectively invested in the action being performed. In virtual reality research, immersion

does not represent this dimension at all. For us, immersion is an intrinsic characteristic of the technological device, which is characterized by a specific ability to offer extensive sensory coverage. It is mainly the coverage of the visual field that will determine the level of immersion. The more the visual field is covered, the more immersed we are in the environment. This is why virtual reality headsets are the most immersive technology to date. A headset completely covers the visual field and prevents us from visually perceiving elements of the outside world.

But beyond the visual field, other sensory modalities can also be added. Technologies are being developed to add smells and touch to virtual reality environments. Research is being conducted on perceptions of heat in virtual reality environments to understand how this affects the user experience.



The concept of *embodiment* [...] is associated with possessing a virtual body in an environment. When immersed in a virtual reality environment, users are subjected to a complex set of multisensory illusions that lead them to appropriate this virtual body as their own.

Antonio CAPOBIANCO

This covers the technical concept of immersion. In my view, the more interesting aspect everything related to the subjective experience of the person in this environment. It offers many more research opportunities, at least in my approach to virtual reality research. Here, we use what are called constructs, the most important of which are *presence* and *embodiment*.

A *construct* is a concept used to determine a subjective experience that cannot be measured objectively. To measure these constructs, we use subjective questionnaires. This is done very effectively in psychology, which uses many constructs. IQ, for example, is one of the best known constructs in cognitive psychology. Similarly, in virtual reality, constructs are used, the main one being presence. Presence is the subjective

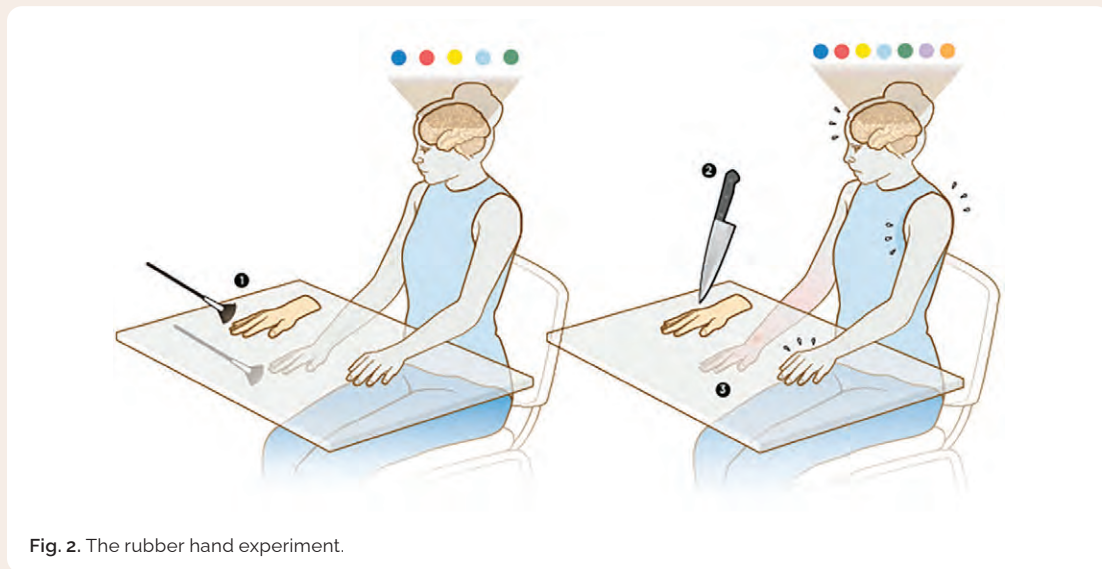


Fig. 2. The rubber hand experiment.

feeling of being there, in the virtual environment, and is manifested by various indicators, including behavioral indicators, i.e., how a person will react to a given situation.

The concept of *embodiment*, meanwhile, is associated with possessing a virtual body in an environment. When immersed in a virtual reality environment, users are subjected to a complex set of multisensory illusions that lead them to appropriate this virtual body as their own.

For this illusion of being embodied in the avatar to occur, there are two essential conditions. First, the illusion of location: you must have a viewpoint of the scene that corresponds to the viewpoint of your virtual avatar. Second, agency: the virtual avatar must respond to the user's real physical actions in a consistent manner. For example, if I move my arm in space, my avatar's arm must move at the same time and in the same way. This will create a feeling of agency, of control over the virtual body.

If these two conditions are met, it will induce a feeling of *possession*, i.e., the idea that the virtual body corresponds to one's own body, and we will therefore cognitively process the information associated with the virtual body as if it were that of our physical body.

To illustrate this, we can take the example of a well-known experiment, often reproduced and widely documented in cognitive psychology: the rubber hand experiment. The following image presents a schematic illustration of this (Fig. 2).

The experiment is very simple and does not require virtual reality to carry out. The first experiments based on this experimental

paradigm simply involved placing a person in front of a desk. The person was asked to hide their physical hand under the desk, and a rubber hand was placed on the desk in the same position as the person's hand.

There is an induction phase that involves stimulating the person's physical hand by touch, at the same time as stimulating the rubber hand. The person sees a paintbrush stroking the rubber hand, and at the same time, their hidden hand is also stimulated by a paintbrush in a synchronized manner. This very simple device creates an illusion that induces a feeling of ownership of the rubber hand. The person incorporates this hand into their body schema. What allows us to observe the existence of this feeling of ownership is a behavioral response. To do this, a threat is often used, for example, an experimenter suddenly threatens to stab the rubber hand with a knife. What we systematically observe, because we cannot fight against this illusion, is an avoidance movement, a withdrawal of the hand, which will be made by the participant.

This is a very simple version of the type of illusion produced by immersion in virtual reality, which can be much richer and more engaging than this basic version of the rubber hand experience.

Harold ÉPINEUSE: Thank you, Antonio, for this description of virtual and augmented reality and the technological continuum between these different devices, as well as for this deconstruction of the various elements that make up immersive worlds. You mentioned a

word that I think is important, which is illusion. This concept of illusion at the heart of immersive worlds brings me to you, Mel, as this is precisely a key concept in your work. How does it help us better understand what is at stake with virtual or augmented reality?

Mel SLATER: I am going to talk about similar things, but from a slightly different perspective. To begin with, here is the first image I will be using (Fig. 3).

As I said earlier, my first experience with virtual reality initially surprised me greatly because of the poor quality of the computer graphics. You could see the pixels, and that really struck me. The illusion of being somewhere else — place illusion, the first image — created by virtual reality works because, in an immersive environment, you perceive the world using your body, just like in real life.

In real life, if I want to perceive what is behind an object, I use my body to understand it. I turn around, I look, I use my eyes, etc. So, in virtual reality, from an auditory and sensory point of view, when we want to perceive something, we use our bodies: We look around, lean forward and back to get better views or to hear something closer, and so on. The brain works in the same way as in real life. When we turn, our field of view changes in VR much as it does in reality. The simplest hypothesis for the brain to adopt is that “this is where I am”. That is the concept

“The brain works in the same way as in real life. When we turn, our field of view changes in VR much as it does in reality. The simplest hypothesis for the brain to adopt is that “this is where I am”. That is the concept of *Place illusion*: the strong sense of *being there*, in the environment depicted by the VR, even though for sure we know that we are not there.

Mel SLATER

of *Place illusion*: the strong sense of *being there*, in the environment depicted by the VR, even though for sure we know that we are not there.

There is also the question of *plausibility illusion* – second image. In a static environment, we look at what is happening around us. If nothing happens, we may have the illusion of being there. But if events occur, as in the image, then the Plausibility Illusion happens and may come into play. If a monster approaches us, we have the illusion that it is really happening, and this occurs when events in the environment react to our actions, when they affect us personally. Under the right circumstances, which is obviously not the case here in the example used,

VIRTUAL REALITY ILLUSIONS & REALISTIC BEHAVIOR



Fig. 3. Virtual reality illusions and realistic behavior.

this is predictable based on your daily life. For example, if you are in a virtual reality courtroom, you assume that everything will happen as it would in a real courtroom. Hence, we have the illusion that things are really happening.

Third image, *body ownership*. We had a project in London in the early 1990s. In my first experience in the HMDs that we bought, I looked down towards myself and I was invisible. That made a deep impression on me. But you can program the application to have a virtual body that replaces your real body. When you see a virtual body replacing your real body, when you look in the mirror and see your reflection, even if it does not look like you, it can create the illusion of body ownership over the virtual body.



When you see a virtual body replacing your real body, when you look in the mirror and see your reflection, even if it does not look like you, it can create the illusion of body ownership over the virtual body.

Mel SLATER

The fourth image refers to the rubber hand experiment, which we reproduced some time ago in virtual reality. Instead of synchronous touch, we used synchronous movement, meaning that I move my body and see the movements reproduced in a virtual environment. All of this creates an illusion that the virtual arm is mine. This can be extended to the whole body. We feel as though the virtual body is our own body.

When all these elements are combined, the key takeaway is that we react realistically to our environment — as in the final illustration. If we feel like a rock is going to fall on us, we move even though we know it is a virtual environment and we are not on Mars. Even if we convince ourselves that this universe is fake, a reaction is inevitable. The body will react, the heart rate will accelerate, we will move automatically, to avoid the threat.

This is what we have been working on for several years conducting experiments to understand different aspects of these concepts related to virtual reality and the body's response.

The human response in the context of justice, and more broadly what we have been working on, is more about prevention and reintegration. Mavi Sanchez-Vives is going to discuss her work on domestic violence and violence against women in the context of prisons in Catalonia during a later panel.

I would now like to talk about the paradigms we use, the *golden rule embodiment paradigm* (GREP), which explains the methods we use for rehabilitation and prevention. We worked on this in Catalonia, in the areas of road traffic and prisons. We tried to help recalcitrant drivers who were sent to prison to change their behavior. This work was done in coordination with the justice system.

In GREP, we move through different phases. In the first phase (**Fig. 4**), one (virtual) person causes harm to another; we have an aggressor who shouts at a woman (for example). Of course, both actors, the aggressor and the victim, are virtual. This is virtual reality. The person witnessing the scene is simply a bystander in the first phase.

In the second phase, the scene is replayed, but now the person in virtual reality finds themselves in the body of the victim, which changes their perspective.

For a control group, the person is simply a spectator; they do nothing except watch.

A few weeks later, the participant and the person in the control group are shown the same scene again, and the results are observed. It is then clear that people are more likely to intervene if they have previously experienced this scene as a victim. There is undoubtedly a behavioral impact. Participants are more likely to intervene than if they were in the control group and simply spectators.

We used this method in an experiment with the police in the United States, in the context of the fight against racism, with suspects from the Black community. Mavi Sanchez-Vives will further explore this later.

Harold ÉPINEUSE: After these general explanations, and unless Fred has any comments on the fundamentals of these technologies, I suggest we turn our attention to concrete applications. I will turn to you, Antonio, to first discuss the uses that are common in our everyday lives, before moving on to applications in our institutions and the justice sector.

THE GOLDEN RULE EMBODIMENT PARADIGM (GREP)

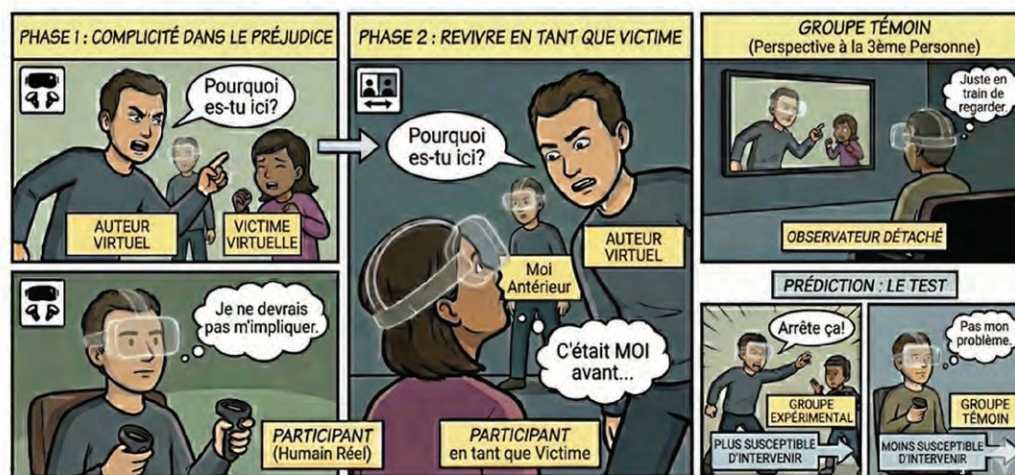


Fig. 4. The golden rule embodiment paradigm (GREP).

Antonio CAPOBIANCO: Many players have embraced virtual reality technologies. The first were manufacturers, who quickly saw the advantages, particularly for the design and prototyping phases of industrial products.

The automobile industry quickly took an interest in these technologies: Peugeot, Renault, BMW... All the major manufacturers had set up their own virtual reality research centers, mainly because it enabled them to shorten the design cycle and achieve economies of scale on tasks that were previously tedious. For example, twenty or thirty years ago in the automobile industry, evaluating the ergonomics of a vehicle interior required producing a full-scale model. It was time-consuming, expensive, and wasted a lot of the teams' time. With virtual reality, you can go directly from the 3D computer model of the interior to an assessment of the ergonomics of the interior in virtual reality.

The industry has therefore made extensive use of it. Then came an increasing number of applications in the healthcare field. First in training: virtual reality is widely used to simulate medical procedures and technical procedures. This is also the case in industry.

I witnessed a very impressive demonstration of a simulator that taught users how to install an electric window motor in a car door, a situation where immersion is particularly important. It required a high degree of visual and sensory fidelity. To achieve this, a 3D environment was

used, coupled with a motorized articulated arm called a phantom. This is a mechanical arm that provides a sense of force feedback and allows the operator to touch objects, enabling them to feel the contact of the motor they were installing in the door. Similar things exist in medical training, where future surgeons can be trained to perform procedures or technical maneuvers.

There are also applications in mental health. In fact, it is widely used in cognitive behavioral therapy and exposure therapy, which involve gradually exposing a person to the source of their phobia to build up a gradual habituation. For example, virtual reality is very effective in treating arachnophobia and acrophobia.

Then there are a growing number of applications. These are now becoming commercial applications, product demonstrations, and even educational applications. Personally, I have rarely seen a truly convincing application for education. On the other hand, it works very well for everything related to procedures and learning technical skills.

Indeed, as Mel Slater said earlier, the body acts to perform a task. We can therefore encode the sensory-motor information associated with performing a task. Consequently, when we must perform a very repetitive movement or learn a sequence of movements to carry out a specific procedure, virtual reality works very well.

Harold ÉPINEUSE: Much like artificial intelligence, which, as you see every day, has already colonized our lives, these technologies are already very present in reality, even commonplace, and perhaps even key to the development of sectors other than ours, such as those you mentioned. Fortunately for us, this has allowed them to improve over time.

The question I ask myself is this: are these technologies a source of inspiration for the justice system? Can we effectively transfer benefits observed elsewhere to our sector? Is justice more than just a new market for these manufacturers?

On this subject, Mel, you wanted to tell us about some work you did with the traffic department in the Catalonia region of Spain. Tell us about this request and what benefits this administration expected to gain from calling upon your services.

Mel SLATER: We were indeed contacted by the traffic department in Catalonia to address the issue of repeat offenses among drivers and what could be done to remedy this. I will come back to that in a moment.

This is in line with what I said earlier. The environment we created in an initial test. An initial experiment worked as follows: you are the participant, and you meet up with a group of friends in virtual reality, who are all, of course, virtual.

You decide together to drive to another location. You thus have two cars heading in the same direction. You are in one vehicle with a driver, and you can see the other vehicle next to you. In this scenario, you are the observer, and your driver is sitting next to you. His cell phone starts ringing, and he begins to answer it while driving. The phone rings again, and he answers it again, while still driving. He eventually causes a collision with another car because he is on the phone while driving. Here is the scenario of this collision between the vehicles.

Then, just like in the second case, the second scenario, you become the victim in the other car that was involved in the collision. You can see the medical team on site taking care of you. In the last scene, you find yourself in the hospital, and you are told that your spine is broken and that you will no longer be able to walk. Your family is nearby and crying at this news. Your cellphone is next to you, but you cannot answer it because you cannot move.

The people who took part in this test in Barcelona were simply volunteers. They were not people who had committed traffic offenses. This perspective was very interesting; people understood the consequences of such offenses.

The traffic and justice division heard about our experiment and contacted us through the University of Barcelona. We will now be able to start working soon with those responsible for these traffic accidents, in prisons.

This time, on a larger scale, with Google's help in setting it up (**Fig. 5**), we went to the United States to a particular police division. It is located in an area that is, shall we say, difficult and complicated, where the police told us not to eat in local restaurants because it was too dangerous, too risky.

The experiment focused on racial bias in the police force. In the first image, once again, you are a bystander to racist behavior by your partner, a virtual officer who carried out the interview in a completely unacceptable manner to a black suspect.



Embodied as the victim, you realize that you did not intervene. But if, on the other hand, you have experienced being the victim, you are likely to intervene. You have gained access to another perspective, and that will change your behavior in the future.

Mel SLATER

In the second image, you are embodied as the victim and re-experience the interview from the embodied perspective.

Finally, for the control group, they are simply observers, watching what is happening through the window.

An initial test was conducted, followed by a second one a few weeks later. The second one was the test scenario. You are in a café, still with the same abusive police officer. A black person enters the café and is immediately subjected to abuse from the abusive officer.

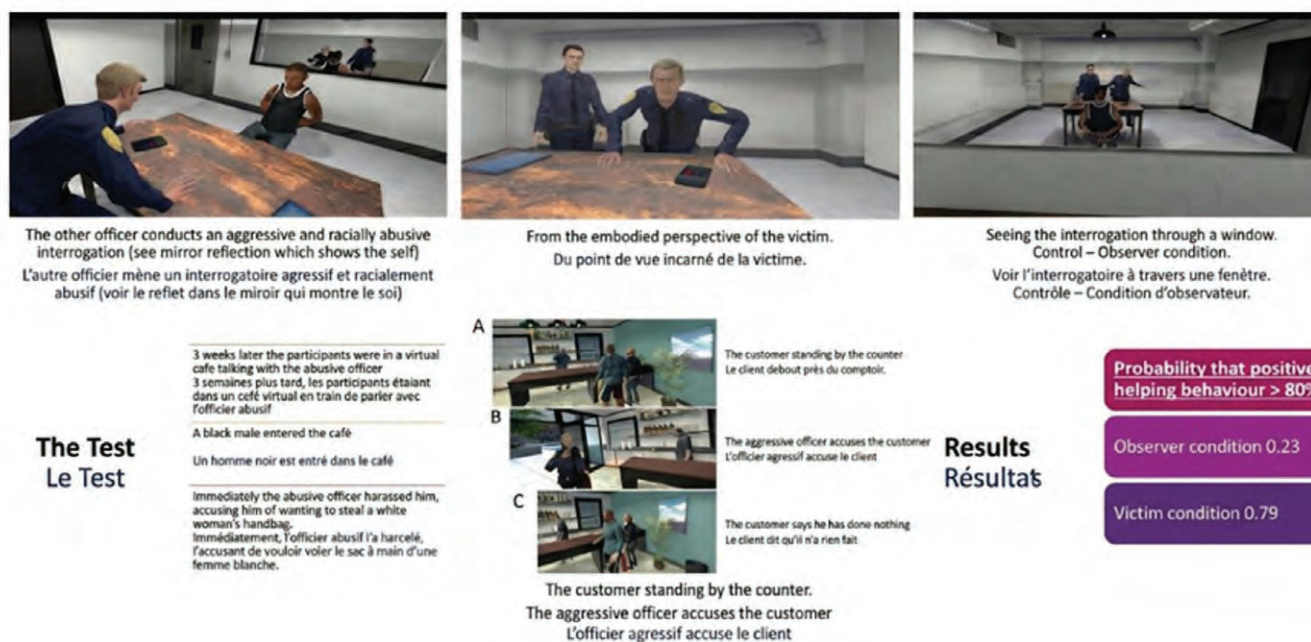


Fig. 5. The Police Study in the United States.

If participants were in the experimental group where they had experienced the interview from the viewpoint of the victim, there was a high probability that they would intervene in the café to stop this. On the other hand, if they were in the control group, the probability is much lower: 20% in the control group, 80% in the experimental group, where they had been the victim.

This is compelling evidence. This test is not the only one we have conducted, but it does mean that the Golden Rule Embodiment Paradigm (GREP) I mentioned earlier works. You see your actions in different circumstances; you have a circumstance where someone else is harming another person. Embodied as the victim, you realize that you did not intervene. But if, on the other hand, you have experienced being the victim, you are likely to intervene. You have gained access to another perspective, and that will change your behavior in the future.

Harold ÉPINEUSE: We will now move from the interrogation room to the courtroom, and hand over to you, Fred. In your experimental courtroom, similar to the one at our partner, the Montréal Cyberjustice Laboratory, you are committed to testing all technologies that could

renew what I would call the courtroom environment. You therefore have started to take an interest in these immersive worlds, but also in recreating presence for remote appearances using holograms. I will let you speak on these two topics and explain what has emerged from your initial experiments in this area.

Fredric I. LEDERER: Our focus is indeed on the use of technology in trials and hearings. We have also conducted other research on artificial intelligence and data, but that is for another conference. Our concern today is the usefulness of this technology in different contexts.

The reality I am going to talk about now is mainly that of the environment, or the reality, of the United States of America. Many of the States represented in this room will not suffer from some of the difficulties I am going to highlight, or at least not to the same extent. Nevertheless, I am going to talk about them in relation to our environment in the United States.

What you see here (Fig. 6) is a photo taken about thirty years ago, five minutes before the hearing began. We created a case in which a company had placed a device in a person's body, the purpose of which was to remove



Fig. 6. Image showing a virtual court record in William & Mary Law School's McGlothlin Courtroom.

cholesterol. But the problem was that the first patient had died. The family sued the company on the grounds that it had manufactured the device incorrectly.

The company had a defense, namely, medical malpractice. It was the surgeon who had made the mistake, not the company. The central question was how to prove it. The company, which was fictional, I should point out, was going to defend itself by demonstrating that the surgeon had made a mistake in the operating room.

A nurse was part of the surgical team and was therefore present. She had been able to observe everything that happened during the operation. The difficulty for the plaintiff was therefore how to counter this testimony.

What you see in this image is a scientist from the California University of Santa Barbara wearing a helmet who was responsible for the entire virtual reality component. At the time of the case, with a federal district judge presiding, what happened? The witness was called, testimony was presented, followed by cross-examination. The witness was asked to put on this helmet, which meant that the witness was, in a sense, brought back into this virtual operating room situation.

At the time, we did not have enough money for headsets for all the jurors. What we did, as

you can see on the right side of the image, was project a large image so that they could see what the witness was seeing. This made it clear that the witness did not actually see the surgeon's hand or hands. She could no longer see them, and her testimony was deemed as not credible, was no longer trustworthy. The ideal solution would have been to include all members of the jury in this experiment, but that was too expensive at the time.

What can we conclude from this? When it comes to evidence, there are sometimes situations where virtual reality and virtual means work better than traditional methods. In this case, we

When it comes to evidence, there are sometimes situations where virtual reality and virtual means work better than traditional methods. In this case, we were able to prove that the nurse, the witness in question, did not see the surgeon's hands.

Fredric I. LEDERER

were able to prove that the nurse, the witness in question, did not see the surgeon's hands.

As far as we know, this scene (Fig. 7), is the only recording ever made in a virtual reality courtroom. Let me explain.

In the United States, all trials and trial recordings — mainly think of important cases here — require a transcript. This is a record of everything that was said during the proceedings, the hearing, and what will be used for appeals. For appeal purposes, lawyers and judges look at a text, which is a transcript of the first trial.

We are not blind to the fact that technologies have been available for many years that would allow us to know exactly what happened during a hearing. Except for the state of Kentucky, and recently also the armed forces, we love written transcripts, even though we could use videos and full virtual reality.

Here are a few small examples that show you why this is important. A few years ago, we conducted a little test. If we were to read the text of a transcript, it would give the following impression:

"Excuse me, Your Honor, you seem to be falling asleep."

The judge: "No, certainly not, Counsel. I am just resting my eyes."

So that is the written transcript. If we took the audio and video recording, it would look like this:

The lawyer intervenes: "Excuse me, Your Honor."

"Yes, yes," says the judge, waking up.

"Your Honor, you seem to be falling asleep."

"Certainly not, Counsel, I am just resting my eyes."

A completely different impression, then. If we could preserve that in virtual reality, there would be no doubt, we would know exactly what would happen on appeal.

No one in the United States wants a virtual reality courtroom. They do not want it, they want a written, textual transcript. How do you pro-



How does remote holographic testimony work? The witness can be anywhere in the world, she can even speak on a smartphone, and she appears in a box of sorts, in this frame. If you are in the courtroom, you think to yourself that it is a real human being in that box.

Fredric I. LEDERER

duce a good textual transcript? By using artificial intelligence.

Our virtual courtroom has precisely this capacity: our FTR artificial intelligence system can handle more than ten people speaking at the same time, record it all, and interpret it into 136 languages and dialects to produce a text, a textual transcript.

Virtual reality would obviously give us much more, it would give us the big picture, the whole



Fig. 7. Image showing a virtual court record in William & Mary Law School's McGlothlin Courtroom.



Fig. 8. Examination of a remote holographic witness via a Proto Epic in William & Mary Law School's McGlothlin Courtroom.

thing, but we do not want that in our legal culture. Judges, lawyers, we know what we want, even if it does not really make sense. It does not make any sense, but we do it anyway, because that is what we want, what we prefer.

Here you see a photo of remote holographic testimony (Fig. 8). How does it work? The witness can be anywhere in the world, she can even speak on a smartphone, and she appears in a box of sorts, in this frame. And if you are in the courtroom, you think to yourself that it is a real human being in that box.

Why is this important? Because we have collected testimony using various means of videoconferencing, particularly those based on computer systems. We do this often. In the United States, there is a problem, however. Putting aside all the scientific and academic issues, which you are all very familiar with in this room, and which will be the subject of a panel discussion today, on the impact of these remote testimonies, in the United States we also have a question of constitutionality. The right to confrontation and cross-examination is guaranteed by the Sixth Amendment to our Constitution. According to this right, which I will summarize, in most cases, government

witnesses in criminal cases must appear in person in the courtroom.

There are several justifications for this rule, including historical ones. But let us put history aside for a moment. In the US legal system, and I believe this is also the case in many Common Law countries, we firmly believe that judges and jurors can discern the truthfulness of witness testimony. They rely on facial expressions, body language, etc. This is called demeanor evidence, meaning behavioral evidence: supposedly, behavior allows us to discern the truth — or not.

Science tells us that it is not the case, but we are lawyers, we are judges, it is part of our system! That is how it is. That is why Zoom, Teams, and other forms of videoconferencing are being questioned. During the COVID-19 pandemic in the United States, there were very few hearings in criminal cases. The few cases that did take place mostly involved remote witnesses who were ill or at risk of becoming ill.

The question we then asked ourselves was: what about holographic representation of witnesses? This may seem like a silly question, but it is nevertheless fundamental. Would it be possible? Could our legal system, our judges, and



The question we then asked ourselves was: what about holographic representation of witnesses? This may seem like a silly question, but it is nevertheless fundamental. Would it be possible? Could our legal system, our judges, and our magistrates accept this as equivalent to in-person behavioral evidence?

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To test this question, we created an experiment, a prototype, a year ago. We wrote a short criminal case with a jury and did our best to reproduce the circumstances identically. But in one case, the witnesses were remote, via video-conference; in the second, they were physically present; and in the third, they were represented by holograms.

It was an interdisciplinary case. We had, for example, a member of the psychology faculty, and members of our Government Department. The experimental data from these three hearings constitute evidence that the method of testimony can have an impact on the course of the proceedings. I do not have time to go over all the details, because there is a lot of information.

Our finding was that there were significant differences in the results between physical, in person testimony and the two remote interventions. Convictions followed the testimony of witnesses who appeared in-person, but not those who appeared via hologram, for instance.

Based on that, we launched a three-year research project. About two weeks ago, we presented some of the results to our National Science Foundation. If all goes well, over the next three years, we will replicate this same test, but in an improved way.

But what exactly do we know? We know that, even if it does not match our usual idea of virtual reality with headsets, it is indeed virtual reality in a different sense. And depending on how we use it, we get different results.

This leaves one small question unanswered: what is justice, and how do we know when we have achieved it? Stay tuned, we may need your help.

Harold ÉPINEUSE: We have taken a step aside with this technology, which is certainly different, but whose challenges are in fact very similar for the justice system. Because, to tie in with what Antonio and Mel were saying just before you, what is at stake, both with hologram appearances and immersion in a virtual courtroom, is this perception of being there, made possible by a device that recreates presence, even if it is still based on an illusion. You have also paved the way for experiments to be carried out in a research setting. Thank you for offering us some initial insights before we hear about some of the research questions being asked about the justice system in the various workshops that will follow.

Before we get into the different use cases that will be presented to us today, as a concluding remark, I would like to ask you one last question: what benefits do you think we can expect from the use of these technologies for justice? Without, of course, minimizing the potential risks to our institution in its exercise of a mission that is essential to democracy and social cohesion, and to the guarantee of our rights.

Antonio CAPOBIANCO: When it comes to benefits, virtual reality is controllable and reproducible. Controllable means that we have complete control over what we put into the environment. However, this does not mean that what we perceive there is objective. Any first year psychology student could tell you that objective perception does not exist. Perception is a dual phenomenon: we perceive as much in a virtual reality environment based on what we bring to it — our knowledge, our history, our mood — as we do based on what we find there. Reproducible means that we can play the scenario repeatedly and it will always be the same, it will always repeat itself in the same way.

One of the main benefits is that the experience is transferable, meaning that we know that an experience in virtual reality can be transferred as knowledge to a real-life situation. I think that this can be very useful in preparing people to testify, or more generally for the administration of justice.

What is more, it is very effective: we are starting to see compelling evidence of its effectiveness in acquiring behavioral skills, such as public speaking, empathy, and conflict management. So, it could be very interesting for

applications involving concepts such as restorative justice.

It is now relatively inexpensive. What is expensive today is the creation of environments, but the equipment is readily available. To echo what has just been said, this allows for greater accessibility and access to places that would not normally be accessible. I think these properties of virtual reality are very interesting and can be used in justice applications.

In terms of risks, the first immediate risk associated with virtual reality is physical risk. A significant number of people cannot tolerate virtual reality and suffer from what is known as cybersickness, which is accompanied by symptoms such as nausea, dizziness, and balance disorders. It is caused by a sensory mismatch between vision and inner ear perception. Some people therefore find immersive virtual reality experiences very difficult to cope with.

The second category is psychological risks. We know that prolonged immersion can lead to feelings of depersonalization and confusion between reality and virtual reality. It is still necessary to have a minimum amount of knowledge about the people who will be exposed to these virtual reality environments. We are seeing the emergence of new uses with significant risk factors. For example, I view the future of virtual agents, now boosted by artificial intelligence, with great apprehension and curiosity. There are already cases of people falling in love with their chatbots. Imagine what could happen if this were embodied in an attractive avatar in a virtual reality environment.

We also know that virtual reality introduces biases. This can be an asset or a risk. It is an asset if we can control the biases we introduce and carefully control the objectives of the application. Typically, when developing an exposure therapy application, we exploit the perceptual biases induced by the virtual reality experience for treatment purposes.

But there are others that are riskier. We know that perceiving distances in virtual reality is complicated. We are already very poor at perceiving distances in the physical world. In virtual reality, it is even worse. Spatial understanding of the environment can be biased. I imagine that when working on a crime scene reconstruction, understanding how the scene unfolded in space is important, so this can be a significant bias.



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Antonio CAPOBIANCO

These problems are sometimes linked to very simple things. For example, when we move in real life, we encode a whole range of somatosensory information. The rotation of our head, for instance, allows us to encode spatial information that, in turn, allows us to orient ourselves. When we sit at a desk, remain motionless, and look straight ahead at a virtual reality screen, this information is not present. The way we perceive space will therefore be influenced.

In addition, the representation of the avatar can influence behavior. Several studies, including some conducted by Mel Slater, show that how we are represented in the environment will have an impact on how we behave in that environment. Depending on whether we are tall or short, strong or weak, our skin color, etc., we project our preconceived ideas onto the environment and adapt our behavior accordingly, based on what we imagine to be the expected behavior of the avatar we have been given.

The last problem, in my opinion, is the existence of risks linked to the fact that the market is dominated by players who are mainly American. However, virtual reality headsets are recording more and more information. Not just information about the environment but also eye tracking data and an increasing amount of physiological information. There are sensors for temperature, heart rate, muscle activity, facial recognition, emotion recognition, expressions, etc. All this information is embedded in

proprietary headsets, whose technological environment we do not fully control.

Mel SLATER: I would like to talk to you briefly about three things: training, simulation, and risks.

First, training. My knowledge of law and justice comes solely from what I see on television programs and shows. But I imagine that jurors, witnesses, and even judges, especially when they are relatively young, may feel a certain apprehension when they must appear in court. Witnesses, particularly, must wonder what will happen, etc., and so virtual reality could be used to give people the experience of appearing in courtrooms before they do so.

This would apply, for example, to witnesses, even jurors, who could experience virtual reality and learn what it means to be a member of a jury or a witness. The same applies to the training of judges, and to defense and prosecution teams, who could use virtual reality for training purposes.

Secondly, simulation. During a trial, one version of events comes from the prosecution, and another from the defense. Increasingly, especially with the use of artificial intelligence, it could be straightforward to reconstruct these two paradigms, that of the defense, and that of the prosecution. This reconstruction would

make it possible to demonstrate what happened, from an immersive point of view, and to explain the purpose of criminal proceedings. I am thinking, for example, of cases involving physical violence, rather than proceedings relating to property disputes or similar cases. The judge and members of the jury could view these reconstructions to determine whether, in their opinion, these various simulations could correspond to a true representation of reality.

“Regarding simulation, we must be very careful and ensure that it corresponds to reality, even if it is not possible because it is a simulation. Therefore, the use of this technology in courtrooms where people’s lives are at stake is problematic. Its use for training is fine, simulation may be feasible, but there are enormous ethical risks.

Mel SLATER



A view of the audience during the conference.

I now come to my third point. Ethics is a subject that is particularly often raised in relation to virtual reality. There is a lot of speculation about the ethical aspects of virtual reality.

We were granted funding from the Spanish government to conduct experiments on ethics. The results of the first experiment, which were quite surprising, although predictable on reflection, indicate that we tend to confuse virtual reality with physical reality. To illustrate this, we conducted an experiment in which we asked people to sit down on a chair that they saw in virtual reality. Forty percent of the participants did so without checking whether there was a real chair there, which is as frightening as it is fascinating.

To take this further, if a virtual character hid an object in a virtual reality location and a week later went to the real location that was the subject of the simulation and were asked where the object was, they would point to that location seen in the VR. There is confusion between virtual reality and physical reality.

Finally, regarding simulation, we must be very careful and ensure that it corresponds to reality, even if it is not possible because it is a simulation. Therefore, the use of this technology in courtrooms where people's lives are at stake is problematic. Its use for training is fine, simulation may be feasible, but there are enormous ethical risks.

Fredric I. LEDERER: Our colleagues here are world-renowned experts. I do not have this expertise in virtual or augmented reality. I think the fundamental question, asked from the outset, is that technology, particularly in justice systems, presents both advantages and risks.

In conclusion, I would like to announce what we are about to install in my courtroom. It started a few years ago when I was visiting Singapore, although it could have happened anywhere. I met the Chief Judge of Singapore Subordinate Courts, and he had only one question: is there a way, anywhere in the world, where I can be certain whether a witness is telling the truth or not? He said to me, "If so, I will get on a plane right now."

Soon, we will install a new technology. The judge and lawyer will see a video presentation of the witness, marked with small red lines. These lines will indicate the artificial intelligence system's predictions regarding the

likelihood that this witness is lying. If this proves to be accurate and reliable, it could have a huge impact on justice systems. In the meantime, I would say that there is a great deal of fear and doubt surrounding these issues.

Harold ÉPINEUSE: This gives our colleagues in the closing plenary session plenty to think about and provides us with food for thought for the parallel workshops that follow, during which our guests will report on real-life cases and the concrete effects that the use of virtual or augmented reality devices can have in the administration of justice. Thank you all three of you.

Workshop 1

Immersive Environments for Professionals, Victims and Witnesses: Preparation, Protection, And Support

Chair: Harold ÉPINEUSE

Deputy Director of the Robert Badinter Institute

Rannveig SIGURVINSDÓTTIR

Associate Professor, Department of Psychology, Reykjavik University (Iceland)

Aislinn McALEER

Performance Improvement Officer within *Victim Support Scotland* (Scotland)

Francine RYAN

Senior Lecturer in Law and Director of the Open Justice Centre, The Open University Law School (United Kingdom)

Harold ÉPINEUSE: Hello everyone and welcome to this first workshop session in which we will hear from our three panelists how immersive environments can help professionals, or future professionals, victims, and vulnerable people to appear in courts by providing them with preparation, protection, and support. We are delighted to welcome you here presenting your experimental work and initiatives in the field of immersive environments.

Francine Ryan, you work at the Open Justice center of the Open University's Faculty of Law in London, in which virtual reality helps you train professionals. Aislinn McAleer, you will be presenting your pioneer initiative using virtual reality at *Victim Support Scotland*. Finally, Rannveig Sigurvinsdóttir, you are an Associate Professor in the Department of Psychology at Reykjavik's University. Given that psychology is crucial in this field, your comments will be very important

when it comes to measuring the impact of immersive environments on people.

We will therefore have a variety of presentations and be in position able to understand and assess the work they are doing in each institution concerned by the use of virtual reality. This will also give us a concrete idea of how research can really help us improve our processes and inform us about the various initiatives we can implement in our judicial systems using this kind of technology.

I will now give the floor to Francine.

Francine RYAN: Thank you very much for the invitation, I am delighted to be here with you today. I am a senior lecturer at the Open University in England, and I will be talking about my virtual reality courtroom⁷.

I will discuss the context of the project, the development of our virtual courtroom, and some of the results of research conducted with students in relation to our courtroom. I will then discuss, more broadly, the relevance of this project to the justice sector. So, what I am going to talk to you about today concerns, first, the creation of our virtual courtroom on a desktop computer and its use in student training and, more broadly, in professional training. I will then explain how this may be relevant to the justice sector more generally and present some of the conclusions we have reached when students reflect on its relevance to professional training and the justice sector.

⁷ Virtual Courtroom | Open Justice: <https://university.open.ac.uk/open-justice/virtual-courtroom>.



Francine RYAN

I imagine that many of you in this room are real experts in technology. I would like to point out that when it comes to virtual reality on a computer, we use a standard computer, without a headset, so that you interact with the virtual environment using a keyboard and mouse, and everything is displayed on your screen.

The reason we made this choice is that it is an educational project. The Open University is an online university, and our students are geographically dispersed. We have 7,000 law

students spread across several countries. Virtual reality offers something quite unique in terms of its ability to replicate real-life experiences, such as attending a trial or participating in legal proceedings. At many universities, this would take place in a physical courtroom, but we obviously do not have that option, as our students are spread across different regions and countries.

We have therefore developed this immersive environment over the last few years, since around 2021. The image above (Fig. 9) shows the original courtroom and the various rooms we had available. Over the past few years, we have expanded and refined it iteratively with the help of students, who help us determine what works and what does not, through research projects aimed at developing the concept and refining its nuances.

We offer two ways to use the courtroom. The first is exploration mode. It allows the user to enter the courtroom alone, walk around, and observe the different environments. We have

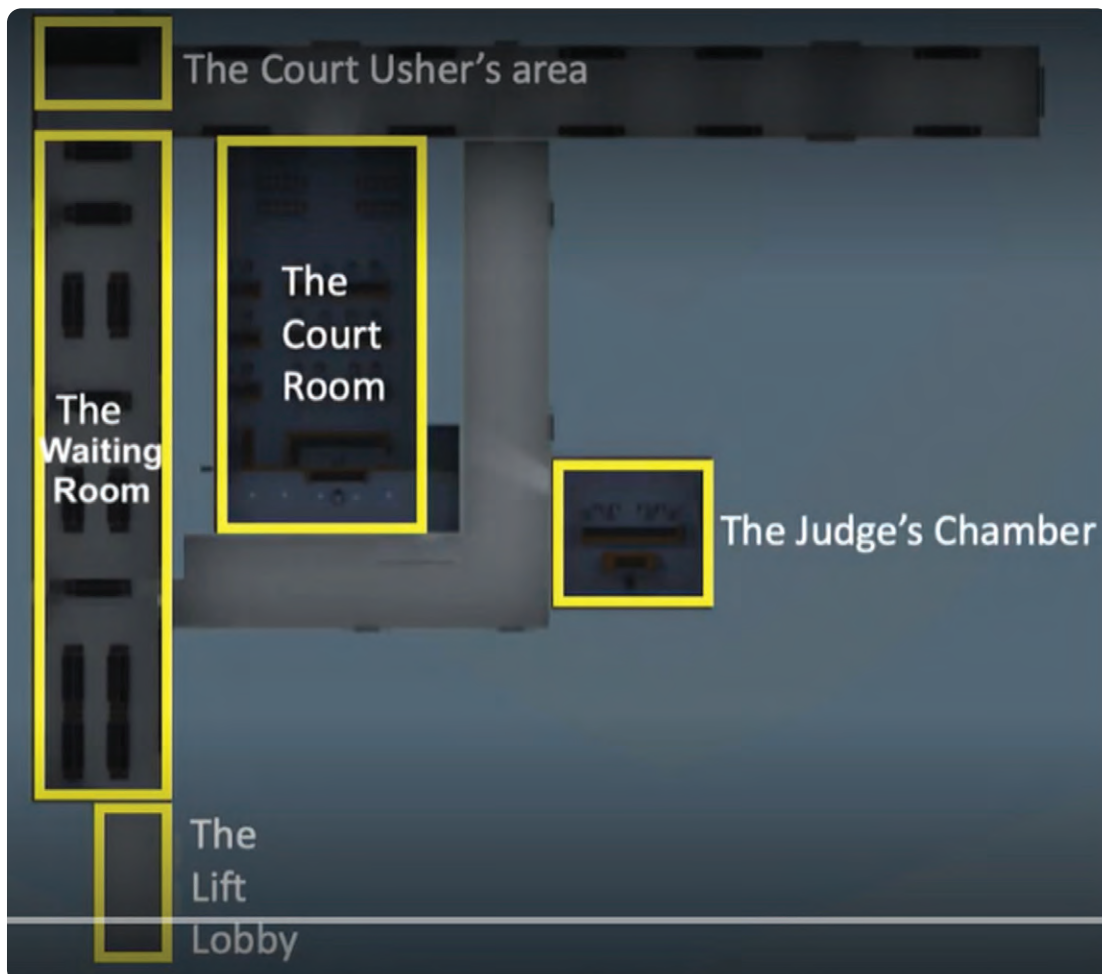


Fig. 9. The various rooms of the immersive environment.

designed some simulations including guided tour. We have created escape game-type activities that students can participate in to find specific objects in the courtroom and learn more about a specific case or something similar.

The second mode is *Moot*, the mock trial simulation. It allows up to sixteen people to enter the courtroom together and has been specially designed for practice, advocacy, and the presentation of evidence. It truly helps our students develop the skills they will need if they wish to practice law.

Hereunder are some photos showing what the courtroom looks like today (Figs. 10 to 16).

As you can see, it has changed a lot over the years. We expanded it so that it no longer consists solely of a civil court and a waiting area.

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Francine RYAN

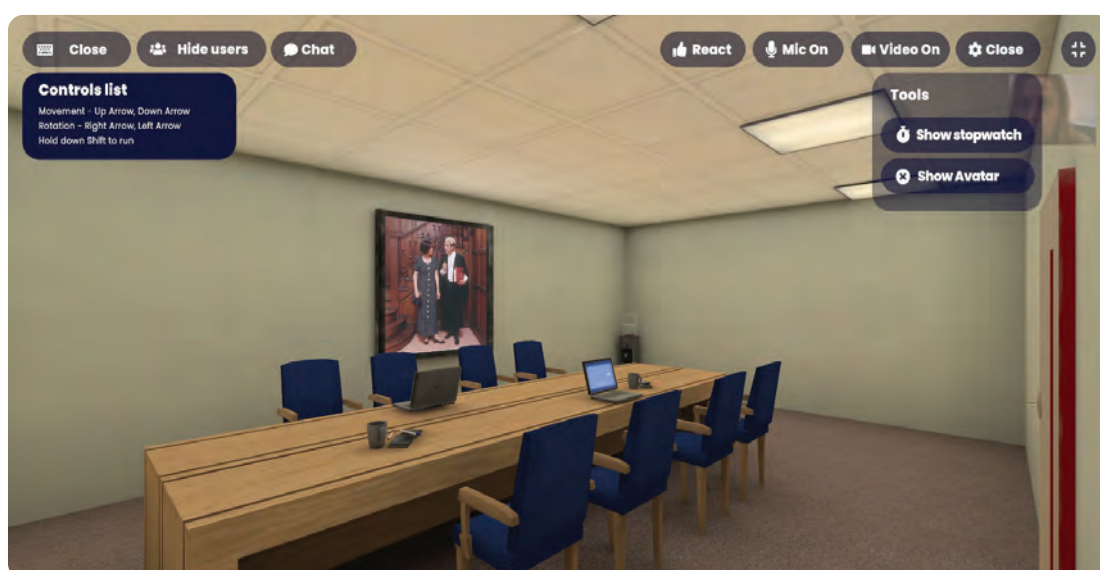


Fig. 10. Meeting room.

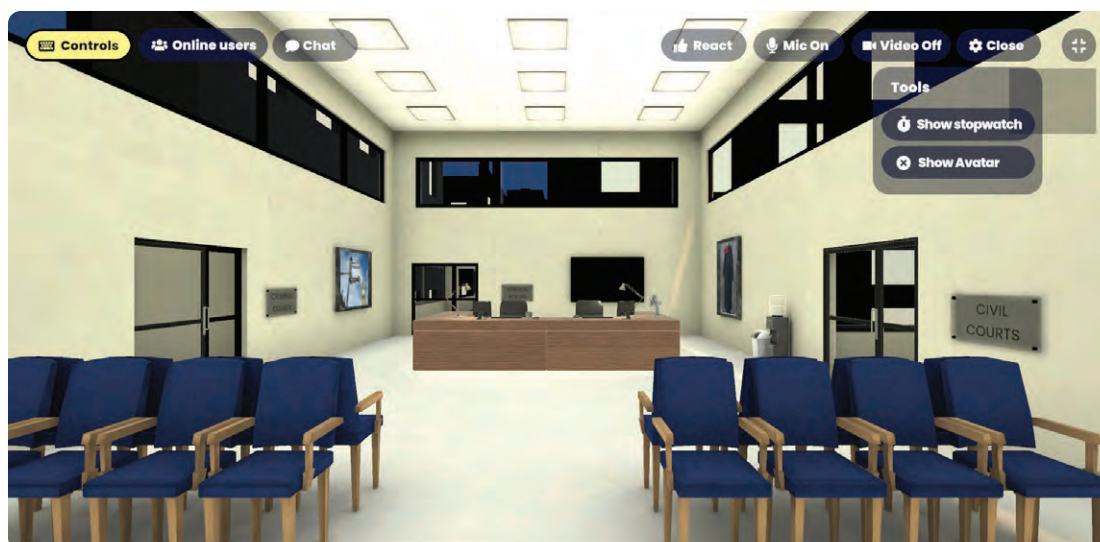


Fig. 11. Waiting room.

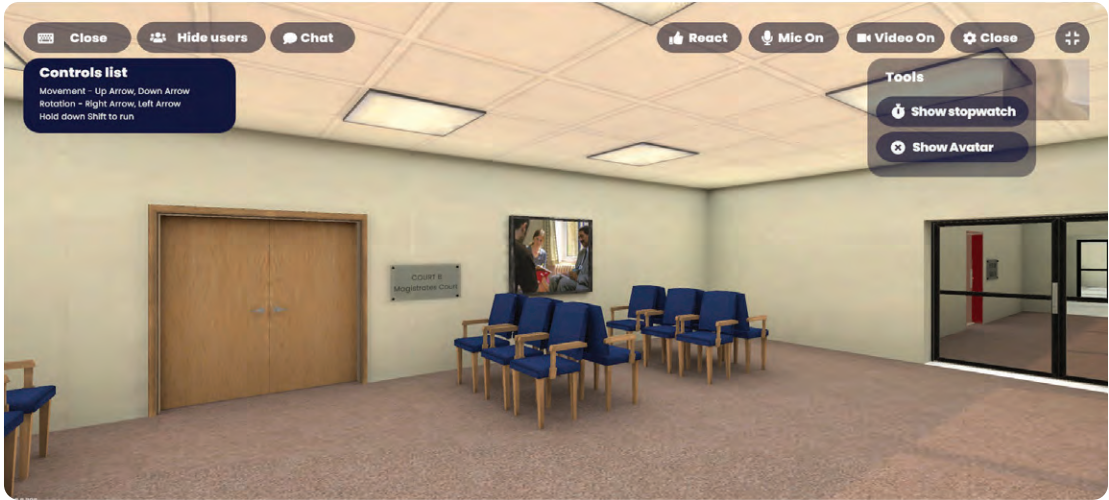


Fig. 12. Waiting room.



Fig. 13. Criminal court.



Fig. 14. Civil court.

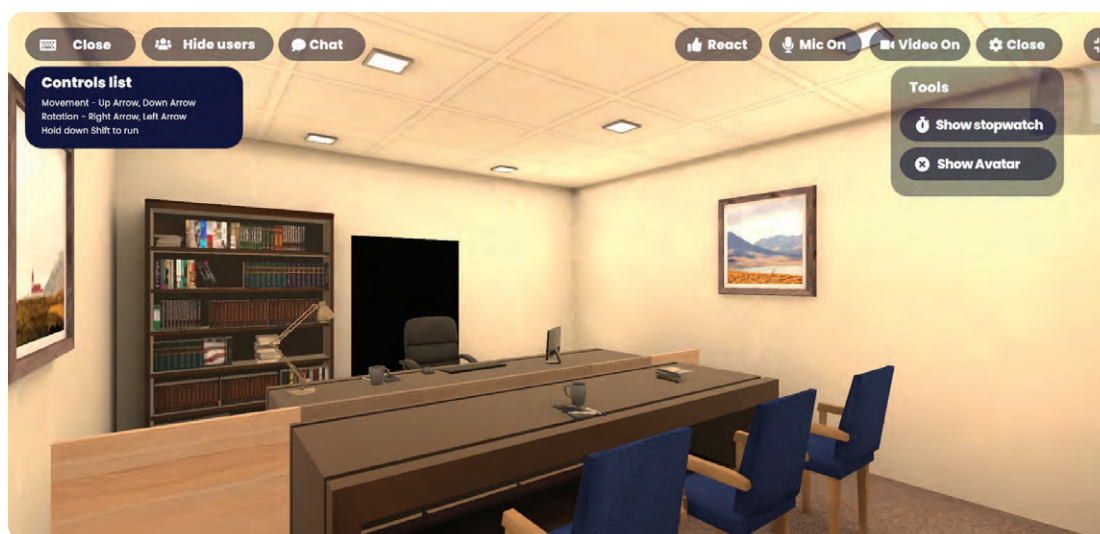


Fig. 15. The judge's chambers.



Fig. 16. Security area.

We completely rebuilt it according to architectural specifications provided by the Ministry of Justice, in England and Wales. Unfortunately, it is not like the big, lovely, fancy courts found in London, but rather the virtual courtroom represents the type of courts found throughout the country. They are less luxurious, with no wood paneling or grand architectural features.

However, we have added additional courtrooms and meeting rooms. We now have two criminal courts, with a crown court and a magistrates court, a civil courtroom and a tribunal room which reflect the courtrooms in England. We have built an entrance area so that you must go through security, just as you would in a physical courtroom.

You can also take an elevator down to the basement, where there are a few cells, and where the defendant can enter the back of the dock... We have gone from a single virtual courtroom to a court center. What is more, it is now a website, it is Cloud-based and there is no need to download it to your computer; you can simply access it via a web link.

We are using desktop virtual reality, so you do not have the same level of immersion as you would if you were wearing a headset. So, we have taken several steps to try to recreate the atmosphere of a courtroom, for example by adding ambient sounds, so that you can hear your footsteps as you move around. There are the background noises you would hear in a



Fig. 17. Courtroom.

normal courtroom, in the hallway, in the waiting rooms. You can hear the rustling of papers, the mumbling of voices, which is important for realism.

We have also set up a specific audio system for each room, which allows different people to be in different parts of the courtroom. Some people may be in the criminal courtroom, others in the meeting room, and you will only hear the sound coming from where you are. You can have many people in different spaces performing different tasks, all at the same time.

We have audio and text communication, and you can choose between several navigation modes. You can navigate in the first or third person. One of the things we have, which is perhaps different from other types of virtual courtrooms, is what we call live video heads.

One of our goals was to try to recreate the feeling of being in a courtroom for our students (Fig. 17). In a physical courtroom, you look at someone and try to interpret their body language, etc. We tried to take these physical aspects and integrate them into an avatar.

We have either fully animated avatars or avatars with a live video head. We used them to think about how we could get students to observe and judge body language. You therefore have video faces in the courtroom, which promotes eye contact, body language, and interpersonal communication. That was one of

our key points in the research we conducted with the students.

One of the projects I am going to talk about very briefly is a project bringing together students from law, policing, and social work where we designed a mock hearing that involved an interim care order in a family law case⁸. Our goal was to create an interdisciplinary hearing in which students could practice their advocacy and evidence-giving skills. The law students played the role of advocates, while police officers and social workers testified as they would in a normal hearing.

Twenty students participated in this mock trial over the course of the following few months. We organized five mock trials, presided over by a judge, to give students a glimpse of what a court hearing is like. This was particularly important for law students, who need to develop their advocacy skills. But it was also valuable for our social work and policing students, who will obviously have to go to court and testify as part of their practice. We wanted to give them the opportunity to experience this before they do so in real life.

We conducted interviews with the students after the hearings to find out their feedback

8. For more information, a report on the project is available on: Virtual Courtroom | Open Justice (<https://university.open.ac.uk/open-justice/virtual-courtroom>).



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Francine RYAN

on working in a virtual courtroom, what they thought of it, and what they gained from the experience. Let me briefly share some of the findings. They talked a lot about the authenticity of the virtual courtroom environment and how it really supported their learning and helped to give weight to this training experience. They felt that this technology really helped them feel like they were in a court hearing, even though it was a virtual reality experience on a computer. They felt that they were able to internalize these practical aspects of the courtroom.

They really appreciated the environmental realism, i.e., the accuracy of the courtroom layout in terms of the location of the judges' benches, the witness stand, the seating arrangement, sound effects, and background noise. They felt that this really gave them the impression of being in a courtroom. They also appreciated being able to move around the courtroom, walk, stand up, or sit down and this is an important part of the experience. They said that it reflected their actual experience of being in a courtroom. In fact, they appreciated the fact that the police officer and social worker had to leave their seats to go to the witness stand to testify. That feeling of being there and moving around that part of the courtroom as they would in real life, was essential for them.

It really gave them that sense of presence and authenticity. They also explained how it had helped them with their professional practice. One of our students who participated in

the mock hearing completed his apprenticeship and then became a police officer. He was called to testify in a real-life courtroom. He said that this experience really helped him develop the skills he needed for this. He found the experience much easier and more useful because he had already been through it before. This is closely linked to the development of professional skills. It really helped the students manage their nerves and work under pressure.

The environment and authenticity were therefore very important for the students' skill development, and this corresponds to what we find in much research on virtual reality. They find it very useful for developing their presentation skills, particularly police officers and students in the field of social work, who generally do not have the benefit of this type of opportunity at universities at present. And they really found it enriching in terms of preparing for their future careers.

Finally, I would just like to discuss how some of the research with students can be related to the justice sector. Our students are geographically dispersed, it is too expensive to buy headsets, and we cannot bring everyone together in one physical location. The advantage of computer-based virtual reality is that it does not require dedicated physical space to participate in a simulation or specialized equipment. Our research has shown that access to this computer-based virtual reality requires minimal support and our students were able to use this technology very easily as it does not require much configuration.

A virtual courtroom has much to offer, particularly in the United Kingdom, where many people represent themselves in court hearings, and require support. This could be helpful in learning how the courts work, but also in preparing their own case before appearing in court.

One of the advantages of computer-based virtual reality, due to its lower level of immersion, is that it does not cause motion sickness or cybersickness. However, on the other hand, it clearly does not offer the same level of immersion as full virtual reality.

In terms of scalability, one of the advantages of our courtroom is that our students can practice and visit the courtrooms as many times as they want, which is very useful. They can do this from home, independently, which promotes self-directed learning.

There are some initial development costs but we did not have a lot of money to develop this project, and it is not as sophisticated in many ways as fully immersive virtual reality. We did it on a restricted budget, but I think it shows the potential of what can be done with limited resources.

Our system works as follows: when you log in, a special feature scans your computer to determine its processing power, then adjusts the graphics to suit your computer. You do not need a sophisticated computer to use it. It was designed to reflect the courts of England and Wales, but it could be re-designed and used for other types of courts. Its design is very minimalist, and a few modifications could make it suitable for other jurisdictions.

Avatars with real faces are, in my opinion, a very interesting aspect of our virtual courtroom. I wonder if this would help some users of the judicial system to more accurately reproduce what they see when they are in the presence of real people. I think this is a topic that deserves further exploration and has very interesting potential.



When you go to a courtroom, you pass through different parts of the building. So you go through security, you go to meeting rooms, which allows you to have complete experience thanks to this combined virtual center that we have created.

Francine RYAN

The ability to move around the virtual space clearly greatly improves the user's experience. It helps people find their way around the courts. Courts are different, but at least in England and Wales, when you go to a courtroom, you pass through different parts of the building. So you go through security, you go to meeting rooms, which allows you to have complete experience thanks to this combined virtual center that we have created.

We have obviously used this extensively for educational purposes, for professional training, but we genuinely believe that it has a certain

degree of transferability to the legal field. We have spent all this time creating and perfecting it, and one of the positive aspects of our presence here is this opportunity to consider what broader research we could do with it. It would be interesting to think about how this type of technology could be compared to fully immersive holograms, and what its strengths and weaknesses are. We hope that this will be useful to others involved in exploring virtual reality, to think about how it could be used in justice research.

That is why I am delighted to discuss it with you, and we will be doing a demonstration this afternoon. If you would like to see how it works, you are welcome to join us. Thank you.

Harold ÉPINEUSE: Thank you Francine for presenting the virtual courtroom you have developed for training purposes. It is a very interesting use case, which I think can really be adopted and adapted to the situation and needs of many people to train in many universities and organizations. I will now give the floor to Aislinn. You will present the program you have set up with virtual reality and report on its use from your NGO perspective.

Aislinn McALEER: Hello everyone, I am indeed from *Victim Support Scotland*. We have created our own virtual reality experience to familiarize victims and witnesses with the Scottish Court room layout and criminal justice system process.

Our mission is to ensure that all victims of crime living in Scotland receive high-quality support and care so that they can move forward with their lives. We believe that virtual reality and the experience of familiarizing oneself with the justice system greatly contribute to this goal.

Just a quick reminder of the context, as Scotland has a unique and different judicial system, particularly when compared to the rest of the United Kingdom. We have three High Courts that deal with Supreme trials, thirty-nine Sheriff Courts that deal with most criminal cases, and 11 remote evidence sites nationwide, two of which are situated in *Victim Support Scotland* offices. These are specialized facilities where vulnerable witnesses can provide evidence live but remotely from two of our offices in Scotland. We also have three verdicts in Scotland: guilty, not guilty, and not proven, which is unique

compared to the rest of the United Kingdom — and very rare globally as well.

On the scale you see on the map (Fig. 18), we are a national service and provide support to all witnesses and victims residing in Scotland, which has a population of approximately 5 million. The central belt, stretching between Glasgow and Edinburgh, is more densely populated, while further north there are more rural communities within the Highlands and the Islands.

The geographical context is a major barrier for isolated communities and victims in terms of access and support. This is something we considered when developing our virtual reality experience, as we want to be able to help all victims of crime, regardless of their location or any other barriers.

The main challenge was determining how to use technology to reduce the impact of testifying in court and how best to help victims and witnesses prepare for these experiences. Our solution was to set up virtual reality familiarization visits, which I will also be demonstrating this afternoon. This experience was designed with victims in mind, and as I said, we wanted to make sure that everyone could benefit from and participate in the court familiarization visit.

In this setting, participants feel safe without sacrificing the realism of the courtroom. In Scotland, any victim or witness who is required to attend a trial can go to the courthouse in person, where they are allowed to walk around the empty courtroom and familiarize themselves with it. The virtual reality experience offers them exactly that, and we can offer our support and allow people to choose to participate. You are under no obligation to do so. Nor does it replace the in-person visit. On the contrary, it goes hand in hand with the in-person visit.



It allows everyone to experience the courtroom environment from wherever they choose. This could be at home, in one of our offices, or in any other safe environment outside the courthouse.

Aislinn McALEER



Fig. 18. *Victim Support Scotland* in Scotland.

It allows everyone to experience the courtroom environment from wherever they choose. This could be at home, in one of our offices, or in any other safe environment outside the courthouse. Users can explore all the different courtrooms they will be visiting. This gives them an idea of the people they will be interacting with that day, their roles, and gives them an overview of how court proceedings work.

It is a very realistic experience. It uses actors and footage filmed in each of Scotland's 50 courtrooms, which we filmed especially for this purpose. The key thing is that victims can go through this experience and see if they feel comfortable with it, at the time of their choosing, and that they have the freedom to decide when to start the experience, when to pause it, or when to stop it completely. Our *Victim Support Scotland* supporters accompany each person throughout the experience if they have any questions or wish to stop at any time.

Here is some background information on how we got here. Before 2020, these rural communities were severely affected. The courts tell victims and witness the exact dates and locations they can go to for a familiarization visit, but these dates and locations are not always convenient for victims or witnesses. They may need to fly, take the train, or use other means of transportation to get there. This obviously creates a sense of isolation for these victims.



Aislinn McALEER

Then came 2020, a year marked, of course, by the COVID-19 pandemic, which had a considerable impact on trials, causing delays in the courts, but also on people who were visiting the courts to familiarize themselves with them.

So, in 2020, we traveled around Scotland and conducted 360° tours of empty courtrooms. These are still available today on our website, so that victims and witnesses can access them at any time during their journey, but also for the public.

This then led us to 2022, when we took part in the *CivTech Challenge*. It was then that we secured the grant that enabled us to develop our virtual reality experience. This took the 360° tours to a new level of realism, with actors playing the roles of the characters in the courtroom, and they are accessible and available in all locations across Scotland where we provide our support. It is specially adapted for the High Court, Sheriff Courts, and our remote evidence sites. We currently provide our support throughout Scotland, and we hope to improve it in the future and develop it further. We are currently working with our minimum viable product, which we created in 2022. But we hope that, with increased funding and development, we will be able to go even further.

Let me quickly outline the benefits of our product. Our victims and witnesses have mentioned many benefits, including being able to experience the court environment firsthand. They can try and try again as many times as necessary, whereas if they went in person to the court familiarization visit, they would only have one chance and, once that was over, they would not be able to return to the courtroom. We therefore find it very advantageous to be able to go back and replay the scene as many times as necessary. They can also go through this

experience at their own pace. It is not the person facilitating the session who calls the shots, but the individual themselves, and the facilitators are there to answer their questions and ask them questions if they need to. This helps to overcome the geographical challenge we face, as we are a national service.

Many of our partners, even within our own organization, are volunteers who emphasize how valuable this tool is in helping the vulnerable witnesses we support. The feedback we have received from victims and witnesses who have used these tools attests to their considerable impact. We are not an academic organization. We are a practical support organization, so we do not conduct academic research to establish the benefits. However, we have seen a reduction in stress and feelings of being overwhelmed before people go to court to familiarize themselves with the premises and visit in person. When they go to testify, we find that victims feel more comfortable and give better testimony because they feel more relaxed, which also benefits our court partners.

It is really helpful in building knowledge and confidence, even for our volunteers and supporters. They use them and, when they go through the training with them, they find it very useful to see the victim's perspective as well. We also see a huge increase in feelings of safety and empowerment. Again, this is in addition to the in-person familiarization visit, which offers greater accessibility and choice to the victims themselves. They are truly at the heart of this experience.

Harold ÉPINEUSE: Thank you very much Aislinn. We are indeed looking forward to experimenting your virtual world during the demonstration sessions. Rannveig, it is now your turn to share the conclusions of your work with us, from a psychological studies perspective.

Rannveig SIGURVINSDÓTTIR: Good morning to everyone, I am delighted to see you. I am an Associate Professor of psychology at Reykjavik University in Iceland. I would like to talk to you about a virtual reality courtroom that we have studied, and which fits perfectly into the context of all the projects we have discussed so far.

To provide some context, studies have found that victims of sexual violence often find

it difficult to seek justice after being assaulted. European and North American statistics show that less than 20% of victims report the crime to the authorities, and when they do, their experiences vary greatly.

They file a complaint with the police, who investigate, and then the case is brought before the courts. The evidence gathered so far, both in our studies and in other work, shows that victims find going to court extremely stressful. This is not difficult to understand, as they must recount a very difficult life experience. These are people who have been victims of rape or other very serious forms of sexual violence. Just talking about what they have experienced is difficult in itself.

Going to court is also difficult because victims encounter the alleged perpetrator of the crime, and the circumstances in which this takes place are generally unknown to them. We find that courtrooms are places where most people never go in their lifetime. And in Iceland, courtrooms are very different from those seen in American films. When people go to court, and we have seen this in our interviews with victims, they often say that they do not really know what is expected of them. They do not understand who the different actors in the court are, and so they have a general feeling of uncertainty about what is expected of them, which can make the experience difficult.

When survivors testify, they recount what happened, but then they are often confronted with very difficult questions. They are asked to remember in detail what happened to them, sometimes with so much detail that it is obvious

they cannot remember everything. We also observe that traumatic memories tend to be very different from other types of memories.

Many victims feel violated when questioned by the defense attorney. They are asked questions that they feel are not really relevant to the case, such as their sexual history, whether they had been drinking alcohol at the time of the assault, what they were wearing, etc.

“ Indeed, one must be able to pay attention to what is happening around them, then remember and explain what happened. And we know that emotions such as distress, anxiety, and fear have, as certain experiments have shown, adverse effects on memory and attention.

Rannveig SIGURVINSDÓTTIR

All of this contributes to victims feeling a great deal of distress and anxiety when they go to court. Having a background in psychology, I am very interested in the impact this has on these victims. The cognitive processes of attention and memory are essential for providing reliable testimony. Indeed, one must be able to pay attention to what is happening around them, then remember and explain what happened. And we know that emotions such as distress, anxiety, and fear have, as certain experiments have shown, adverse effects on memory and attention. In sexual assault cases, testimony is extremely important, as is the perceived credibility of the victim.

The risk is that the victim will be perceived as less credible simply because they are so upset that they are unable to explain properly what happened. In our work, we have found that there is a real need to help victims feel more in control of their reaction to their environment and more able to know what they are doing and what they want.

Our project is therefore based on exposure therapy, a technique widely used in psychology. This simply means that when you are afraid of



Rannveig SIGURVINSDÓTTIR



Fig. 19. The courtroom from the perspective of the victim who is testifying.

a particular stimulus or situation, you must confront that stimulus or situation, and you are not allowed to walk away from it. Our first instinct, if you have a phobia of snakes for example, is to run away when you see one. This only reinforces your fear. Exposure therapy involves confronting what you are afraid of and forcing yourself to stay there. If you do this long enough, your anxiety will decrease. This technique has been widely used, both in real-life examples and in virtual reality. There is very strong evidence in favor of using virtual reality to treat phobias. This is the first project I am aware of that applies exposure therapy to court cases.

We have created a virtual reality courtroom, based on a real courtroom in Reykjavik, Iceland. Unfortunately, I will not be doing a demonstration today, but you can find more information about it in our publications.

As you can see above (Fig. 19), this is the courtroom from the perspective of the victim who is testifying. Opposite her is the judge, to her right is the defendant and his lawyer, and to her left is the victim's lawyer, the prosecutor, and, in the corner, a secretary.

Participants use a virtual reality headset to experience this. They can explore the room. As you can see, not all the characters are from a real-life photograph, but rather from a virtual reality rendering. All the avatars are therefore quite realistic and look at you when you speak. They move slightly, as a real person would, which makes the situation quite realistic. There are also ambient sounds. We have done our best to make the experience as realistic as possible. We have conducted three studies to date using virtual reality.

First, we conducted a pilot study in 2020 and 2021. At this stage, we simply wanted to know if

victims would want to use a virtual courtroom. Would it improve their experience in any way? Does it resemble a real courtroom?

We recruited 38 survivors, some of whom had been in a real courtroom before, and others who had not. Overall, they felt that it was very similar to a real courtroom. Some people said they felt like they were reliving the situation they had been in when they did testify, and survivors were very supportive of using this technology to prepare for trials.

We then used this method to conduct two case studies, in which we repeated virtual reality exposure therapy sessions, one for rape cases and the other for child custody hearings involving a history of violence. We found a significant increase in feelings of control, better management of emotions, a greater sense of bodily autonomy, as well as greater self-efficacy and resilience to stress.



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Rannveig SIGURVINSDÓTTIR

Our most recent project is an intervention study that we launched in June 2024 and completed data collection for, in August 2025. We had 58 survivors participate in a randomized controlled trial (RCT). Our intervention involves people participating in two sessions of a simulated trial. We created a simulated trial with questions drawn from real cases. The participant enters virtual reality and takes part in the simulated trial. Virtual reality asks you questions

and you must answer them. Depending on your answer, it asks you another question.

In the future, we would like this process to be automated, but for now, we have done it with a research assistant and predetermined questions. But this interactive element seems to be a really important component. It responds to what you say. Participants talked a lot about how the interactive component puts you on the spot, which can contribute to feelings of panic in this situation, because you explain what happened and you get more questions in return.

We organized two sessions of this type and collected a lot of data and questionnaires. We conducted interviews and physiological measurements, which I will tell you about in a few minutes. We are currently analyzing all this data. I just wanted to share with you some very brief and basic descriptive statistics.

For example, we see a decrease in fear and anxiety, which are quite high at the beginning of the first virtual reality session. We then observe a very significant decrease. They increase slightly again, but remain below their initial level, then decrease again. We believe that if we continued these sessions, this trend would continue to decline, but it is nevertheless a significant reduction in fear and anxiety after only two sessions.

We also observed, when examining feelings of control and empowerment just before and after the first session, a very significant increase in feelings of control and a truly significant increase in feelings of empowerment. This is exactly what we had assumed and predicted.

We are currently analyzing the data, measuring physiological responses to stress. We will be able to share these results later or in our published article. We have been doing eye tracking using galvanic skin response to measure stress and examining heart rate variability.

One last thing: what we did not really expect when we started this project was that many of our participants reported feeling a strong sense of closure and liberation after participating in this experiment. I think that is very important. Among other things, it shows us that virtual reality can be used to prepare survivors who are going to appear in court or go through this experience. But for many survivors, their cases will never go to court. This may simply be because there is insufficient evidence, the perpetrator has died, the statute of limitations has

expired, etc. There are various reasons that have nothing to do with the survivor and that may prevent them from going to court.

This would allow them to have this experience and turn the page. For example, many survivors told us, even though we had not asked them, and we were very surprised to hear this: "I felt like in the courtroom, I was finally closing the case. You know, this was like missing piece of the puzzle that I needed to finally resolve this case for myself.". We have many other quotes like this. I think it can be very useful to use a tool like this.

To summarize, here is the process as we see it. We believe that by allowing survivors to visualize using virtual reality; to express themselves and to really participate in the mock trial, we are enriching their knowledge. They feel less uncertainty and understand better what is happening. But they also have greater self-efficacy. They know they can do it and believe in themselves. Victims therefore have better control over their responses and feel better prepared. We hope that all of this will enable them to give more convincing and higher-quality testimony.

— **Harold ÉPINEUSE:** Thank you very much Rannveig. Your articles, which are very informative, are available on the Internet, and that is how we discovered your expertise and the various experiences that are being presented today. Thanks to the three of you for sharing the protocols underlying your initiatives and studies. I think it is important for the non-researchers here to see what we can and should do to properly evaluate all these initiatives involving virtual reality. I now invite the public to ask our three experts questions.

—

Q&A Exchange



Question: *Thank you very much for your very interesting presentations. At the end, you mentioned that people felt a sense of closure simply by going through this process, which I found very compelling. I wonder if you will explore this aspect further, that is, using it not only for preparation, but also to bring closure to people without going through an actual court hearing.*

Rannveig SIGURVINSDÓTTIR: I think so, yes. Initially, we thought we should just identify people who are going to court in real life, because that was the most obvious application. But I think making this technology available to survivors, regardless of where their case is in the justice system, and even if they have not disclosed it to the justice system, is definitely something we want to explore further. We want to try to understand what helps them move on, using this tool, and promote that as much as possible.



In the foreground: Rannveig SIGURVINSDÓTTIR.

Aíslinn McALEER: I would just like to add that we are seeing family members and loved ones of victims and witnesses that we have helped benefit from the use of virtual reality headsets. They may not necessarily be able to attend the trial or the court familiarization visit, perhaps with their children or siblings, or others. So, we also see a huge benefit in that kind of family connection, because it allows them to understand what their loved ones are going through, their experience, and how they can better support them.

Question: *You may have already mentioned this, but how do the victims interact in the simulation? What happens when they are training? Could you give us*

a little more detail about that? Can they talk to the people present? You mentioned actors. Is there some kind of interaction with them? Is it automatic? How does it work?

Aíslinn McALEER: So, the question of how it works in practice. The headset I have here next to me can be used by anyone, with their loved ones present in the room. They have a kind of remote control and can walk around the courtroom in a very realistic way. They can select different parts of the room, walk through them, and choose where they want to go next. We pre-recorded actors who had been given a script. Instead of interacting in real time, victims and users can choose the person they want to talk to, and that person will then start talking. Since you are in virtual reality, you feel like that person is talking to you. The person experiencing this can ask questions directly to the actors in the headset. But that is also why we want our volunteer to be present in the room with them, to provide them with additional information if they have practical questions that are not answered in the pre-recorded headset.

Question: *I find this extremely interesting, and we know, of course, that the parties involved feel that legal proceedings are difficult. They may not understand everyone's role, what has been said, and may experience difficult feelings. You mentioned the victim being "tortured" by the defense attorneys. This can be mitigated by explaining what the defense attorney's job entails. Some lawyers will talk to people to explain this, which can help them accept the process. And I think that is something that could also be done, by explaining the roles of each person. I had a very personal experience where a close friend, who was the victim of a serious crime, after the hearing, turned out not to understand the role of the prosecutor, thinking that he was somehow against her. And as an expert, I felt so stupid for not explaining to her in some way what was going on. I think this is very important and we should have researchers working on this topic.*

Francine RYAN: We have talked a lot about witnesses so far, but in the UK context, people are called to serve on a jury and receive minimal support; often only a very short video explaining the role of a juror. In England and Wales, there have been proposals to reduce the number of trials that involve juries. Virtual reality has a very important role to play in supporting jurors and supporting the jury system.

There is often limited support for jurors, if you participate in a six-week trial for child sexual abuse, for example, it has enormous implications and can be very traumatic. There is a lot of research that needs to be done in terms of looking more broadly at the impact of the justice system on the people involved. It would be very interesting to gather testimonials and consider how virtual reality technologies could support and improve their experience.

Rannveig SIGURVINSDÓTTIR: From what I have learned from our previous discussions with *Victim Support Scotland*, these requirements are very informative. You explained very well that, in a court setting, you can go there and the people involved explain who they are and what they are supposed to do. That is a very important point. In our project, we did not have the opportunity to work on that. But our project has an interactive component that really gives the impression that the trial is taking place in real life. So, I think that if we could, in the future, integrate these two components, it could be very useful and effective and meet a wide range of needs, both for victims and for jurors and other types of witnesses.

Question: *I have another very specific question for you about the Scottish context. It has two parts. First, you say that members of Victim Support Scotland who support victims can be at their side. Does that mean they go to their homes, and they can use the service wherever they want? And second, how does the contact happen? Can you contact the victims, or do they have to do it themselves?*

Aislinn McALEER: As part of our support, we can help any victim of crime in a safe environment where they feel comfortable. We therefore visit some victims at their homes if this meets their accessibility needs, but only if they wish us to do so. We can do this in an office or community center, wherever they feel most secure in receiving our support.

When it comes to supporting victims and witnesses across Scotland, we have several referral channels. The majority comes from the courts. We receive court referrals from victim information services, who inform us that a victim is going to testify and will need to attend the trial. We then contact the victim or witness, explain what we can do, and what other practical support we can provide. We can then offer them a virtual tour of the court to familiarize themselves with it if they wish to participate.



In the front row: Jon-Paul KNIGHT. In the back row: Hannes WESTERMANN and Antonio CAPOBIANCO.

Question: *It is really interesting because, from a Swedish perspective, everything is very transparent and we have access to all public information. However, victim support services cannot obtain witnesses' contact details. They therefore must go to court and contact them there to offer their services. Alternatively, a form is sent to their home and if they get in touch, the responsibility lies with the victim or witness.*

Aislinn McALEER: The victim or witness must give their consent if they choose to receive our help. It is not a service that you can opt out of, for now. The same applies to reports from the Scottish police, but we have set up a reporting procedure with them so that we can get this information. Victims and witnesses can also report themselves; there are helplines available. We do not just provide legal assistance; we also offer community support throughout Scotland. So, if someone receives our legal assistance, even after their trial has ended, they can continue to receive our support in other practical or emotional ways.

Question: *In your opinion, how important is the accuracy of the simulation in achieving the desired results? Would it be better if it were more photorealistic? In these virtual courtrooms, do the level of immersion and the quality of the virtual reality experience make a difference, or is there a threshold beyond which it is sufficient or irrelevant?*

Aislinn McALEER: As our minimum viable product includes a very realistic setting, we can see the benefits for victims and witnesses. They said that the 360° tours offered during the Covid-19 pandemic made them want a more human experience, as the courtroom was empty. That is why we introduced very realistic actors into this

setting. And they find that it humanizes the judicial process. Many people do not know what really happens when you go to court, and this allows them to familiarize themselves with the judicial process, to normalize it in a way.

Rannveig SIGURVINSDÓTTIR: That said, our environment is not very realistic, in the sense that you would never confuse it with reality. But it still works the same way and requires the same behavior from the survivor in that context. From our point of view, it was enough to make them feel like they were there. And then, we see this all the time, when they take off their headsets, they sometimes say, “I forgot I was in this room.” They really forget the real room they are located in and immerse themselves deeply in the virtual reality. From our point of view, that was more than enough. I do not know if you could achieve the same result with virtual reality on a computer. I hope so, because that would make the system much more accessible to the public.

Francine RYAN: I do not think that the performance aspect is that important; what matters is the interactions in the courtroom. I was always a little worried when we were creating our virtual courtroom that it was going to be sufficiently realistic as many students play a lot of video games, and the graphics are not the equivalent of video games like *Call of Duty*, for example. But I think that once you are in the experience, you forget your surroundings. It is more the context and the reason you are there that makes all the difference. I think you can get away with lower quality graphics in that respect. And then, that brings us back in part to the question of scalability and accessibility. The higher the resolution and the better the graphics, the fewer

people will be able to access it. It is about finding the right balance between what works, what is sufficient, and how to continue to create those benefits. The advantage of desktop virtual reality is that you can do it on a larger scale.

Question: *It is therefore likely that some users now own headsets, as these are sometimes cheaper to buy than many phones. I just want to know if the same app works on a headset.*

Francine RYAN: Yes, it works with a virtual reality headset. We are somewhat unique in that we are an open access university. Although the price of headsets is falling, we do not have access to funds to pay for our students to have good quality headsets. In a previous research project, we gave students cardboard headsets and we found that it did not work very well. However, you are right, if the quality of the headsets improves and the price drops, then more options open up. The desktop version of the virtual courtroom can be converted to full immersive VR, so I think there is a lot of potential in how the courtroom could be used.

Question: *For the training of lawyers, did you combine this with feedback on their performance, for example on the questions they ask or the way they approach situations? There is certainly a lot to be developed in this area.*

Francine RYAN: Once students had completed the trial experience, we give them some feedback on how they performed in the courtroom, etc. But our findings clearly showed that students wanted more, so I think we can incorporate more feedback into these types of scenarios.

Above all, we wanted to see if it was possible to bring students together in a courtroom to engage in a mock trial. We knew that it works face-to-face, but we also wanted to see if this was the case in virtual reality. We wanted to find out whether the students felt like they were in a courtroom. I think we could develop this project further, and that is what we would like to do in the future, based on the research findings. We are working with undergraduate students who are not necessarily going into practice, but who certainly want to work in a professional context, and the virtual courtroom helps support the development of professional skills. We are in talks with a UK organization called Expert Witness, which would like to use the courtrooms to train its experts.



Harold ÉPINEUSE

Question: *I was thinking about that for expert witnesses. I train judges in Finland and one thing they find difficult to grasp is feedback on their work. We know from hypnographic studies of judges that they may think they are behaving differently. I believe that a Norwegian study, dating back many years, filmed judges at work. They were surprised to see that they looked much angrier than they actually were, if I remember correctly. This is something that could be achieved with this technology; there are many avenues for development in this area.*

Francine RYAN: Many expert witnesses, perhaps medical witnesses, have probably never had much experience in court. They may have written reports, but now they find themselves in this situation where they are going to courts. And it has been found that the quality of their testimony could be much better if they had had the opportunity to come and practice giving evidence. I think its purpose and applications are indeed much broader.

Harold ÉPINEUSE: I have a question about how you evaluate your initiatives. How did you assess their impact, using questionnaires, interviews with participants, or victims only? How do judges perceive victims' testimony after this program, or lawyers trained through these experiences?

Aislinn McALEER: We do not conduct rigorous academic research, but we constantly gather feedback throughout our support process and are always looking to improve. At each support session, we ask victims and witnesses what they think of our assistance and what impact, positive or negative, it has had on them.

This is how we have found that they have had a positive impact. We have not precisely established the impact in Scottish courts, as we focus primarily on victims. But it is afterwards, when they return to the community support center or participate in the follow-up session after the hearing, that they feel they have been more effective and felt more comfortable testifying. Obviously, if they had never testified before, there is no comparison. But the emotional aspect is evident in this impact and positive reinforcement.

Francine RYAN: A few Scottish universities would probably be very interested in conducting academic research on your project. We are currently writing an article on this subject as we obtained approval

from the ethics committee, conducted follow-up interviews, and explored the issue in greater depth to investigate the possibilities for further research in this area.

Harold ÉPINEUSE: *Another contextual question: do you feel that the judicial system in your country is interested in your research, or even supports it, or are you working on it alone?*

Rannveig SIGURVINSDÓTTIR: The project has received media coverage in Iceland, which has been very favorable.

We also worked with a panel of practitioners on another project, including a judge, a prosecutor, and a defense attorney. We consulted with them when designing this study. When we began this process, we were concerned that it might be perceived as witness coaching, that we were influencing these individuals' cases. That would have been unacceptable. The defense attorney might have raised the issue that the witness had undergone training and asked how we could be sure that they were talking about their own experiences and not those fed by academics, etc.

We discussed this at length with them. The legal professionals were firmly convinced that this did not constitute undue influence, as long as the mock trial was conducted in a specific way. Questions can be asked of the victims, which they can answer, but they must not receive any feedback on their answers. We do not tell them what to do, to talk a little more in this way, to use this word instead of another... We do not interfere with the testimony. We tried to keep the legal professionals in the loop. This gives the project more validity, particularly in terms of their feelings. They were very positive about it, and it has been a very rewarding collaboration.

Harold ÉPINEUSE: Thank you very much to the three of you. The different types of use cases we have heard about are very important to keep in mind as probably the safer situations in which systems can use virtual reality. They offer broad potential and different from other uses that we will hear about today, which are probably more controversial. The potential for the judicial system is real, and that is why we are here today to discuss initiatives such as yours. Thank you for presenting your work and discussing it with us.

Workshop 2

Virtual Reconstructions: Augmented Evidence for Augmented Justice

Chair: Olivier CHEVET

Head of Studies and Research, Robert Badinter
Institute

Till SIEBERTH

Professor of Photogrammetry at Jade University
of Applied Sciences (Germany)

Chiara VILLA

Department of Forensic Medicine at the
University of Copenhagen (Denmark)

François LALÈS

Magistrate, former investigating judge within the
jurisdiction of the Caen Court of Appeal

David BRUTIN

Professor of Mechanical Engineering and
Scientific Director of the University Institute
of Industrial Thermal Systems (IUSTI) at Aix
Marseille University, Court Expert (France)

Olivier CHEVET: Good morning, we are now ready to begin workshop number two, which is devoted to the issue of virtual reconstruction, i.e., how to use virtual reality as a means of evidence. Obviously, the question of evidence is central to the judicial process. The very purpose of a trial is often to ultimately rule on the evidence, but above all to collect, administer, manage, and debate to effectively uncover the truth. Each system has its own procedural rules, which are more or less precise and often the subject of very important debates. But all of this is governed, as has been pointed out, by

extremely important principles: fair trial, fairness in the administration of evidence, the ability of the parties to debate the evidence presented against them... These are key components of the trial.

The question of evidence is undoubtedly one of the areas in which the justice system has had to resort to and be confronted with technological developments the most. From the origins of evidence, from the emergence of early photographic and video evidence to the arrival of DNA, and now all the issues surrounding digital traces, technology has led to the evolution of the evidentiary process in legal proceedings to incorporate these developments. Not to mention, of course, the obvious issues of ballistics, as forensic medicine has also evolved considerably.



The question of evidence is undoubtedly one of the areas in which the justice system has had to resort to and be confronted with technological developments the most.

Olivier CHEVET

All these developments, in science and among the various players, have meant that the justice system has often had to deal with technological advances in this area of evidence, and that the trial process has gradually had to incorporate all these new aspects. Faced with this evidence, judges and courts can indeed



Olivier CHEVET



Till SIEBERTH



Chiara VILLA



François LALÈS



David BRUTIN

aggregate these pieces of evidence to establish the legal truth and ultimately reach the decisions that lie upon them.

Virtual reality, although it remains within the realm of evidence, has a somewhat different position compared to what the justice system has traditionally encountered. As such, virtual reality does not produce new evidence. Rather, it is a means of aggregating evidence and constructing an overall picture, as this workshop will show us. Thus, in a court case, we are closer to the work I was just describing—that of the judge—which involves forming a firm conviction

This is one of the major issues today, which will be examined in the presentations that follow. How are these objects developed? Who develops them, under whose supervision, to preserve the principles of the trial? To answer these questions, we are fortunate to have three expert speakers here today who are implementing these tools.

Chiara Villa, from Copenhagen University, focuses in particular on issues relating to forensic science, modeling, and the use of these tools. Till Sieberth, now based in Germany but previously at the 3DZZ laboratory in Switzerland, has been working on these reconstruction issues for a long time. Finally, David Brutin, a researcher at the University of Aix-Marseille, is accompanied by François Lalès, a French magistrate. Both are working on an ongoing European project, I-Crime, which aims to address precisely these issues of virtual crime scene reconstruction.

Chiara VILLA: Hello, ladies and gentlemen.

I am a professor of forensic anthropology and forensic imaging at Copenhagen University. Today, I would like to show how 3D reality can be used to facilitate crime scene reconstruction, sharing with you the Danish experience.

We live in a 3D reality, yet we often use 2D documentation of crime scenes (**Fig. 20**).

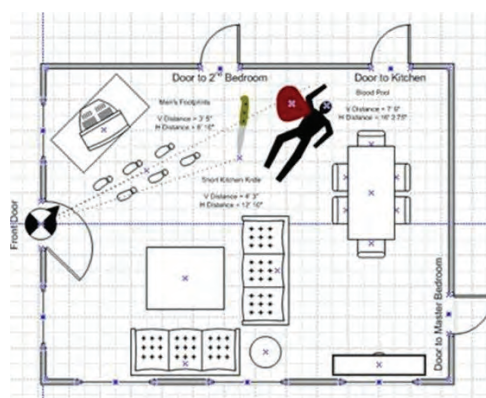
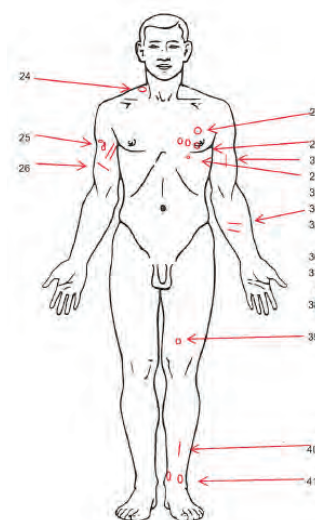


Fig. 20. 2D documentation of crime scenes.



Fig. 21. Reconstruction of injuries and of the chain of events.

The autopsy report, for example, provides a very detailed description of the location of injuries. However, it can sometimes be difficult for those without medical training to understand. The crime scene, particularly in Denmark, is documented using sketches or photographs. In Denmark, and in many other countries, the reconstruction of injuries and the chain of events is established using dummies or reenactments

with actors (Fig. 21). However, this is not accurate enough and does not allow for an accurate reproduction of the scene.

That is why I wanted to create individualized 3D reconstructions using a multidimensional and multi-imaging approach (Fig. 22). We can have a 3D model of the crime scene and combine everything to better understand what happened at the crime scene.

This means you can use all the evidence to integrate it into a 3D environment and identify the specific relationship between all these elements. Such 3D reconstruction can be used during the investigation or in court proceedings.

A 3D model representing the victims can be created using CT scanning technology. Below (Fig. 23), you can see the CT scanner used by some forensic medicine institute. You can see the inside of the body, before proceeding with the autopsy. Using various post-processing software, you can then recreate a 3D model of the victim.

You can create a 3D model of the skeleton, internal organs, and bullet trajectories. But to document injuries, you need to use other technologies, such as photogrammetry, 3D models

Walking dead: individualized virtual 3D crime scene reconstructions

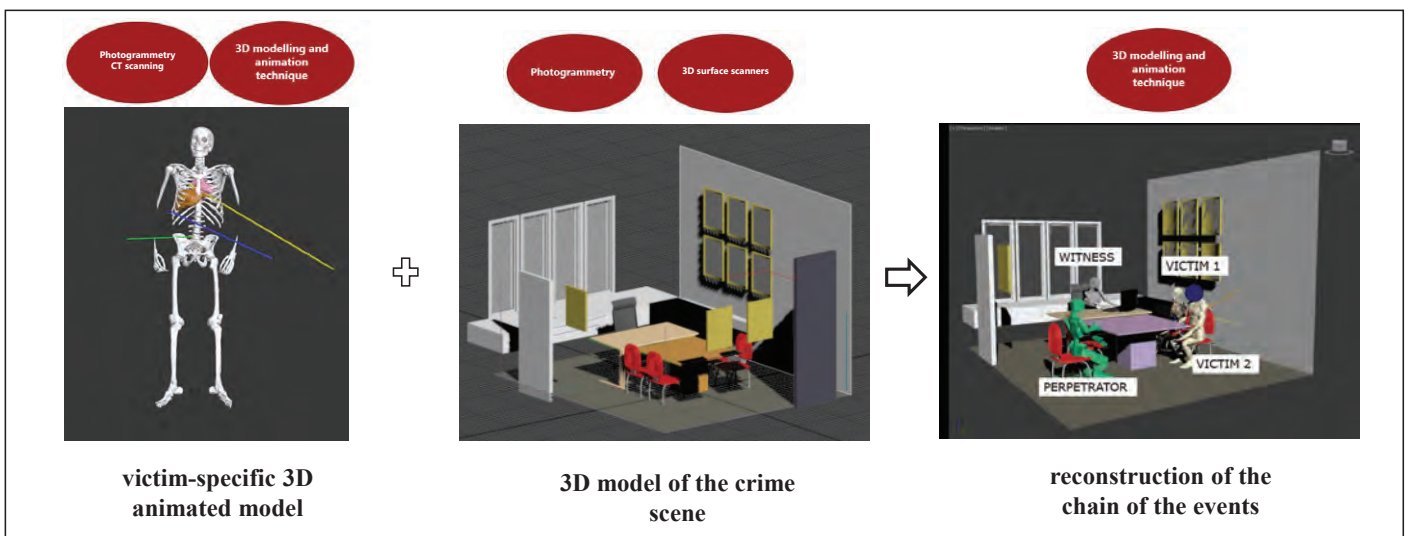
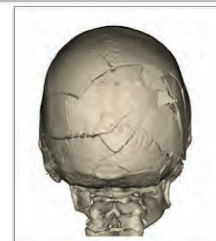
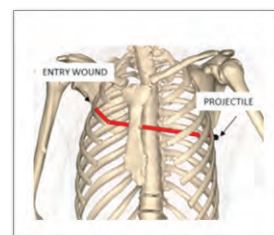
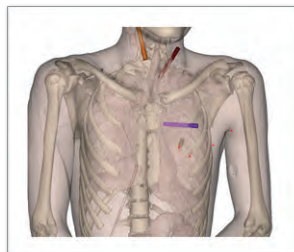


Fig. 22. 3D reconstructions using a multidimensional and multi-imaging approach.



3D VISUALIZATIONS Homicide cases



- Useful tools to have an overview of the lesions
- Metal object, projectiles / projectile fragments / pellets
- Bullet path/ knife injury direction

**BEFORE, DURING AND AFTER
THE AUTOPSY**

Fig. 23. CT scanner (left) and 3D model of a victim (right).

from CT and photogrammetry that can be combined to create a 3D model of the victim. 3D visualizations are very useful when victims have multiple injuries, as they allow you to see all the injuries at once.

For example, in the 3D image below (Fig. 24), you can see a victim with multiple injuries. You can also add colors, with red corresponding to entry wounds and blue corresponding to exit wounds.

wounds. You can visualize the internal organs and the trajectory of the bullet. And, if, for instance, different weapons were used, the relative injuries can be marked with different colors.

This 3D visualization serves as an additional complementary tool to the autopsy report. It is even possible to create animated models specific to the victims to recreate the victim's position at the time of the shooting.

These 3D visualizations play a key role when dealing with multiple and complex cases.

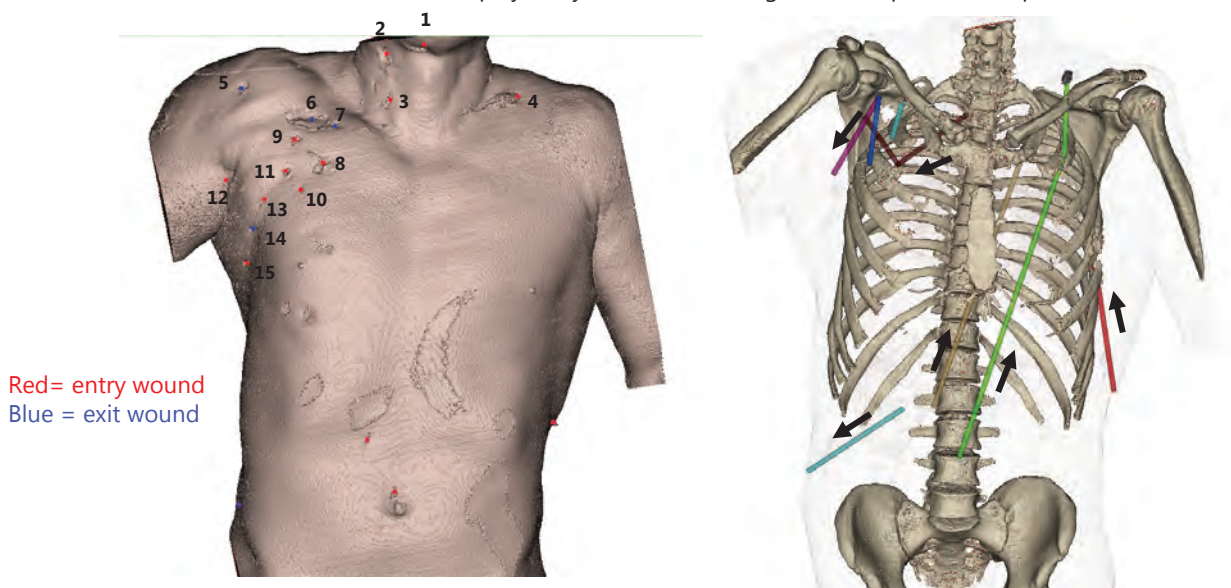


Fig. 24. 3D model of a victim with multiple injuries.

I used an advanced skeleton model (Fig. 25), and adapted each bone of these models to match the bones of the individual. Then I transferred the movement from the computer skeletal model to the actual skeleton. The result

(Fig. 26) is the skeleton of the actual victim, which moves and changes position; the internal organs of the skeleton, the trajectory of the bullet, move accordingly.

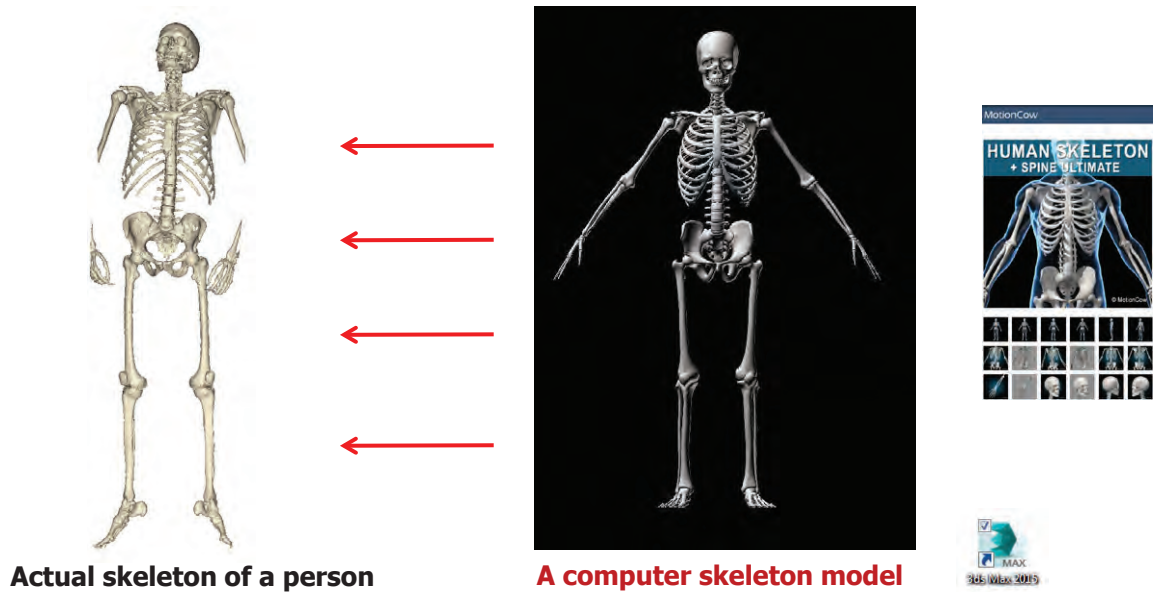


Fig. 25. Victim-specific 3D animated models.

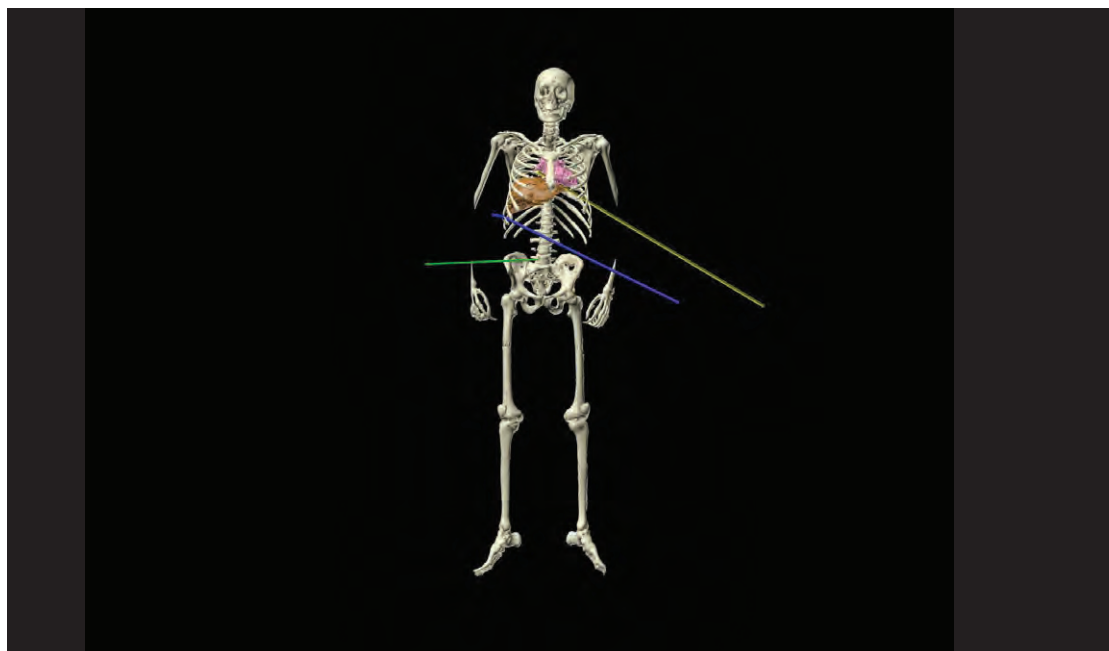


Fig. 26. Victim-specific 3D animated models.

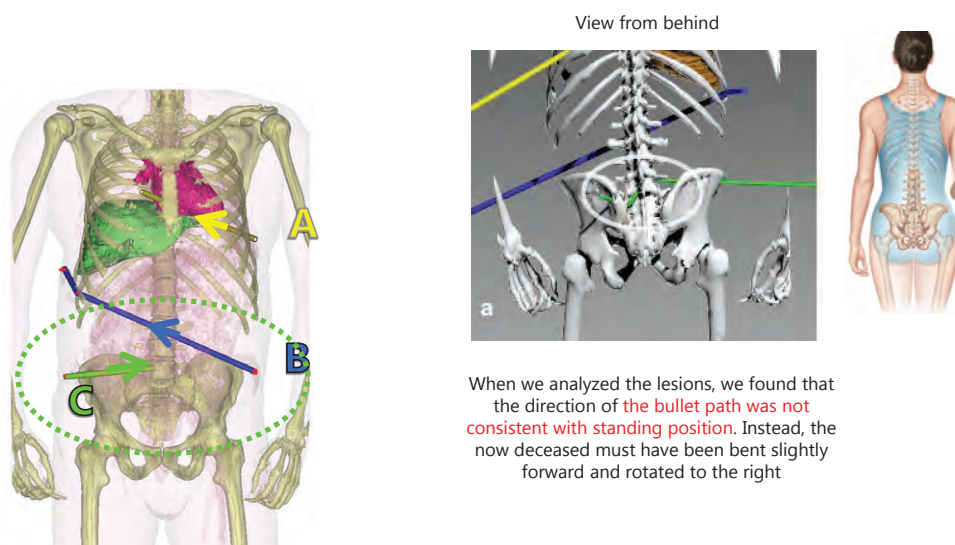


Fig. 27. Analysis of injuries observed on a victim.

We tested such animations in a real case, showing their importance. There was a victim with three lesions; we were interested in the lesion C, which is visible on the right in the image below (Fig. 27), and its analysis.

As visible on the CT visualization (Fig. 28), the trajectory of the bullet did not match the position of the injuries. It appears the bullet had followed a zigzag trajectory. The forensic

When we analyzed the lesions, we found that the direction of the bullet path was not consistent with standing position. Instead, the now deceased must have been bent slightly forward and rotated to the right

pathologists therefore concluded that the only way to understand this trajectory was if the victim had been leaning forward and rotated to the right. I animated the victim, and doing that allowed us to understand that this was indeed the case. We could then develop several hypotheses: the victim was running, she was sitting (Fig. 29)...

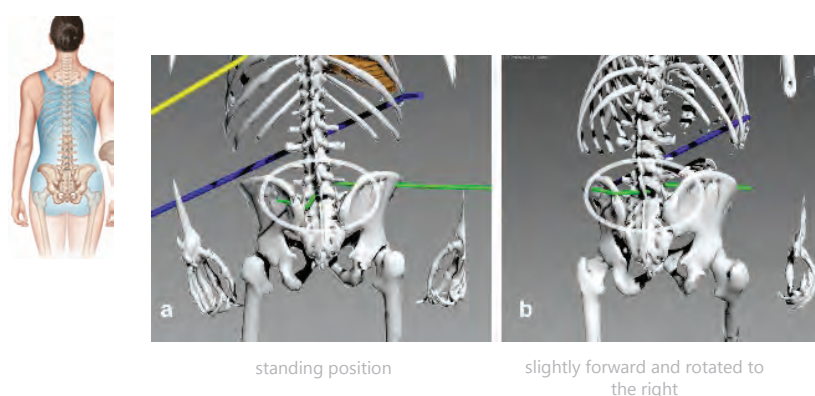


Fig. 28. CT visualization.

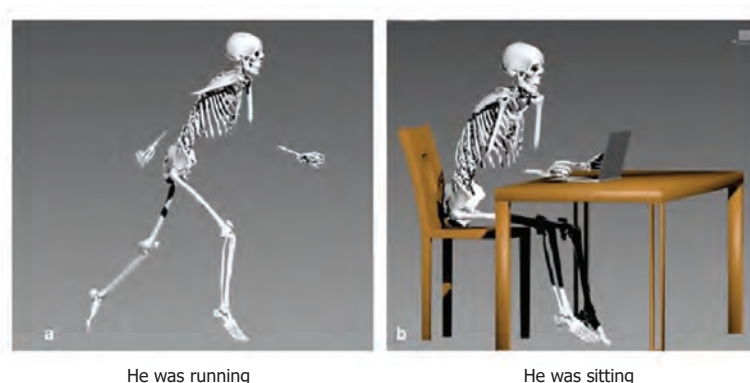


Fig. 29. Multiple body postures are evaluated.

The documentation of the crime scenes is the next step. In Denmark, the police use photos, 360-degree cameras, drawings, and manual measurements. But the limitation is that 3D reality is reduced to a 2D plan. Photogrammetry and 3D surface acquisition systems can be used for it.

I use photogrammetry (Fig. 30) to estimate the suspect's posture from CCTV cameras. I ask the police to take many photographs of crime scenes, so I can create 3D scenes using photogrammetry. Then I transfer the measurements scene of the 3D to the video-camera frame and I can take measurements of the suspect.

Photogrammetry has many potential applications, including combining 3D models from

scanner models. For example, if we have a video showing a suspect moving around, we can estimate the position of a person, as I mentioned earlier, but also of objects. That is not all: we can also estimate the height of the gun, whether the perpetrator is moving, etc. By creating this type of 3D model, we can obtain more information about the crime scene and reconstruct it (Fig. 31).

The final step is to combine all the evidence with the police report. Let me give you an example: a victim, a man who had a gunshot wound (Fig. 32). The wound was located on his chest, and the bullet trajectory was toward the back, slightly to the left. He had been shot in his car.

3D models of the crime of scene: Photogrammetry Surface scanner combination



Fig. 30. Use of photogrammetry.

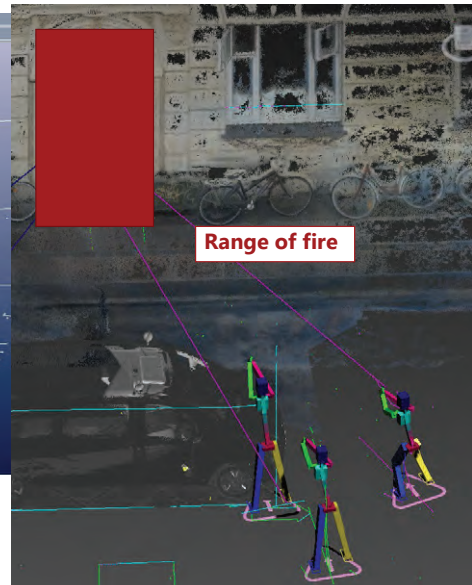
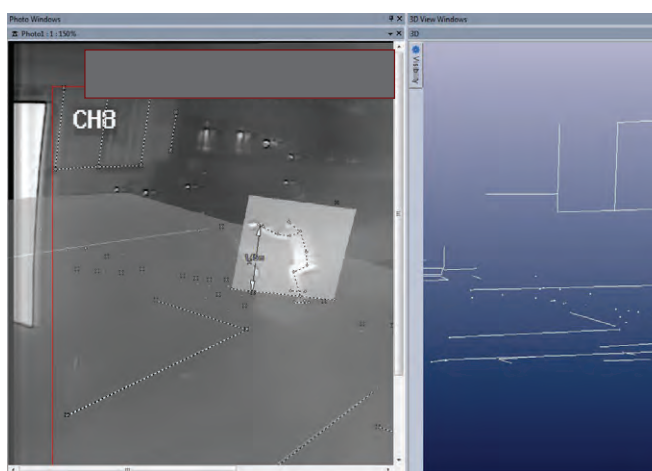


Fig. 31. Estimation of the position of the person or other object in the scene (height of the pistol).

The trajectory in the car based on the police reconstruction was downward. However, as can be seen in the image above (Fig. 33), the bullet trajectory did not match the victim's wound. The police were puzzled by this and suggested that perhaps the victim had been trying to escape from the rear door.

So, I animated the victim sitting in the car. By rotating the vertebrae and the pelvis, we were able to see that there was a match. This is a very simple example that helps us understand the advantages of these technologies.

But there are also issues and challenges. These 3D reconstructions are not currently used in police investigations in Denmark. How can this information be combined, and who should do it? Should there be collaboration between the judiciary, the police, and experts? Because all these parties are supposed to work separately. And what about the animation process?

“How can this information be combined, and who should do it? Should there be collaboration between the judiciary, the police, and experts? Because all these parties are supposed to work separately. And what about the animation process? It is very subjective, as we all move differently. And as for hypotheses, we can produce thousands of them, but who suggests them?”

Chiara VILLA

It is very subjective, as we all move differently. And as for hypotheses, we can produce thousands of them, but who suggests them? The public prosecutor's office, the police, the experts? Once again, will this work be done collaboratively?

We must be very careful with 3D technologies for reconstructing crime scenes. This also involves biases and preconceptions. Often, when we visualize a scene in 3D and animated the events, we assume that the event happened that way.

Olivier CHEVET: Till Sieberth, who has also done a lot of work on the issue of integrating these crime scenes, will now take the floor. There is a sophisticated development process, which Till will outline its various aspects for us.

Till SIEBERTH: Thank you, Chiara, for this very interesting presentation and for explaining what we could do with 3D technologies right from the start. I have been working in Zurich since 2016 and have since moved to Germany, but I am going to talk about my time in Switzerland, when these technologies were already being used not only in research but case application. This has been the case since 2001. The older ones among you will certainly remember that there was a major shooting at the Parliament in Zug, and the scene was reconstructed in 3D.

A case



Fig. 32. Crime scene reconstruction (1).

Animation

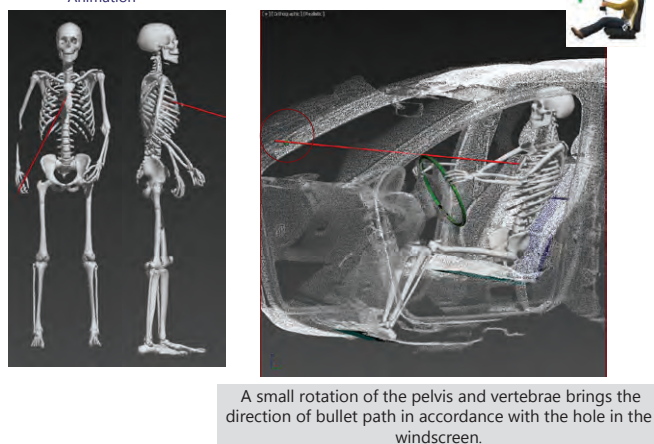


Fig. 33. Crime scene reconstruction (2).

I worked with a team at the 3D center in Zurich, a combination of forensic and technical experts, with experts from law enforcement, ballistics, medicine and other fields. We worked on objects, scenes, bodies and all aspects, giving you an idea of what we were doing. The cases include a variety of incidents from shooting incident reconstruction to helicopter accidents. That is the range of possibilities with 3D technology.

As Chiara mentioned, documenting bodies is not the only aspect of our work. It is possible to combine the structure of bones documented using medical x-ray imaging with body surfaces scanning technologies. However, the problem lies in the lack of precision in x-ray imaging: there are no colors and not enough detail.

Photogrammetry can be used on deceased as well as living people. In Zurich, we have a room with numerous cameras that capture images simultaneously and document a living person in 3D without difficulty. This method can also be used for a wide range of objects: teeth, tracks, tires, weapons, etc.

It requires a multidisciplinary approach to reconstruct an incident in 3D. While some work in forensic medical departments often adjunct to universities, others work for the forensic departments as part of the police forces. This causes questions about the use of data. Who has the right to use this data? Can it be transferred between the investigating institutions? We have an advantage in this respect, as we have obtained legal authorization to exchange



It requires a multidisciplinary approach to reconstruct an incident in 3D. While some work in forensic medical departments often adjunct to universities, others work for the forensic departments as part of the police forces. This causes questions about the use of data. Who has the right to use this data? Can it be transferred between the investigating institutions?

TILL SIEBERTH

data between forensic Institute and forensic services as well as the police forces in Zürich. We were therefore able to combine all this information to create complete 3D reconstructions.

Below is another example of a shooting (Fig. 34), in which we can see some uncertain elements. We have a bullet trajectory in yellow and red.

We can completely reconstruct the bullet's trajectory in the room, but the degree of certainty remains limited. There is a margin of error. The shooter is displayed twice as well as the cone shows the area of uncertainty of the shot, which must have been in this area. We can locate the shooter, have a margin for

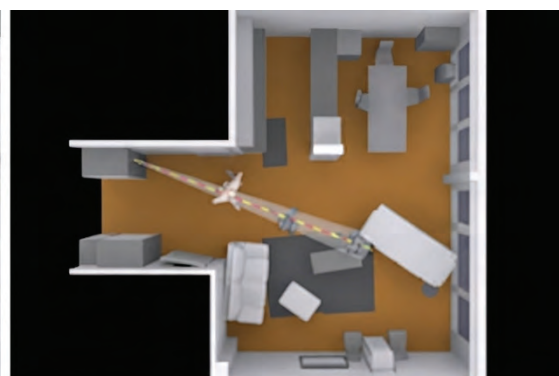
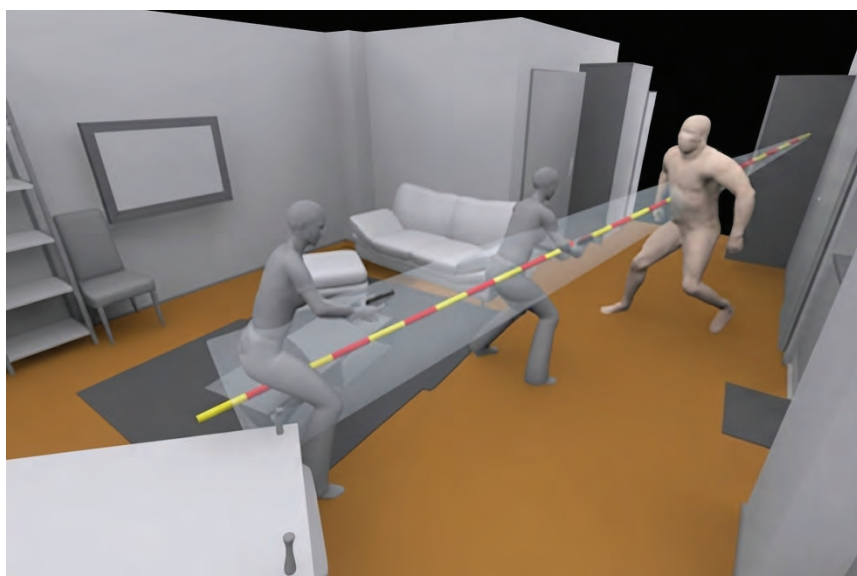


Fig. 34. Area of uncertainty (grey cone) around the bullet trajectory (red and yellow line).

understanding where he was, whether he was seated or not, and have more precise details about the scene. However, the problem is that we reconstruct the scene fully in 3D but then show only 2D visualizations such as plans. The problem is that a 2D image retracts the depth information and does not allow us to understand the depth in a scene.

Looking at the following example (Fig. 35) of a shot trajectory (red and yellow line) in a top down map like view, we can see that it is not possible to establish whether the person in the images center, leaning forward and occluding the shot trajectory, was hit by the shot, or is above the shot.

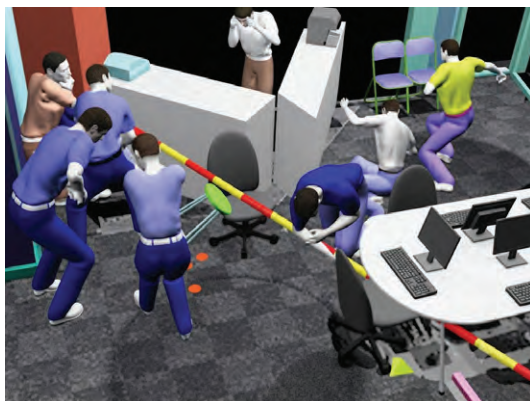
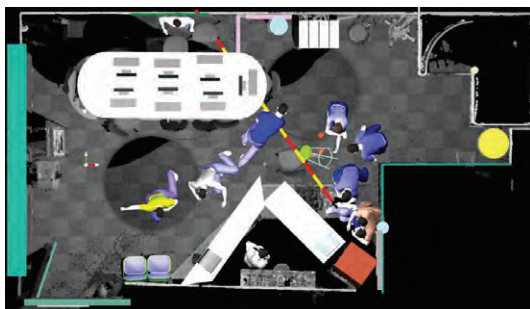


Fig. 35. 2D visualization of a shooting scene.



Fig. 36. 2D visualization of a mountainous landscape.

It requires multiple perspectives to establish that the person was slightly hit at their arm, which is visible in the following two perspectives.

Another illustration (Fig. 36) of the problem with 2D is shown below: is the red line at the top of the mountain or at the bottom of a valley? If we flip the image, we realize it is the same. This concept is used on topographic maps to realize depth to the map reader.

This can have effects that must be considered in 3D modeling. Based on this, would it not be better to try to visualize everything in 3D to avoid any confusion?

Below (Fig. 37) is one of the first prototypes created in 2015, showing different bullet trajectories. It shows what the person sees in the helmet, and this approach can be used for different visualizations throughout the investigation and legal proceedings.

In the next image (Fig. 38), you can see correspondence in a 3D scene for a victim who unfortunately suffered a head injury. Once again, we were able to use a VR headset to match the wound and the information. We could do this for autopsies, but it may still be

too inappropriate a use. In any case, there are undeniable advantages to using 3D.

It is also used in real-life situations, in courtrooms. Here are some pictures (Fig. 39) of the courtroom on the day it was used. We had to use the room next door because there were steps in the court room forbidding the use of VR. It was set up and used by the expert witness to give testimony that everyone could understand while the court could participate either in VR or on a screen.



Fig. 37. Visualization of bullet trajectories.



Fig. 38. 3D scene depicting a victim with a head injury.

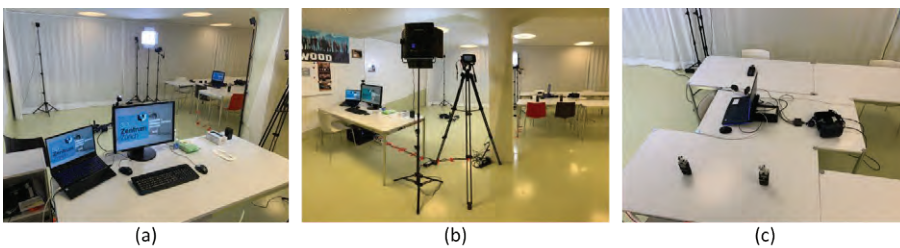
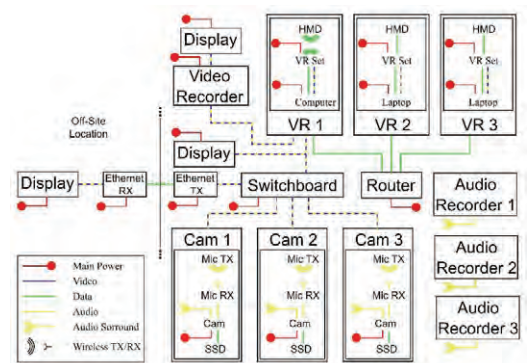


Fig. 39. Courtroom setup during a hearing.



Olivier CHEVET: We will now discuss the I-Crime project — a project currently underway — presented today by David and François. This project is unique, or at least a very good idea, in that it involved both forensic experts and François in his capacity as a magistrate, since he served as an investigating judge for many years. The aim is to bring together professionals and the issues they encounter. These technical tools are ultimately intended to be integrated into a procedure, and this dual perspective is therefore essential to the discussion.

David BRUTIN: Thank you for the invitation and for this introduction. François and I are pleased to present the I-Crime project, which is in line with what has been said, since it is intended to be a tool to help reveal the truth. We are not here to create evidence; we simply highlight it.



We are not here to create evidence; we simply highlight it.

David BRUTIN

It has become something of a tradition to work with people in the field, which began a little over ten years ago. The first project in criminal science was called D-BLOOD. It is an application that is now available on smartphones and is currently being rolled out. It is the result of a collaboration with the judicial division of the national gendarmerie to meet the need for bloodstain pattern analysis in the field.

It was a key project, preceding I-Crime, which was funded and for which we were fortunate enough to obtain a patent application. We were then supported in the creation of the application on smartphones and field testing. So, it was indeed this approach of carrying out an interdisciplinary research project, based on a need in the field, that was followed. And, ultimately, at the end of this project, new needs emerged.

I was fortunate enough to be put in touch with François, and to have these two approaches to the field, from the beginning to the end of a crime scene. From the first

responders at the scene and criminal investigation technicians, who then work with the prosecutor and the investigating judge to bring the crime scene to trial.

The initial idea was therefore the need for fieldwork, the desire to be able to work in a specialized field, the morphoanalysis of bloodstains at the crime scene. Until now, this morphoanalysis has been presented in 2D. Now we are presenting things in 3D: acts that were committed at the crime scene, bloodstains. These are 3D projections, whereas previously they were presented in 2D on a computer screen.

The goal is to immerse everyone involved — the investigating judge, the prosecutor, the bloodstain expert, witnesses, and defendants — in this 3D scene. And then, eventually, to conduct virtual reconstructions or interrogations, etc.

We were fortunate enough to receive funding after several calls for applications and began the administrative process for this interdisciplinary project in November 2024. It involves staff from Aix-Marseille University, including myself. I deal with fluid mechanics, while my colleague Sébastien Mavromatis is responsible for computer science and image processing. We have colleagues from the École Polytechnique, colleagues from the PJGN (*Pôle Judiciaire de la Gendarmerie Nationale*), now the UNPJ (*Unité Nationale de Police Judiciaire*), as well as the IRCGN (*Institut de recherche criminelle de la gendarmerie nationale*). Finally, the end user, so to speak, the one where the project will be implemented, in one of these rooms, is the Caen Court of Appeal, the Caen Judicial Court, and more specifically François, who will speak soon.

You have a real crime scene that is being investigated by the internal security forces, in this case the PJGN, under the direction of a prosecutor or an investigating judge. Evidence is gathered, photos are taken, and possibly point clouds are created. We will talk a lot about this last point, using lidar. All this data is processed, and when the time comes, we go to court to present it, but that is much later. A long time has passed between these two stages.

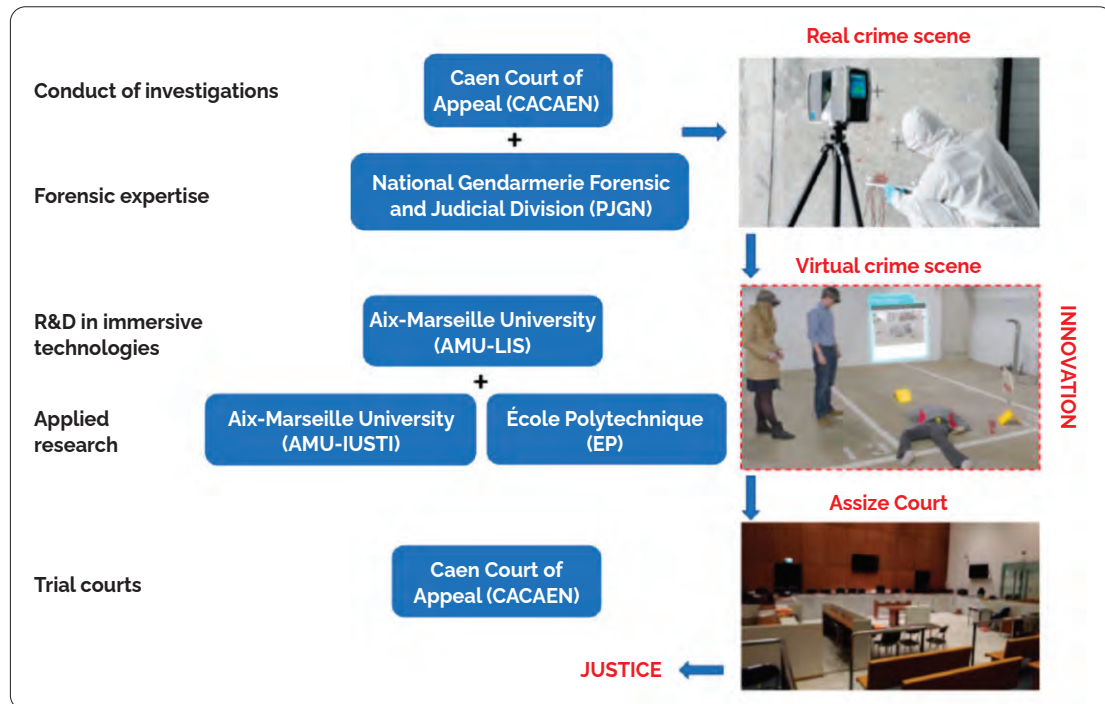


Fig. 40. Creating a digital twin of the crime scene.

So, we are somewhere in between, trying to create a digital twin of the crime scene (Fig. 40), in which we can recreate the context, the body, the events, and then test hypotheses. The academic partners come in at this point to create physical models. Our goal is to make it clear that, in virtual reality, these are not random models, but rather equations of physics that translate the movements of a body, the movements of bloodstains, etc.

What do we need to do in the laboratory to achieve this goal? We need to conduct experiments to observe when a bloodstain hits a wall (Figs. 41, 42). What the forensic technician or

expert analyzes is the final result. However, how was it originally created? We need to be able to tell our colleagues who are working on the simulation in the helmet how many drops will be ejected from a bloody knife with a certain curve, what the diameter of the drops will be, their initial velocity, and so on. We must establish these initial conditions. And so, to obtain these initial conditions, we need to carry out some rather gruesome experiments, using a hammer, a baseball bat, etc. These experiments involve quite different conditions to feed and inject these physical models into our simulations.



Fig. 41. Impact projections.



Fig. 42. Ejection-based projections.



Fig. 43. Blood spatter.

In addition, we are required to perform image processing, from crime scenes. When there are blood splatters, abundant traces of blood are projected onto horizontal or vertical surfaces. Currently, the bloodstain expert selects manually certain traces that will provide information to trace back to what is called the point of origin. This is done using a personal approach by someone who has been trained to select the traces; the approach is not automated. Next, software will help them trace linear trajectories. However, bloodstains do not

have linear trajectories. Trajectories are influenced by gravity, friction, etc. From a physics perspective, it is more complex (Fig. 43).

The project aims to automatically recognize all these bloodstains, cut them out, and detect them automatically. This will allow us to erase them so that we can work on the scene in its immaculate state. This will enable us to ask questions, rework scenarios, and reverse the calculation from the immaculate scene to the non-immaculate scene.

To do this, the data acquired by point clouds must be converted. To this end, we have lidar, the technical device that acquires these point clouds. It simply records the points through which the blood drops can pass. Processing these points allows them to be converted back into a 2D mesh, a flat surface, so that photographs can be pasted onto it. This means that in the virtual reality headset, the object can be picked up and manipulated. If we limit ourselves to using only photographs, we will not be able to manipulate anything.

We must be able to certify what we are going to do (Fig. 44). We are using a fluid mechanics approach, which produces physical models. And, in fact, for each type of bloodstain that may be found at a crime scene, we are there to produce a model, which will generate uncertainty, to have a documented approach

iCRIME simulations must be certified before they can be used during Assize Court trials.

Three reference cases will be used to certify the accuracy of iCRIME:

- case 1: an impact pattern model,
- case 2: a cast-off pattern model,
- case 3: a sudden stop in cast-off motion.

Uncertainty in quantitative data such as:

- the point of origin of the impact pattern model,
- drying time,
- the spread area of the blood pool.

Two-stage certification process:

- first certification phase using simple, existing physical models
→ results with less than 30% uncertainty
- second certification phase using exact but simplified models
→ results with less than 5% uncertainty.

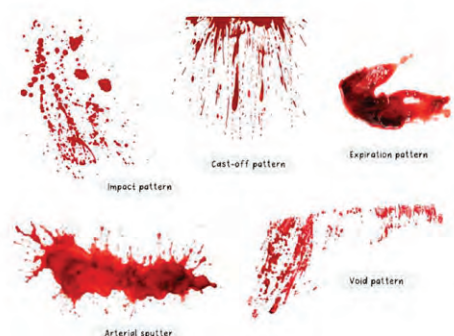


Fig. 44.



and respect the adversarial process right up to the trial level.

In demonstration images, which are not real scenes, but fictional scenes, you can manipulate a baseball bat or a knife. We do not get the projection after the umpteenth blow, but after the first. If we hit an avatar, there is only one blood spatter, which is intentional. However, the idea is that this single projection will produce different trajectories and colors that reflect the current approach, linear trajectory, gravity, etc. This is the result of physics, and we will demonstrate it this afternoon, if you would like to attend.

Our colleagues will then take over, presenting the automated point cloud processing elements developed by Sébastien Mavromatis. These physical models, along with all the multi-model data, will be combined in software to work on scenes that will become real scenes, but which are currently fictional scenes for demonstration purposes (Fig. 45).

François LALÈS: I am going to outline the main advantages of digitizing crime scenes. Crime scenes are a source of a wealth of information. They bear witness to what happened, just like the body. They are evidence that must be protected and exploited to the fullest because they directly bear the traces of the acts that were committed.

This is the approach we propose to take with the I-Crime software, using virtual reality for morphoanalysis, i.e., the interpretation of blood-stains to understand the mechanisms that led to their appearance. This discipline makes it possible, for example, to define the areas of impact on a body, determine the respective positions of the protagonists, identify the object used to commit the acts, and ascertain the movement that was made with it, the amplitude and orientation of the movement, and possibly the force of that movement – all elements that contribute to determining the intentions of the perpetrator.



This discipline makes it possible, for example, to define the areas of impact on a body, determine the respective positions of the protagonists, identify the object used to commit the acts, and ascertain the movement that was made with it, the amplitude and orientation of the movement, and possibly the force of that movement – all elements that contribute to determining the intentions of the perpetrator.

François LALÈS

For example, if it can be shown that ten blows were struck against a person while they were on the ground, and moreover to their head, this speaks volumes about the intentions of the person who struck the blows. Conversely, if it can be scientifically proven that only one blow was struck by a person who was on top of their victim, this may indicate a situation of self defense, or at least a situation of panic on the part of the person who struck the blow. It is essential to have this information to make a proper judgment.

The first advantage of virtual reality is the preservation of the crime scene. Preserving the scene is costly, as the Ministry of Justice is responsible for compensating the owner in good faith for as long as they are unable to

access their property. The investigating judge will be required to weigh up the benefits of preservation against its cost, in proceedings that can last several years. The investigating judge may be convinced that they have fully exploited the crime scene and no longer need to preserve it, only to be confronted much later with the emergence of a new suspect or new versions of events that would justify a return to the scene. In such cases, returning to the scene, even if only virtually, can be of great interest. Virtual transport is not entirely comparable to transport to the crime scene, as it has its limitations, but in certain situations, it is better than no transport at all.

Virtual reality allows the scene to be preserved over time but also protects it. Currently, after technicians have visited crime scenes to make observations and collect samples, investigators arrive, along with authorities such as the prosecutor. Although technicians collect samples exhaustively, there is always the possibility of new developments. However, the arrival of these legitimate visitors to the scene causes irreversible contamination: sometimes as many as ten people enter the scene, carrying their DNA with them and moving traces from one place to another... and the mere fact that they may have moved DNA is enough to create doubt, which can have serious consequences in terms of evidence. In the future, it may be possible for only technicians to enter a crime scene, with all other parties only immersing themselves in virtual reality, which would involve "putting the real scene under a bell jar" to preserve it completely.

Another advantage of virtual reality is easier access to crime scenes. With virtual reality transport, you can access crime scenes without having to deal with the formalities of breaking seals and summoning parties. You can access them without having to manage the security of the sometimes hostile environment of the crime scene, and without having to provide escorts or protection for detainees.

Another advantage of accessing the crime scene in virtual reality is the effective sharing of essential information with all parties involved in the criminal justice system.

Currently, access is mainly limited to first responders: police officers, gendarmes, criminal investigation technicians, and sometimes experts. The scene is also accessible to the

investigating judge, the prosecutor, and lawyers if a reconstruction is organized. However, it is not uncommon for several investigating judges to succeed one another in investigations that last for years. For example, there may be three investigating judges who succeed one another on a case that has been under investigation for seven years. The third investigating judge may be called upon to conduct an interrogation on the course of events, based on information provided by photographs and reports, which are necessarily biased: the way in which the scene is described is the result of the choices made by the writer, which photos were taken, which choices were made to present the scene, and the reconstruction of events. A transport, even a virtual one, would give the third judge complete freedom to examine the scene without influence, with his own questions.

Furthermore, it is common for the prosecutor present at the reconstruction to not be the same one who will be prosecuting at the hearing. It may also happen that the lawyer present during the reconstruction is not the one appointed to defend the case at trial... These individuals involved in the trial will not necessarily have had access to the crime scene. Some of them will have had access and will be able to convey their experience more easily, while others will not.



It is essential for the manifestation of truth that this fundamental information be accessible to all parties involved in the proceedings, on an equal footing.

François LALÈS

It is essential for the manifestation of truth that this fundamental information be accessible to all parties involved in the proceedings, on an equal footing.

Finally, it is difficult to understand why this essential information is not directly accessible to those who will be responsible for judging the case. Today, it is very rare for a criminal court to visit the scene of the crime, for practical reasons or because the scene no longer exists.

This information, which is accessible during the investigation phase, is currently only imperfectly transmitted to decision-makers, to those who will choose to declare the person guilty or not, to those who are responsible for understanding the intentions of the accused and for pronouncing a sentence. Virtual reality will be a tool that will enable judges to better understand the facts and make better judgments.

Access to the crime scene, whether real or virtual, provides a better understanding of all the elements that are subject to assessment. There is a great deal of data to be processed in the course of an investigation and trial: footprints, fingerprints, DNA traces attributed to a particular person, blood spatters in a particular place; movements, sequences of movements; the size of a room, the ease or difficulty of moving around in it, hiding in it, etc. Investigating involves working on hypotheses and verifying them. It involves working on accounts, sometimes evolving, from witnesses and suspects. There is therefore a huge advantage in being able to visualize these elements to try to link them together as effectively as possible and, quite simply, to facilitate reflection.

The virtual scene is a tool for experts, investigators, and judges to reflect on, but it is also a presentation tool. When the bloodstain pattern analysis expert describes to the court the position the victim must have been in given a particular spray pattern, he will explain it and illustrate his point with photographs or a video. But it would be much more effective and reliable if his audience could visualize his conclusions directly, so that they could then take a critical look at them and assess their relevance.

I-Crime will be a new tool for interacting with those involved in events. In an investigation, interaction with those involved in the events is essential and sought after. Sometimes we deal with people who, for various reasons, do not necessarily want to talk about what they have done. Either because they are ashamed, or because they fear the legal consequences of their actions, or because they want to hide the truth, or because psychological mechanisms prevent them from remembering or recounting what happened. Without communication, without talking, the investigation does not progress or at least progresses more slowly. Immersing a suspect in the crime scene can facilitate this interaction.

This is often one of the main purposes of reconstruction. Of course, the primary objective of reconstruction is to reproduce actions, verify the plausibility of versions and hypotheses, and check their compatibility with findings. And reconstruction allows us to see to better understand. But often, reconstruction is an opportunity for emotional shock, which will elicit reactions. Sometimes, it will be an opportunity for the suspect to say what he had not said before, precisely because he is brought back to the scene.

Immersion can be a way for suspects to express through gestures what they did not want to or could not say with words. It is undoubtedly not easy to say, "I stabbed my wife three times in the throat, aiming for her carotid artery." For some, it is easier to show it, and this is what regularly happens during reconstructions. You may have a suspect who says nothing throughout the investigation, and then suddenly seizes the moment to reenact the gesture with a fake knife toward the throat of the mannequin representing his wife. His participation in the reconstruction may be limited to this single point, but he will ultimately have expressed the essentials through his actions.

Immersion, even virtual immersion, makes it possible to work with the defendant, stimulate their memory, and confront them in a concrete way with their inconsistencies or impossibilities, rather than simply pointing them out during questioning.

Virtual reconstruction will even allow for better reconstruction in certain respects than visiting the scene. When you reconstruct in the physical environment, traces of the events remain, particularly bloodstains, which are pieces of information that were not present



Immersion, even virtual immersion, makes it possible to work with the defendant, stimulate their memory, and confront them in a concrete way with their inconsistencies or impossibilities, rather than simply pointing them out during questioning.

François LALÈS

before the events and which will influence the behavior and statements of those reconstructing them. Some people will be determined to explain the presence of blood in a particular place in the room by reproducing actions that they have little or no memory of, to stick to the information they see at all costs. In a virtual environment, it is possible to remove all traces of the crime, including bloodstains, to start from scratch, so to speak. This environment, as it was before the events, allows for a reconstruction based solely on the memories of the protagonists, without any influence. And it is perfectly possible to bring back the traces of blood at a certain point in the reconstruction, to check whether the reconstructed gesture is compatible with the facts or not, to elicit reactions.

The main risk in using a virtual reality tool that incorporates scientific models to calculate blood trajectories would be to consider this evidence as irrefutable and absolute because it is technological and scientific. This risk already exists when assessing evidence with a strong scientific dimension, such as DNA. At first glance, one might consider that the presence of the suspect's DNA necessarily proves their guilt, whereas many other parameters should be considered, such as the circumstances in which the DNA was deposited, its quantity, the legitimate interactions that the carrier of this DNA may have had with these locations, etc. Scientific evidence, like all evidence, has its limitations, which must be taken into account.

It is up to the expert to be transparent about the reasoning that led to their conclusions, to explain their methods and their limitations, to qualify their conclusions (probable, highly probable, etc.), and to explain the margins of error. The equations integrated into the I-Crime tool to calculate trajectories will be published in a fully transparent manner, so that another calculation equation can be implemented if necessary. As with any expert assessment, the assessment carried out with I-Crime must be subject to cross-examination during the investigation phase. Access to the virtual scene, identical to that used by the expert, may be used for cross-examination. The margins of error for the calculated trajectories can not only be described but also visualized. Once again, the virtual reality tool is above all a tool for communication and understanding.

Olivier CHEVET: Thanks to all three of you. We can feel the passion that drives you in this research. We realize, perhaps in this round table discussion, that in virtual reality, we are talking about reality, sometimes extremely raw and harsh, but that is also the subject of the investigation.

What strikes me as I listen to all three of you is that, ultimately, with this subject, we have talked a lot about hypotheses and models. We get the impression that when we want to introduce virtual reality into the investigation, a kind of co-construction emerges, a process of building something together, this model of the scene. This construction reopens the discussion and questions the roles of each person in the procedure.

The introductory remarks emphasized the powerful impact of virtual reality. If we only saw the final reconstruction of the scene with the truck hitting the child, presented by Till (see box below), we would think that this is exactly how the scene unfolded. It is extremely impressive. We feel that the question of the development process is crucial.

For example, in Switzerland, this method was used to create an immersive 3D reconstruction and a virtual reality model to analyze a complex traffic accident involving a truck. Investigators combined high-precision trajectory data (distance, speed, and timestamps) with physical evidence collected from the road surface and the vehicle to reconstruct the vehicle's movement frame by frame. The driver's position, anthropometric data, head orientation, and field of view were modeled in 3D to calculate obstructions and blind spots under real-world spatial conditions. At the same time, impact marks, tire tracks, and injury patterns were digitally documented and mapped within a spatial model to determine the precise point and dynamics of contact. Witness statements and fingerprint analysis were taken into account to estimate the pedestrian's probable path of travel at the critical moment. By merging kinematic data, forensic imagery, and visibility analysis within a single immersive environment, the experts were able to simulate what was objectively perceptible from the driver's perspective (details of the case cannot be disclosed).

How do you think these tools are redefining the way experts who used to work separately now collaborate and discuss issues? The judge or prosecutor would generally commission the expert and then receive the finished work. Now, should the judge work more closely with the expert? This also raises the question of the role of the parties. Should they not be present during the reconstruction, so as not to risk things becoming set in stone after the model has been developed? Ultimately, this calls into question the process of constructing these models in relation to the investigation.

Till SIEBERTH: For me, this is one of the most important points. I have made numerous presentations to courts and prosecutors. I have always said that I am an expert who manipulates 3D models, but that when it comes to expertise regarding the trajectory of a bullet, this comes from another expert or an anthropologist. For my part, I simply move the data around in 3D.

The key, therefore, is to bring all the players together to carry out the reconstruction. That does not mean, however, that it was done immediately in 3D. Normally, the experts worked in isolation, made their decisions, and then got together. And sometimes their decisions or actions evolve based on their interpretations when they discuss their results together.

Chiara VILLA: I completely agree. Reconstructing a virtual crime scene is a team effort, with each expert offering different explanations. Using virtual reality allows you to come together and view the scene from different angles. This can be beneficial, but all experts must at least come and present their point of view.

In addition, I believe that all experts, starting with judges and forensic experts, should have experience with 3D. I had a case where I simply translated an analysis into a 3D environment, and the expert then said to me, "No, that is not what I was looking for." You must not forget that working in a 3D world is new, and we need experience as experts. We need to work together.

David BRUTIN: To sum up, on the interdisciplinary side, this is already being practiced in the project. Truthfully, what matters is that in real situations, investigating judges and prosecutors



From left to right: Till SIEBERTH, David BRUTIN and François LALÈS.

are informed that they can request this interdisciplinary approach and call on several experts to work together. There are also opportunities in terms of this information. You know that you can request DNA analysis and morphoanalysis, but you should also be aware that you can call on this expert, who will be able to work with that expert. The request and the order from the Commission of Experts form the basis of the work on a case. We therefore often already work together in an interdisciplinary manner. Nevertheless, the basis remains that the magistrate knows that this interdisciplinarity is possible and does not hesitate to call upon it.

Q&A Exchange

Question: *I would be interested to know how commonly this technology is used. Are we talking about one case in a hundred, or is its use statistically very high in criminal cases?*

Till SIEBERTH: In Switzerland, we started implementing this in 2017, which was the first case. At the time, we worked on 17 cases, which is a very high rate for homicides. I am only talking about cases using virtual reality here, and 17 is a lot. There are not that many homicides in Switzerland, especially not in the region we covered at the time. As for 3D reconstruction, I cannot tell you exactly how many cases we worked on because there are so many: jewelry thefts in stores, plane crashes... For example, there was a plane crash in 2018 with many victims, for which we reconstructed the flight path. But, as you pointed out, in many cases it is important to have a discussion with prosecutors and judges to find out what they are looking for and tell them what is feasible and what is not. You need to know whether you can provide them with what they are asking for, and that is how we proceeded. We first ask them about the nature of the case before assessing whether we can intervene.

Olivier CHEVET: While preparing for the conference, we realized that behind the concept of virtual reality, there is in fact a continuum, to quote Antonio Capobianco during the opening plenary session. The number of cases involving 3D reconstruction is certainly very high. The question of how far to go in reassembling a virtual crime scene is much more complex to address. What we realized as we discussed this conference was that, despite its use by magistrates in a few cases, it remains covered by the secrecy of the investigation. We do not know its extent. It may be used in investigations that do not lead to trial, or vice versa, but we will not necessarily use the 3D model that will have had its effect. Perhaps the accused person has changed their version of events, and the facts are now recognized. The 3D model will no longer be needed at the hearing, but it will have had an effect. Today, we realize that it is difficult, at least in France, to know to what extent these techniques are being used by experts. Perhaps they are ultimately the best placed to know. Research certainly needs to be done on how these

technologies are used and manufactured, and the impact they can have on investigations themselves.

Question: I was wondering if, during the implementation of these reconstructions, you had any dialogue with the judicial authorities in your respective countries to consider changes to criminal procedure and the rules of adversarial proceedings? Did these discussions with judges and lawyers reveal a need, for example, to allow the models to be questioned, or at least to open the possibility for each party to propose different scenarios? In short, to truly reexamine the rules of adversarial proceedings. Have you had this type of experience?

François LALÈS: I have no experience in this area, but it is prudence, in my opinion, that leads us to consider that the adversarial process should be maximized to avoid the pitfalls of a presentation that could be perceived as definitive, as reality. It is therefore important to involve the defense as early as possible so that it can take ownership of the tool. There are already many contradictory elements, and for tactical reasons, it is quite common for the defense to remain silent during the investigation and then exploit areas of uncertainty during the trial phase. It is essential to stimulate this debate by providing effective access to the crime scene, communicating information to which lawyers have rarely had access until now, and allowing them, from the investigation stage onwards, to criticize the way in which expert reports are carried out and to request a second opinion on the basis of this shared data.

This sharing of information is necessary to consider reproducing hypotheses that serve the interests of the accused, so that the court is ultimately provided with images. These images will have an obvious impact, but they will support the interests of all parties. From this point of view, the image will be impactful, but it will be impactful in all scenarios.

Today, paradoxically, we prefer not to use data rather than use it with bias. In practical terms, in



A view of the audience during the conference.

French criminal courts, we prefer not to show a corpse at a crime scene in the name of protecting human dignity. But in doing so, we lose essential information.

It is common for a lawyer to advise their client not to reenact the scene they have admitted to committing, to avoid being seen stabbing someone, for fear that the image will have a devastating effect on the jury. Ultimately, it is preferable not to do it, not to show it, and to let the judges and jurors imagine it. But sometimes it is precisely the imagination that suggests the worst, with everyone forming their own idea of the scene that we do not want to show them.

I believe that virtual reality will enable us to show what is currently hidden, using avatars. By creating an avatar of the victim, you can display the location of wounds, the position of the body, and all the elements that can be presented by the medical examiner, without showing the victim's face. Virtual reality will create a certain distance to avoid the emotional impact of seeing a corpse, while preserving the morphological characteristics of the victim. You have the essential information, without emotional impact.

Similarly, a defendant could be asked to reproduce the gesture on an avatar, and possibly appear as an avatar himself, if he does not want the jury to see him striking someone with a knife. All the data presented will be faithful to the version presented,

while removing the overly emotional dimension. With virtual reality, we can play with immersion: more or less immersion, more or less withdrawal from reality. But, once again, it is essential to be transparent about the processes used and what the image represents. It is essential that everyone be aware of the biases that exist when using this method of presenting evidence, but as is ultimately the case with all other methods of evidence. The adversarial process is essential for this evidence, as it is for other types of evidence.

Olivier CHEVET: I would like to thank our speakers for all the information they have presented, which has certainly left us with more questions than answers. This workshop was fascinating and gave us a glimpse of all the questions that will arise in the coming years regarding the use of these devices in legal proceedings, which will certainly be in most serious cases at first, but which are likely to become more widespread.

Panel for early-career researchers in cyberjustice

Winners of a call for submissions launched by the organizers and supported by the Université de Montréal's LexUM Chair on Legal Information.



Chair: **Valentin CALLIPEL**

Head of Mission at the Cyberjustice Laboratory (Canada)

Migration justice and digital platforms: towards increased protection or virtual discrimination?

Azin KARAMI

PhD student in public international law at Aix-Marseille University (France)

From physical courtrooms to digital twins: exploring immersive uses of courtrooms in the justice system

Sébastien MEEÛS

PhD student in law at the Université Libre de Bruxelles (ULB) in joint supervision with the Université de Montréal (UdeM) (Belgium)

Legal and practical issues of justice in the Metaverse

Michela TRINCHESE

University Researcher at the National Research Center (CNR) (Italy)

Valentin CALLIPEL: Good afternoon, I am a lawyer and the head of mission of the Cyberjustice Laboratory in Montréal, who is participating in the organization of this event. I am pleased to present this panel dedicated to young researchers, designed to showcase new trends in research in our field. The three panelists were selected following a rigorous selection process after responding to a call for papers.

Azin Karami is a doctoral candidate in public international law at Aix-Marseille University and a license lawyer in Iran, specializing in human rights and refugee law. Her research focuses on the protection of migrants, refugees and minors, the subject of her presentation today: *Migration justice and digital platforms: towards increased protection or virtual discrimination?*

Michela Trinchese holds a PhD in human and social sciences from the University of Salento. She also is a research fellow at the National Research Council (NRC) of Italy. Her research at the NRC focuses on the intersection of human rights, digital technologies, and public governments, with a particular interest in the social and legal implication of the Metaverse, which is totally adequate with her topic of the day.



Valentin CALLIPEL



Azin KARAMI



Sébastien MEEÛS



Michela TRINCHESE

Lastly, Sébastien Meeùs is a doctoral candidate in law at the University of Montréal, in a joint PhD program with the Université Libre de Bruxelles (Brussels Libre University), where he serves as a teaching assistant for the data law course. And today, Sébastien will focus on the work he has conducted both in Brussels and Montréal on the development of the digital twin in courtrooms.

Azin KARAMI: Hello, I will thus start with my presentation entitled *Migration justice and digital platforms: towards increased protection or virtual discrimination?*

Digital platforms and smart surveillance tools are creating a form of virtual justice. Decisions are crucial when it comes to the fate of migrants, such as whether they can enter, stay, or be deported from a country, and these decisions are now often made by algorithms and databases rather than physical courts. This is the new challenge of virtual reality in justice. Justice now takes place within digital systems rather than in traditional courts.

Today, borders are no longer just barbed wire, checkpoints, and inspections. Borders have become digital: our identity is verified by facial recognition; the right of passage is determined by algorithms; a migrant's future is shaped by data from an artificial intelligence

system. This change raises a fundamental question: do digital technologies reinforce migration justice or are they becoming tools of virtual discrimination?

I will examine this issue through data, real-life experiences, and human rights documentation. I will focus particularly on vulnerable groups of migrants, namely unaccompanied minors.

To begin with, we need to talk about externalization. In recent decades, many countries have outsourced part of their migration control to third countries, a process known as border externalization. This means that migration is stopped before migrants even reach national borders. Take the European Union and Libya, for example: by strengthening Libya's digital system, the European Union has extended its borders into the Mediterranean and Africa.

According to the United Nations High Commissioner for Refugees, in 2024, more than 24,600 migrants were returned by the Libyan coast guard. Hundreds of unaccompanied children were among these migrants. Libyan detention centers have been described as inhumane, violent, and lacking minimum human rights standards. This example shows that digital technology, when used irresponsibly, can become a tool for repression and violation of the right to asylum.

What digital technologies are used in relation to migrants? Biometric systems (EURODAC, VISABIO), facial recognition and age estimation, risk analysis algorithms, drones and thermal sensors to detect people in areas where visibility is poor, and platforms for sharing data between countries. These tools, deployed to improve speed and transparency, carry serious risks.

What are the risks? According to a recent study, *Performance Differentials in Deployed Biometric Systems Caused by Open-Source Face Detectors*, published by Professor Cook and his colleagues in 2025, facial recognition error rates are 25 to 35% higher for people with darker skin. UNICEF France reports that age analysis tests can be inaccurate by one to two years. In some European countries, children's data has been shared with police and security agencies.

In a country like France, which is a major destination for unaccompanied minors (13,600 in 2024), these misjudgments, particularly biometric errors, can lead to children being



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Azin KARAMI

incorrectly classified as adults. This has serious consequences such as detention, denial of legal protection, exclusion from education, and denial of access to healthcare.

Final analysis: justice or discrimination? Digital technology is not neutral. Algorithms reflect political and structural biases. The lack of independent oversight can increase digital discrimination. Artificial intelligence often analyzes data from the majority, not from minorities such as refugees, which increases the risk of error. These errors are not technical. They are errors that can change a person's destiny.

Artificial intelligence cannot understand human context, fear, or trauma. Technology itself is neither liberating nor oppressive by nature. It is policies, values, and oversight that determine its impact. Technology can be unfair because it is the product of humans and human rules, not something that automatically makes fair decisions.

Therefore, in a world where borders are becoming increasingly virtual, migration justice must be human-centered. Artificial intelligence, biometrics, and digital platforms will shape the future of migration. But that future must be one where unaccompanied children are not forgotten.

The right to asylum must not be sacrificed for the sake of fast algorithms. Technology must promote human dignity, not exclusion or discrimination. It is our responsibility in academia, politics, and research to make these digital borders fair, humane, and secure.

Valentin CALLIPEL: Thank you very much for this first presentation, which was very interesting in setting the scene for this afternoon's debate. It identified some of the main challenges and pitfalls we face when it comes to leveraging technology in the field of public policy, but also in the judicial sector. Michela will now take the floor for the second presentation.

Michela TRINCHESE: Good afternoon to everyone and thank you for welcoming me to this conference, in such an important place. I hold a PhD in human and social sciences and am working as a research fellow at the National Research Council in Italy. I am here to present some aspects of our project MetaJust.

MetaJust is an interdisciplinary research project developed by the National Research Council – Isasi Department, the University of Salento and the Polytechnique of Bari. It aims to investigate how Metaverse technology is reshaping interaction in the public sphere, where virtual environments are increasingly used to extend and diversify public services. On the other hand, it is also about understanding how Metaverse technology can enhance access to justice, support the delivery of judicial services and contribute to the training of legal professionals and students.

Alongside this analysis, the project is developing an immersive virtual reality courtroom that replicates the architecture of real hearing courts, enabling experimentation and critical analysis on how judicial processes might operate within a future digital ecosystem in the justice ecosystem.

Starting from the first technological and social developments of immersive technologies, attempts to define the Metaverse expose underlying power dynamics. Indeed, the act of defining is an inherently political act, revealing who has the authority to shape the digital future, and whose priorities prevail.



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Michela TRINCHESE

This plurality underscores a key government's issues in the context of Metaverse. That is, Metaverse is not a single space, but is a socially constructed and conflicted negotiated assemblage. This becomes especially evident in debates on interoperability and decentralization.

Indeed, while optimistic vision portrayed Metaverse as a decentralized, WEB3 ecosystems governed by the users, the reality remains dominated by Big Tech, such as Meta, Microsoft and Apple. These companies continue to set standards, control infrastructure, and consolidate data governance in Metaverse, reproducing the same logic of the platform society in which we are currently living.

Consequently, Metaverse risks becoming not a democratic alternative to platform society and web2, but an extension of existing power asymmetry in digital space. Understanding this dynamic, it is important to create a real shift of public service in Metaverse space, capable of safeguarding autonomy, transparency, and collective oversights.

In the judicial domain, the implication of Metaverse integration is very significant. The dematerialization of proceedings from video-conferencing to fully virtual hearings directly affects not only the procedural aspect and the right to fair trial, but also the symbolic authority historically embedded in the courtroom.

According to Antoine Garapon's notion of despatialisation, the courtroom has long operated as a space of normative and social meaning. It organizes roles, structures, ritualistic procedures and conveys institutional authority. Translating this architecture into a virtual environment risks attenuating these symbolic

signals. Metaverse adoption does more than digitize existing practices: it e-shapes the spatial and relational dynamics through which justice is enacted.

The configuration of the physical courtroom produces shared meaning and socially recognized interpretative categories. For this reason, virtual courtrooms cannot be considered neutral spaces. They are devices of governance and discipline that organize rules, rituals, and expectations inside the courtroom.

With digitalization introduced by virtual proceedings, these categories with which we organize physical spaces, and their meaning, can become less stable. And for this reason, virtual courtrooms redefine interaction, perception of authority, and the ritual enacted by the norms. So, when we talk about the translation of the public services, we must start from this standpoint to create a real, inclusive and power-controlled virtual space, in which we can work efficiently.

Considering these reflections, we are working on a virtual courtroom in the context of legal clinics' experiences. They are a learning space where students, academics, and professionals offer free legal assistance to the community through mock trials, drafting legal documents, client interview and advocacy, especially for vulnerable groups. Legal clinics enable students to apply legal theory to real cases, developing practical skills and ethical awareness about the work of lawyers, and much more. The virtual tribunal extends this possibility, to dive deeper into the trial and judgment space, creating an immersive setting where students and professionals can simulate criminal and civil proceedings.

Our virtual tribunal system (**Fig. 46**) has been designed according to the specific environment derived from documentary, jurisprudential and photography analysis of the real judicial space and comprises three main environments. The first two in the photography, that is the courtroom, faithfully reproduce the real structures of the courtroom in Italy. The third one is a room for private interviews or mediation, useful for legal clinic exercise. The last one is a protected virtual room intended for hearings of vulnerable groups or witnesses such as minors or people with disabilities, mediated by qualified professionals with secured video, that is transmitted to the other space.



Metaverse adoption does more than digitize existing practices: it e-shapes the spatial and relational dynamics through which justice is enacted.

Michela TRINCHESE



Fig. 46. The project MetaJust, a virtual tribunal system.



Our virtual courtroom [...] becomes a tool for exploring how digitalization transforms the symbolic rituals and operational dynamics of justice, combining education technological experimentation and safeguarding of human rights.

Michela TRINCHESE

The adoption of the virtual tribunal in our project has five practical objectives. The first one is to support the training of future justice professionals. The second is piloting immersive virtual reality applications for justice services, in line with the previous reflections. The third one is reducing travel for participants and, the fourth one, ensuring safety hearings of protected categories. The last one is improving the experience compared with traditional videoconferencing.

To conclude, in the testing of our virtual courtroom to support public services, it is important to recognize that it does not merely replicate a physical space. It becomes a tool for exploring how digitalization transforms the symbolic rituals and operational dynamics of justice, combining education technological experimentation and safeguarding of human rights.

Sébastien MEEÛS: I am happy to present part of the Virtualization and Augmentation of Justice (VIRAJ) project at the Cyberjustice Laboratory. I will try not to repeat what has already been said but be more practical. We are following the traditional methodology of the Cyberjustice Laboratory, which means that we first look at the technology available, which is evolving fast. We then find use cases around them. And finally, we develop our tools to test and check their impact on justice.

We wanted to explore the potential of the digital twin aspect of the Cyberjustice Laboratory courtroom, which you can see on

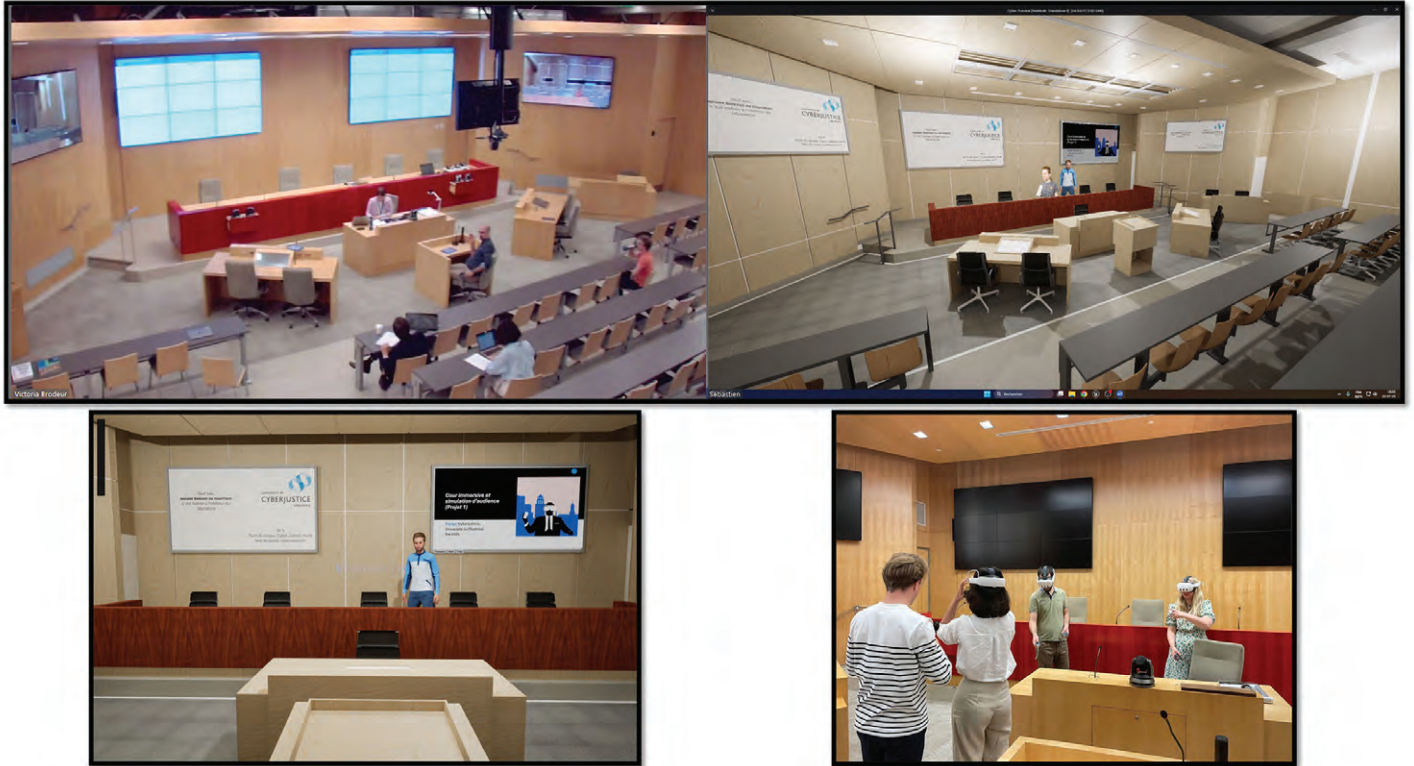


Fig. 47. The digital twin.

the left hereabove (Fig. 47). And it means that, of course, the physical space must be replicated in 3D, but we are also looking at different digital twins. For example, the person who will be in the room as well as the interactions between them. For that, we have on the top right the 3D courtroom where I am in Brussels, it was a Zoom call, and on the left, you have the regular Cyberjustice room located in Montréal, which can be seen thanks to one of these cameras.

We are looking at the digital twin in human terms, and therefore in terms of the impact of technical possibilities on our behavior. It is starting to resemble the book or movie *Ready Player One*, if you have read it or seen it. On a more serious note, the use cases we have already mentioned are court hearings, particularly remote hearings. What is interesting is that you will no longer have to drive three hours just to testify or complete any other formalities.

It is also interesting in terms of professional training as well as public awareness. Today, I am going to focus on professional training. We have developed a tool in this area, trying to take advantage of one of the latest technologies, namely generative artificial intelligence and large language models (LLMs).

In many fields, you already can train your skills in a digital environment. In the next image (Fig. 48), for example, Formula 1 drivers can rehearse complex procedures. They can try out a specific circuit, take turns, and test various weather conditions: rainy, dry, etc. The same goes for airplane pilots, who can practice take-offs and landings, whether visibility is good or not.

This is something that already exists in other fields, but we want to try to do it for the justice system, with the courtroom simulator that will be set up. We are also collaborating on this project with the FARI Institute (AI for the Common Good Institute) in Brussels, as they have a CAVE (Cave Automatic Virtual Environment), which is a computer-augmented virtual environment. In this environment, you have a full-scale display of the courtroom, which can also be useful if you do not have access to a physical classroom, as the Cyberjustice Laboratory in Montréal offers.

In this context of digital training, we are looking to use LLMs-powered avatars to enable natural conversations. The idea is to create immersion through interaction. It should be kept in mind that this is not a real-world use case in the context of a hearing, but rather professional



Fig. 48. A Formula 1 driver trains on a virtual racing circuit.

“ It is not a question of replacing humans or the decision-making process, but rather of improving operations and training.

Sébastien MEEÛS

training. Therefore, it is not a question of replacing humans or the decision-making process, but rather of improving operations and training.

In terms of digital training aspects, once again, it concerns activities that we are already holding at the Cyberjustice Laboratory, which are pleading, training, or Moot court, mock trials, that happen from time to time in the physical courtroom. But we can see the potential to hold these activities within the virtual courtroom here under (Fig. 49).

Just like F1 drivers or airplane pilots, you could customize your experience, select opening or closing statements, the context, the legal field. You could be in economics, in civil law, etc. Or you could also choose the mood of the judge. It could be interesting, for instance, to have an experience with a judge that is not in a good mood, because then you could acquire some experience. This customization is one of the great things about generative artificial intelligence, avatars, even if there are riskier aspects about it, and that is why we are still monitoring the avatars in a controlled environment.

Valentin CALLIPEL: Thank you for your presentations. I now have a question for each of you. Azin, you have illustrated very well the risks associated with this new European policy on externalizing controls, which relies heavily on the use of technology.

One aspect that you may have covered less, but which is equally interesting, is that this creates a new form of access to law and justice for asylum seekers, refugees, and unaccompanied minors. Do you have any information about refugees' access to technology? Are these tools available to them?

And secondly, is there any research, or are you interested in evaluating how this access to justice can be improved for people who are immigrants or seeking refugee status? In other words, are you considering any areas of research or reconfigurations of technology to improve access to law and justice for migrants?



Fig. 49. Virtual courtroom.

Azin KARAMI: Firstly, regarding technology and refugees, we already have, for example, EURODAC and thermal sensors. To improve their situation, we must understand that artificial intelligence should not be used to control anything; we must not confuse the role of artificial intelligence with that of a judge. Artificial intelligence must protect the right to asylum. To do this, it must use a diverse database, from a group comprising citizens and non-citizens, and rely on experts to analyze and obtain this diverse data.

Valentin CALLIPEL: To stay on today's topic of remote participation in legal proceedings, we conducted an evaluation in Canada of hearings conducted by Teams for the Immigration Commission of Canada. We found that remote hearings were relatively well received by participants. Have you identified the same trend in your work?

Azin KARAMI: Truth be told, when a judge must verify something remotely concerning a refugee, I do not think it works very well. A refugee must prove their status, for example, their state of fear. How can this proof be provided remotely? For a refugee, it would be better if the system were face-to-face.

Valentin CALLIPEL: From this point of view, there is therefore a lack of adequacy with the very concrete need to be able to access the law or justice. Technology is not the first problem refugees encounter when it comes to accessing the law and justice.

Azin KARAMI: It must in fact adapt to the actual flow, adapt to what is individual. That would be difficult, because a lot of diverse data would need to be provided to achieve this goal.

Valentin CALLIPEL: This goal is closely linked to the current theme of your research center, Michaela, and to the Metaverse project. The idea is to develop an immersive virtual reality courtroom that faithfully reproduces the architecture and procedural dynamics of a traditional, real courtroom.

An interesting aspect in this area is identifying what might be called the functional equivalent, when we consider that presence in the courtroom is essential. How can we leverage

technology to replicate the functional equivalent of presence in a courtroom? Can you tell us more about the new rituals, decorum, or new configurations we could put in place to return to the essential function associated with the courtroom?

Michela TRINCHESE: That is a very interesting question, and I do not think I can provide a complete answer to it, because our project is interdisciplinary. The technological aspect and the reproduction of the judicial aspect of the courtroom in the virtual environment are being developed by the engineering group and the judicial group. We, the advisors, are working on the social aspect of court hearings in virtual space.

From my point of view, the aim is to try to create a very realistic space in terms of spatial visualization. For example, during our first training session with students, some of them told us that the main problem was the representation of the judge and other parties by avatars. It was not very good at the time; it looked like a cartoon. This kind of gamification, this gamer aspect of virtual hearings, is problematic in terms of realism, consequences, and student perception.

On the other hand, from the point of view of rituals and power relations, as I said earlier, I think the solution is to try to create a conscious institutional design. Conscious of the power relations we share in the physical courtroom, to try to create other power relations, not reproduce the same ones. In Italy in particular, the problem lies in the influence of large platforms in creating the social space of the courtroom. It is therefore important to create political governance for this transition, being aware of this influence and the power relations in the courtroom.

Valentin CALLIPEL: Sébastien, today, in many court hearings, it is possible to appear remotely. The question that now arises is: do we have a right to be present online? In other words, the right not to necessarily be present in the traditional courtroom. This presence has long been understood as a physical, in-person presence. Does the defendant have the right to opt for a digital or virtual presence? What conditions would need to be met for this to become possible? And, last question, could you also



Audience view during the presentation.

elaborate on the principle of open court proceedings and how you envision public participation in your virtual courtroom?

Sébastien MEEÛS: Regarding a right to appear online, we are indeed moving towards a possibility of online appearances. Ultimately, virtual courtrooms will increasingly resemble real courtrooms, thanks to improvements in the appearance of avatars and in the way videos of people are projected in this environment. We could eventually achieve this. But of course, this is more relevant to the first use case, namely court hearings.

This raises the question of a mixed context, such as this conference. We are in the physical room here, and there are also people online, on Zoom. It would be much more complex to set up then. If everyone is already in a virtual space, it is easier to manage all aspects of interactions and conversations. But I would say that soon, we will have to answer this question, with expertise from other disciplines (technical and cognitive) and the judicial system itself.

As for the principle of open court proceedings, the problem would be that, in a mixed environment, it would be complex to set up. But we could have participants, or even online

spectators, who could join us, especially if it is a virtual courtroom that can accommodate 100 people. It would be very easy to accommodate as many people as the servers can hold in the virtual space. But this also raises the issue of cybersecurity, as well as the management of changes in participation when it is only a spectator and not an active participant.

In other words, these issues relate more to the regulation of these new forms of court hearings than to their technical feasibility. This does not necessarily mean that we must move towards these connected court proceedings, but we cannot leave these issues unresolved for too long, given the simultaneous development of immersive technologies.

Free-Access Demonstration Areas

In addition to discussions on the challenges of virtual or augmented reality in the justice system, it seemed important, given the experiential nature of immersive technologies, to allow conference participants to see for themselves the effects these technologies have on their users.

Demonstration areas have therefore been set up near the conference rooms, where several free workshops will be held throughout the day:

- **Reconstruction of crime scenes, virtual autopsy, and subjective perception, presented by 3D-Zentrum Zürich and Forensisches Institut Zürich**
- **Getting to know the court through virtual reality, presented by *Victim Support Scotland***
- **I-Crime immersive technologies in the service of criminal justice, presented by Aix-Marseille University, the Caen Court of Appeal, the École Polytechnique and the Judicial Division of the French National Gendarmerie**
- **Training in a virtual courtroom, presented by the Open Justice Centre at Open University London**

The organizers would like to thank the research laboratories responsible for the workshops for their voluntary contribution to the Cyberjustice Europe 2025 conference program.





Workshop 3

Towards hearings in Virtual Reality?

Chair: David TAIT

Honorary Professor of Criminology at the Research School of Social Sciences, Australian National University (Australia)

Lisa FLOWER

Associate Professor of Sociology at Lund University (Sweden)

Hannes WESTERMANN

Assistant Professor of Law and Artificial Intelligence at Maastricht University (Netherlands)

Julia KORKMAN

Professor of Forensic Psychology at Åbo Akademi University in Turku, Program Manager at HEUNI (European Institute for Crime Prevention and Control, affiliated with the UN) (Finland)

David TAIT: Welcome to this session on reflecting on the future of virtual reality hearings. We are not assuming that we are already there; we are making projections about the future. Part of our mission in this workshop is to imagine what the future might look like and to propose ideas on this subject.

The organizers deliberately called upon a psychologist, a sociologist, and a lawyer or IT specialist, depending on how you choose to describe Hannes. He is someone who knows a little bit about everything. In any case, this is a deliberate combination of different disciplinary approaches.

The three speakers are Lisa Flower, associate professor of sociology at Lund University in Sweden; Hannes Westermann, who works at Maastricht University and has played an active role in setting up numerous systems within the Cyberjustice Laboratory; and Julia Korkman, professor of legal psychology at Åbo Akademi University in Finland.

Lisa FLOWER: I am very happy to be here with you today to talk about the role of physical presence in trials. I have just started a project funded by a grant from the European Research Council (ERC). We began this year, and the project will run from 2025 to 2029. We are still at the very early stages of this research, but I will nevertheless tell you about it and the way forward.

What I am going to talk about is also related to another project, E-ViVi, which I am conducting in collaboration with Julia. I am also involved in another project, funded by the Swedish Research Council. All these projects focus on



David TAIT



Lisa FLOWER



Hannes WESTERMANN



Julia KORKMAN

the role of video links. We will therefore use videoconferencing tools as a starting point to address other topics today and imagine what the future might hold.

I will approach the subject from a sociological perspective to understand which important factors need to be considered when designing fair trials without physical presence in the future. In other words, how can we ensure that a trial will be perceived as fair when we construct these trials in virtual reality, in the Metaverse, or in augmented reality?

There are two aspects to remember from what I have just said. The first concerns physical presence and the second concerns fair trials. Let us start with physical presence, which I believe can be divided into two themes. The first is physical location and *co-location*, and the second is social *co-presence*.

When it comes to physical location and co-location, trials currently take place in shared physical and sensory environments. This means that we go to a physical courthouse. We enter a physical courtroom. We sit on physical benches, and we meet with a physical judge.

And it is not just about this materiality, but also about a sensory experience. The presentations we had this morning on victim support mentioned the importance of having a certain type of sound. Someone talked about pain and the different senses involved in trial experiences. I think all of this leads to a certain experience. The physical location is the fact of being in a material and sensory environment that we share together (Flower, 2021; Herrity et al., 2021).

And these traditional assumptions about trials are based on the belief that the authority and decorum of the court require this physical presence (for discussions see, e.g. de Vocht, 2022; Kremens & Peristeridou, 2025; McKay, 2018; Mulcahy, 2010; Peristeridou & de Vocht, 2023). We need to be physically together to experience a solemn trial and all those essential things that we consider important in the judicial process.

And physical co-location allows us to access the very dense and detailed information that we send when we interact with each other, i.e., emotions, gestures, postures, micro-movements, all those things that we need. Current research indicates that when we use videoconferencing, this can be disrupted (Brucks et al., 2025; Mierke et al., 2011; Wegge, 2006).

The other aspect of physical presence concerns social co-presence, which was discussed in the previous presentation. I think it is very interesting and important, as we move forward, to distinguish between co-location, the fact of being in the same place, and co-presence. We can be co-located with each other, sitting in the same room, but not necessarily be co-present. Copresence means that we can read each other's signals and cues. From a sociological point of view, we send this information, we read it, we



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interpret it, and then we act on it (Goffman, 1959). Social copresence is therefore different from physical presence. We need to try to keep these two concepts separate.

Currently, physical presence is considered necessary to be able to read everyone's social cues. This ability to read, interpret, and respond to others' cues is essential in all social interactions (Blumer, 1959), especially in courtrooms. It facilitates interaction, helps us understand what the other person is doing and what we mean, and allows us to converse and continue interacting.

The second part concerns physical presence, i.e., the place, the co-presence, but also, and this is the other aspect I would like to address, the fair trial. For me, the fairness of a trial, from a sociological point of view, corresponds to the feeling of having been treated fairly and equally.

Tyler's (Tyler, 1988, 2003) concept of *procedural justice* is therefore very interesting to use here. He argues that a trial is perceived as fair if you feel that you have been seen, heard, and

treated impartially and with respect. If these elements are present, then you feel that the judicial system is more legitimate. You are more inclined to believe in the decision that has been made, and you have more trust in the judicial system.

In the same vein, this can contribute to a sense of belonging to a larger community. We can feel like members of society because we rally around the standards and values that we consider important in a trial, which the law is supposed to uphold. In an ideal world, people would feel listened to and heard, treated fairly and with respect, have trust in the system, and feel like members of a larger community.

However, this requires that those involved in the trial understand what is happening. Erving Goffman, a famous American sociologist, wrote about social interactions and the importance of understanding the type of situation we are in, the type of interaction that is taking place (Goffman, 1963).

And when you walk into a courtroom, it is perfectly clear that you are entering a trial, because of that physical environment. If we remove that physical environment, we are no longer entirely sure what is going on. And that is extremely important for our understanding of what we are doing, our expectations of ourselves, but also of others.

Currently, this is largely linked to physical co-location, to the fact that we must be present in that space. Some very interesting studies are being conducted in virtual environments, online virtual reality. They show that even in an online environment, it is possible to create this sense of belonging and of being part of a

larger collective, even if we are not physically co-located.

Returning to a sociological perspective, what are the important factors to consider when designing fair trials without physical presence in the future? Here are six key points to consider as we move forward.

The first is the importance of virtual courtroom rituals. David Tait, our chair, has written extensively with Meredith Rossner about the importance of rituals in trials (Rossner & Tait, 2021, 2023, 2024; Rossner et al., 2021). We need to ensure that we can transpose physical courtroom rituals into the virtual environment. We need to be sure that the symbols we have in physical trials can be easily transposed into virtual trials. How can we create the feeling of a trial, the atmosphere, all those things we need to consider when making this transition?

We also need to focus on the importance of moving from co-location to co-presence. We need to try to find ways to ensure that we can be co-present, understand each other socially, and interpret each other's social cues, even if we are not physically co-located. We would not be sitting next to each other, we would not be able to see each other physically, but we could still find a way to interpret those social cues and act accordingly.

It is important to find ways to achieve this form of shared focus, or entrainment, which allows us to focus on the same thing and bring together this shared knowledge. This requires developing a virtual social gaze. We practice this social reading of the signals we send to each other in everyday life. We are doing it right now, reading, interpreting, and acting on the signals we send to each other. The social gaze is well established in physical environments, and we need to develop ways to make it possible in virtual environments.

Another factor we need to ensure, to better understand what we are doing, is to develop and define the virtual interaction order (cf. Goffman, 1983). This essentially consists of knowing what is expected of each person. What we would do in a given situation, what the other person would do, how we are supposed to behave, act, what we can expect from others. The virtual order of interaction will also help facilitate the conduct of virtual trials. We know exactly what we are doing in physical courtrooms, but there may be subtle changes in the online context. We



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therefore need to explore this issue in greater depth.

We must also examine the concrete and subjective aspects of trials. The concrete aspects are the practical, logistical, and legal aspects, to ensure that we are fulfilling our commitments. We have already discussed presence and what it means: ensuring compliance with laws relating to presence and the rights of the parties during the trial but also paying attention to the subjective aspects of participating in a trial.

And finally, we must also understand that when we develop these technologies, we consider them to be emerging and provisional results of an interaction. We are the creators of the technologies that are currently being implemented. Human beings are involved in this process; we also socialize the technologies we develop. We must therefore be very attentive to the discussions that take place and the decisions that are made when we develop these technologies.

All these points are not mutually exclusive. They are interrelated.

One last point I would like to dwell on: many discussions during this conference focus on virtual trials, virtual reality and holograms, augmented reality. We conduct a test and enter a virtual sphere. Is this really what we want? Are there new ways of doing things, rather than taking an old method and reusing it in a new way (Susskind, 2019)? Do we want to find new ways of doing new things?

David TAIT: What strikes me are new things approached from a new angle. It is a very important challenge, which stems from an approach that involves not accepting rituals as they are, but questioning them, going further, trying to understand their function. Then, when you find yourself in a new environment, a new world, facing new challenges, you rethink some of these assumptions. Things have to change, and sometimes old judicial rituals are obsolete anyway, so why continue using them? This is an opportunity to question some of these assumptions to promote, as you say, greater loyalty and fairness. This is a very good basis.

Our next speaker, Hannes Westermann, has a background not only in law but also in computer science. One of his contributions in Montréal was to rethink the way certain online

dispute resolution platforms work. He transformed them from a system that required a program with incomprehensible jargon to one that is accessible to anyone who knows how to copy and paste. One of the things I learned from Hannes is that you can simplify very complicated things by bringing together talented young people and challenging them.

Hannes WESTERMANN: Thank you very much for that kind introduction and for your very interesting presentation. I am very happy to follow it, especially since it ties in perfectly with the topic I am going to address. David asked me to reflect on certain aspects of virtual reality; in particular how virtual reality and virtual reality technologies could influence courtrooms or legal proceedings in the future. I am talking here about detached spaces, i.e., spaces that are completely separate from the physical reality in which we live.

I will begin by briefly introducing the topic, then suggesting three speculative ideas. These ideas are still incomplete. They intend to encourage discussion and perhaps debate on some of these topics. Then, I will conclude with a quick summary.

I approach this topic, as I do in much of my research, from the perspective of access to justice. Today, the judicial system sometimes struggles to serve ordinary people who are unable to understand the law that applies to them. What is more, justice is administered in courts, in an environment that is unfamiliar and difficult to understand for laypeople, which can be very detrimental. Litigants may end up spending large sums of money, wasting precious time, and being severely affected emotionally by the process.

Now, let us think about the courtroom and its design. The courtroom, the building, and the procedure must comply with certain constraints, one of which is, of course, cost. We cannot build a courtroom exactly as we would like, because it would be very expensive. Courtrooms cannot be infinitely large, covered with windows... This is partly due to cost. There is also a lack of flexibility. Once the courtroom is built, you cannot easily change it.

There are also physical constraints, which I find very interesting. These are things that we take for granted, but which do not necessarily apply in virtual reality. For example, if you see

someone, you are in the same room, you share the same environment. To talk to them, you must be close enough to that person. These are assumptions that, to a certain extent, underlie the way courtrooms have been built, but they do not always apply to virtual reality.

Will we have the technology needed to overcome these constraints, and when? I cannot answer that question. However, I would like to highlight some rapid developments that could indicate that this will soon be the case. We are moving toward a future where there may be no difference between sitting in the same room and wearing virtual reality glasses and seeing

We are moving toward a future where there may be no difference between sitting in the same room and wearing virtual reality glasses and seeing yourself sitting in the same place.

Hannes WESTERMANN

yourself sitting in the same place.

A couple of things need to happen for this blending of the physical and real world to be possible. First, you would need to integrate physical space into virtual reality. Today, this is almost possible. For example, Meta recently released an application called Hyperscape, which allows the mapping of spaces in 3D, using just an off-the-shelf VR headset such as the Meta Quest 3S. Once mapped, you can walk around the space in your headset, no matter where you are in the real world. I tried this out in my kitchen, which worked very well, and almost made me forget that I was not in a real environment.

Second, to create these 1:1 representation of the physical world in VR, we would need to bring faces into virtual reality. Today, there are avatars that can represent you in virtual reality. Below are some studies conducted by Meta, where we can see these avatars, which are essentially photorealistic representations of the user's face. They are obtained by scanning the user's expressions and then providing these highly realistic 3D representations.

Third, for such technology to be comfortable and wearable for long periods of time, current headsets can be uncomfortable. Users may also not be accustomed to wearing them. However, based on recent research conducted by Meta, we can see the realism of these avatars.

But we have also seen the emergence of very lightweight glasses of this type, which look almost like sunglasses. There are clearly many developments in this area. We are not yet at the point where we cannot tell the difference. However, let us assume for a moment that we will have this type of virtual reality in the next five, ten, or twenty years. We could essentially put on glasses and see no difference from what we would otherwise see.

What impact would this have in the courtroom? How would we act in a courtroom taking this technology into account? Here are three ideas that could be interesting.

The first is that of *detached judicial spaces*, i.e., spaces that are not linked to reality as it is. They are entirely remote, meaning you can use them regardless of your location, and entirely controllable, meaning we can modify them and adapt them to the needs of the participants.

This raises some interesting questions, for example, from a mediation perspective where we want people to be willing to find a settlement among themselves, but also in courtrooms. What environment is most comfortable and pleasant for these individuals? This varies considerably from person to person. In virtual reality, we can offer each participant their own environment. Even if they see the same opposing party and the same judge, they may

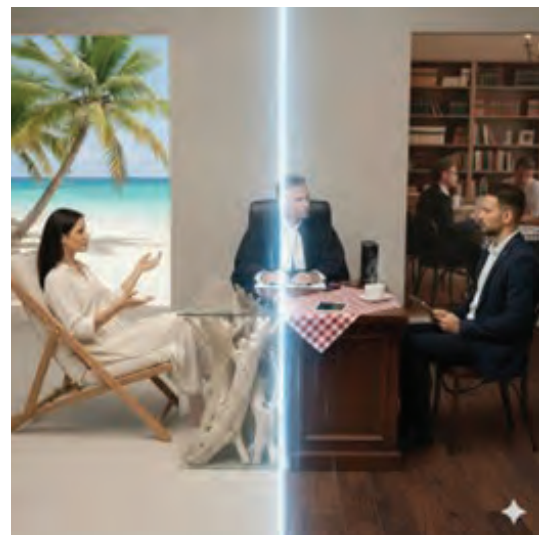


Fig. 50. Illustration of adapting the environment for the individual parties, created using Google Nano Banana.

find themselves in completely different spaces (Fig. 50).

This is not possible in courtrooms: you are in the same room. But in virtual reality, it becomes possible. Above is an example of a virtual reality illustration. On the left, a woman is sitting on the beach, while the man on the right prefers to sit in a café. This could perhaps bring them some comfort and allow them to discuss their conflicts and find solutions in different ways.

The same applies to the representation of people. Here, we assume that avatars are realistic, but many people do not want to appear as they really are. You have the option of choosing your appearance, that of the other party, or that of the judge in this courtroom. Again, this is something that can fundamentally change the courtroom experience for the various participants.

That would be very interesting, and in my opinion, it will certainly happen. But it also raises the question addressed by Lisa, namely how the environment influences the administration of justice. Today, the courtroom conveys a very clear image. We expect to find certain elements in a courtroom that put us in a certain frame of mind and allow us to interact in a certain way. The virtual courtroom would change all that. Sometimes for the better, perhaps, but as I will come back to later, we must not rush into it.

These *detached spaces* are still mostly tied to reality. We assume that the elements present in virtual reality are elements that exist in real life. Even though participants may occupy different spaces, these are still elements that we actually see happening in real life.



Fig. 51. Illustration of a personalized avatar supporting the parties in the court room. Created using generative AI.



You can have a special avatar that helps and guides you through the process, tells you what to do, and supports you, which can be useful in many cases.

Hannes WESTERMANN

We can also go in this direction in virtual reality or transcend it and create *enhanced judicial spaces*. Technologies such as artificial intelligence can be used to enhance the user experience in ways that are not yet possible today. For example, below you can see an idea for an integrated procedure: you can have a special avatar that helps and guides you through the process, tells you what to do, and supports you, which can be useful in many cases (Fig. 51).

Since this is virtual reality, the other parties do not need to see this personalized avatar. We can separate these different realities between the different parties and modify the space in a way that is simply not physically possible.

Live translation as well. If you talk to someone, you will hear them physically, and you will get a response in their language. With the advent of artificial intelligence, we may have systems that translate what people say in real time into a language we understand. Again, this could go beyond today's courtrooms and perhaps help people in their interactions, creating a more comfortable and understandable environment for them and preventing them from feeling uneasy, as is sometimes the case today.

And the third idea is that of *deconstructed judicial spaces*. The previous ideas were still based in some way on the current appearance of courts, which were created due to constraints and numerous rituals that have evolved over the course of history. However, courts are still based on the idea that we occupy a physical space and that this space also functions as a physical space. For example, you must sit facing the judge, so that you can stand up and present documents in certain cases, and there are many considerations that arise from the physical aspect of the world.

So, in an image, you can see a space like The Matrix, where the people navigating created this space to guide the planes. As you can see, it is still a physical space, so you have a seat, but everything else is different. It is a virtual space that aims to replicate the features used to guide aircraft, but in an ideal way, as we do not need to worry about things such as rooms and physical appearance.

It is interesting to consider the functions performed in a courtroom. What would happen if we reduced them to the various tasks performed in court, then took them and reassembled them in a new way? In all honesty, I do not know what that would look like. However, I think that by thinking outside the box, by no longer thinking about the physical constraint of simply having a room, we could go even further and

 It is interesting to consider the functions performed in a courtroom. What would happen if we reduced them to the various tasks performed in court, then took them and reassembled them in a new way?

Hannes WESTERMANN

build this space in a way that would allow people to do things more efficiently.

Of course, this requires understanding what we are currently doing, why we are doing it, what we want to keep, which could be a lot of things. But it is something that could be done right now, applying it separately, as we already do to some extent with online resolution. We take the idea of being in this space and translate it into a virtual environment, interacting there, submitting documents, etc. I am very intrigued to see what that might look like in a virtual reality environment.

Those are the three main ideas I wanted to talk about.

In conclusion, just like artificial intelligence, which is my main research topic, virtual reality offers many interesting possibilities in terms of justice and judicial experience. This technology already exists in many cases and is maturing

to offer a more realistic framework for what we experience in our physical reality. Remote participation could be a considerable advantage, as it would mean that parties would no longer have to travel to court and could participate from their own physical space.

But these other aspects, namely the controllable and improvable environment in which it is possible to integrate elements that we cannot integrate into the physical world, would, I think, add a very interesting dimension to these reflections.

Finally, as is the case with many technologies, I believe that working in virtual reality, in this space, also means reflecting on the purpose of judicial systems. What are the essential functions we want to establish, and how are these currently being implemented in courtrooms? What do we want to keep and what do we want to change? If we think only about these aspects, how can we put them together without the constraints mentioned throughout this day, and what would be the result? I do not have the answers to these questions, but I hope they will spark discussion.

David TAIT: You have made some excellent suggestions and ideas. Listening to you, I could not help but draw a parallel with Lisa, who spoke about co-presence and the importance of being together and sharing a common experience. Hannes, you ultimately say that it can be an individualized experience. We do not all need to see the judge as some kind of fearsome ogre at the top of the hierarchy; we can see them as a loving, warm, and compassionate mother. People can choose how they experience the judicial process. It is provocative, but it is certainly possible. But that is the point of this workshop: to be provocative and to think about the possibilities we want to embrace and those we want to unite against and resist firmly.

Lisa FLOWER: I think we are saying the same thing. You do not have to be physically present all the time, but you must be able to get immersed and focus completely on each other, regardless of how the judge or anyone else looks, or where you are. That is very interesting.

Julia KORKMAN: I am very happy to be here today. I have not done a lot of research on virtual reality; the few studies I have been involved in

have mainly focused on eyewitness testimony. And indeed, virtual reality is a fantastic tool for studying these phenomena, which we have generally studied in the lab with very little ecological validity.

I have a background in legal psychology. I work part-time as a professor of practice at the law faculty of Åbo Akademi University in Finland, but I mainly work for HEUNI, the European Institute for Crime Prevention and Control, affiliated with the UN. I am also the current president of the European Association of Psychology and Law. We are seeing growing interest in the research we are discussing today, and I sincerely hope that this research will develop even further. I am very happy to represent this field at this conference.

My own career has also been largely focused on rather pragmatic aspects of criminal justice. I worked for many years in an expert unit investigating crimes against children and adolescents. I have conducted numerous investigative interviews and am regularly called to testify as an expert witness in court, and I train legal professionals, people who have been working in this field for a long time.

Lisa has already mentioned that we are collaborating with colleagues from Tilburg University on the E-ViVi project, which focuses on remote hearings and the use of video-recorded interviews, based in part on recommendations developed by the Council of Europe.

I will not go into detail here, as this requires even less technology than virtual reality. But I would just like to highlight a few minor points. Sweden and Finland are both geographically large countries, with large areas in the north that are sparsely populated, much like Australia. The need for remote hearings has existed for a very long time, and people are used to hearing parties remotely.

As part of the E-ViVi project, we collect data in various ways, both from questionnaires and individual interviews, but also from observations in courtrooms. And I think that, fairly consistently, we see that in Finland and Sweden, the further north you go, the less problematic it is to get people to participate remotely. It is quite clear that these people are familiar with this technology, which works well. Many judges have pointed out, for example, that they do not feel any need to have the person physically in front of them to assess their credibility, as was

mentioned in one of the previous sessions. Whereas in the south, even if it is a bit black and white, there really seems to be a difference, it is perceived as more difficult.

I would like to add one last thing about remote consultations and interviews. When the pandemic hit, psychotherapy had to move online, and many experienced psychotherapists feared that this would have a negative impact on how they established a relationship of trust with their clients. To everyone's surprise, it is entirely possible to establish a very good rela-



The question is no longer whether, but how. What needs to be put in place? How do you create that feeling of being together, of being present, if you are doing it remotely? And it is entirely possible, just as it is possible to communicate very poorly in the same room.

Julia KORKMAN

tionship and conduct effective psychotherapy online, provided you do it right.

The question is no longer whether, but how. What needs to be put in place? As Lisa said, how do you create that feeling of being together, of being present, if you are doing it remotely? And it is entirely possible, just as it is possible to communicate very poorly in the same room. I think it is important to look at it from that perspective.

And indeed, this E-ViVi project is particularly interested in communication in courtrooms. Another thing that emerged from this project is that some professionals were concerned that the parties would feel excluded from the process if they were heard remotely. This is of course very important, and something that virtual reality may be able to help avoid. Others, on the other hand, said that the parties felt respected and that their needs were being considered when they were allowed to participate remotely if they asked to do so. In certain circumstances, it may indeed be more convenient to be heard remotely, and this is something to take into account.

Another project I am working on with many colleagues is based on the use of large language models (LLMs) in criminal investigations. I will not go into detail on this topic, but I will simply say that I am also interested in the question of how we can combine virtual reality and large scale language models, as mentioned by Hannes. As part of this project, we have helped investigators conduct investigative interviews using large language models, which can aid in suggesting good-quality questions for investigators to ask.

These language models cannot yet conduct the interrogations themselves, as they risk getting sidetracked, starting to hallucinate, and committing all sorts of absurdities. We still need experts to supervise the process, but they can be a valuable aid. They can also process large amounts of information and extract, for example, relevant alternative hypotheses about a suspected crime, which can be very useful.

One of my hopes for technology, and perhaps more specifically when looking at what has been done in the field of virtual reality, is to think about how we can combat bias in courtrooms, which is somewhat related to fundamental legal psychology and improving decision making.

We know that human beings have biases. These are sometimes confused with intuition. For example, in how we evaluate victims or suspects, how to detect lies, or who is likely to be guilty... We all use heuristics, of which some are silly, such as the fact that people who look nice are considered more credible. There is an amusing study called "Attractive people tell the truth — can you believe it?", the title of which pretty well condenses the content. The perception of deception can be biased by appearance.

Learning about the first trial based entirely on avatars in Colombia, I thought to myself that this may be a way to mitigate risks, to have the people responsible for evaluating evidence look at avatars. I think that most of our current judicial systems might not allow this, but it is an interesting idea.

Another conclusion concerns racial bias, a topic that everyone here is probably familiar with. Racial bias exists in the criminal justice system. For example, research has shown that black defendants in the United States are more likely to be convicted than their white counterparts. This is also reflected in statistics

on incarceration rates and sentence lengths. This is a very serious problem when it comes to justice.

One of the studies I found very interesting in this regard is one that looked at people embodying avatars that were either black or white. It had an effect. Participants were more likely to find the defendant not guilty and more confident in that verdict if they embodied a black avatar, and they were less likely to consider ambiguous evidence as indicative of guilt.

I find this study interesting because it does not assume that we would only see avatars in court. The people who participated in this experiment were in a virtual reality environment, they embodied a black avatar, did certain things, and *then* were asked to evaluate a case without being told that it was related to this experiment with the avatar. And indeed, this had a mitigating effect on racial bias.

Another interesting conclusion is that participants who embodied a white avatar were also more cautious in their evaluation of the evidence. Other studies indicate this may result from a change in perspective, from putting oneself in someone else's shoes. I think this is very interesting in terms of mitigating prejudice and deserves further investigation.

Another very clear bias — I work a lot on credibility assessments — is that we know that when a woman cries, she is much more likely to be judged credible if she is a victim of rape or domestic violence than if she is calmer. This is problematic from a scientific point of view, because these are not indicators that you should take into account. But we have what is called the emotional witness effect, now established in research at a meta-analysis level.

We also know that people may overestimate their ability to judge whether others are lying. Experts in lie detection tend to say that there is no such thing as a Pinocchio nose, implying there are no reliable visible clues of whether a person is lying or telling the truth. Very often, the signs of lying are more likely to indicate nervousness, and they are not very good at distinguishing liars from people who are telling the truth.

Therefore, I have thought a lot about aspects of training for judges and other court professionals. I think virtual reality and avatars could be very instructive in combating this type of bias.

We have already discussed today the presentation of evidence through virtual reality. Some studies claim that this has many advantages, including better understanding and clearer memory of the evidence presented. But here again, we run the risk of bias. These virtual reality scenes are created by someone who may also be biased.

Furthermore, these scenes tend to be constructed from fragmentary information, and when assembled, they form a kind of story in which gaps can be filled in. This is also how human memory works, so it is not surprising, but it can indeed lead to gaps being filled in a way that may not be optimal.



Furthermore, these scenes tend to be constructed from fragmentary information, and when assembled, they form a kind of story in which gaps can be filled in. This is also how human memory works.

Julia KORKMAN

In addition, memory researchers are concerned that virtual control of sources may lead to confusion. This is because people tend to forget where they learned something. They may therefore think that a hypothetical virtual reality scene corresponds to the truth. As someone has already pointed out, decision-makers may find it difficult to understand that they are not looking at the crime scene, but at a reconstruction of it, when they examine it. It is therefore crucial to collaborate with these specialized researchers and communities, as well as with psychology researchers, when we consider these issues.

I often work on human trafficking cases, and in these cases, vulnerability — showing that a person was in a vulnerable situation — is crucial. These are examples where the use of virtual reality in the presentation of evidence could prove very interesting. For example, in cases of forced labor in very difficult conditions, simply showing photos does not convey what it is like to be in a very confined space or what it is like to stay there for even a few minutes. I therefore

think that this could be a very interesting area for the use of virtual or augmented reality.

My own opinion, after today, is that possibilities for using virtual reality in training for legal professionals are highly promising. Virtual reality offers fantastic possibilities. What is more, we know from research that emotions can have a considerable impact on our decision-making. Studies have shown, for example, that police officers who have been induced to feel anger, for example, make poorer decisions. We do not make good decisions when we are angry. Conversely, when we are sad, we are much more analytical. Perhaps, thanks to virtual reality, we could induce these different emotional states, help people identify them better, and lead them to make wiser choices when they are in the grip of these emotions. That would be another remarkable aspect.

Recognizing biases and obtaining feedback could be used efficiently in virtual reality legal training, where LLMs would also be used to provide this feedback. In mediation, some people have already had to write down what they wanted to say to the person they are angry with. LLMs can intervene to suggest that they rephrase this message, which was too aggressive. This is something that LLMs are already capable of doing well.

One last thing: evaluating verbal evidence to encourage decision-makers to focus on verbal content rather than behavior, beauty, race, or other such factors. It is important to examine the direction being taken in the evaluation of evidence.

David TAIT: Listening to you, it struck me that much of what we discussed during this workshop concerned visual appearance and the biases associated with what we see. But there are also biases associated with voices and accents, for example. When I listen to the radio, I tend to believe in certain people more because I like the way they speak. This is completely inappropriate; I should be listening to what they say, not how they say it. Nevertheless, I do it unconsciously. I wonder if, with all these wonderful avatars at your disposal, if you still had a working-class accent, perhaps it would still work against you and send you to prison despite you being the most beautiful person in the room.

Lisa FLOWER: It seems that the theme that all three of us brought up was the fear that we are moving forward and developing these new systems and these new virtual reality trials, still based on assumptions and intuitions that you can tell if someone is lying or that you need to be able to look someone in the eye. I know of a brand-new courtroom that was designed with that in mind. The architect told me that "the judge must be able to see if the defendant is lying.". The design of courthouses was based on misinformation, and I think that is the main lesson I learned from this.

However, we are aware that there is something important about space, and we continue to talk about it. We can develop technologies that can be used anywhere, and I think that has many advantages. But from the perspective of victims or witnesses, being able to have this technology and use it from home is not always a good thing. It is good because they no longer have to go to court and face the perpetrator of the crime or offense. Nevertheless, on the other hand, the safe space that was their kitchen, for example, then becomes the place where they relive these experiences. It could be the scene of the crime. And so, the scene that was previously a safe space then becomes the place where they participate in a trial. I think we can deconstruct judicial spaces and rebuild them but also realize that we do not need to merge everything.

Hannes WESTERMANN: I really like it when you talk about the rituals of the judicial system. I think one of the very interesting aspects of virtual reality and other technologies is that they allow us to examine them and reflect on their purpose, their objective, and their effect.

When you go to court, one of the things that strikes you when you enter the courtroom is how symbolic it is, right? You sit in your seat, and there is someone sitting above you, who is dressed very formally. I would say that this is part of the symbolic value of the court. It serves a purpose, because going to court is a serious matter. People want to feel that they are being listened to, and they want to feel that something is happening. That could be one aspect.

On the other hand, it imposes these kinds of very serious feelings. People feel out of place, uncomfortable, they feel like they are not part of the system, and that it may not be working

in their favor, but against them. In a way, they sometimes feel excluded.

What you are talking about here, rituals, the symbolic value of spaces, and even the fact of having to go there, all of that also has symbolic value. Doing something remotely, even if it is different, does not impose this constraint of having to physically go somewhere. But also, realizing that the other person had to do it, knowing that they were also affected, that they had to leave their own space to come here to do this, that too could be part of the value of this experience.

This really made me think about the effects of virtual or augmented reality on the justice system, what is happening, perhaps accidentally, perhaps intentionally, and what we want to keep and what we should not keep.

Lisa FLOWER: That is absolutely right, we have a unique opportunity here to examine these fundamental values and principles, and what we want to preserve.



We can develop technologies that can be used anywhere, and I think that has many advantages. [...] We can deconstruct judicial spaces and rebuild them but also realize that we do not need to merge everything.

Lisa FLOWER

Julia KORKMAN: We have the chance to test which judicial rituals are good and which are bad, and which we should get rid of. There seems to be this traditional misunderstanding that people expect certain things when they go to court. But, in reality, most people who go to court do so for the first time in their lives. It is not at all necessary for them to know what to expect. Judges and professionals already have this knowledge.

But by being present, some things may be easier to communicate than in remote contexts. In our project, a prosecutor works extensively with young defendants. Her comment was that she always wants young defendants to

be present in the courtroom, because it shows that there is a group of adults present who take the case seriously and she considers it may increase also the extent to which the defendant then perceives the case as important. I find this an interesting question. We do not know if this is a group conclusion, for all prosecutors, but I think it would be very important to conduct research on this topic.

Hannes WESTERMANN: The judicial process is very important, as is everything surrounding it, which may or may not be desirable — I do not know. One aspect I really appreciated from the other presentations was using VR as a method to encourage empathy, as it can be used to physically experience someone else's reality. In virtual reality, you can do that in a way that was not possible before, which I believe could be very powerful, in the judicial system and beyond.

I am very intrigued by this area of research. I wonder if it is something we can use as a tool to help people understand how other people

live, which may be very different from their own experience, give them a better understanding, and help them make better decisions in this regard.

Julia KORKMAN: Once again, I think this is something that could be addressed in the training of legal professionals. How does it feel to view a frightening situation in virtual reality, then be heard in court and put in the place of the witness or victim? Friends of mine who are judges have been in court for personal reasons. They found it very stressful and were nervous throughout the trial, even though they should have been very comfortable with it. It is indeed interesting.

I would also like to say that with remote hearings, some judges felt that this created a certain amount of confusion, while others felt that this was not the case and that, if properly administered, it improved the way people saw and understood each other. And I think the same applies to virtual reality. It is simply a matter of learning and acquiring new skills.

Q&A Exchange



Question: *I just wanted to share some information that corroborates what you have all said. About a year after the pandemic began, an American organization, the U.S. Administrative Conference, asked us to evaluate how twelve major federal agencies were conducting their remote hearings. There is a lot to say about this, but we will come back to it another time. However, we do have one piece of information: one agency reported something completely different from what we expected. Our Department of Labor is responsible for administering a claims process for minors, particularly those with a disease called black lung disease. For various reasons, which are not fully explained, this agency conducted remote hearings by telephone. All the others used video. And they reported high satisfaction on the part of the miners, which they attributed to concerns about the formality of the courts.*

I would like to comment on why everyone has these expectations, given our culture and entertainment, but in any case, they indicated that this worked better. It is therefore clear that if we care about the satisfaction of individual participants, it is possible to move away from the traditional model.

Julia KORKMAN: This corresponds quite well with what I have observed. For example, we conducted a study on children or adolescents who were victims of sexual abuse in many different countries, with the help of international organizations and their employees. So, it was a complex issue. Some of them noted that many victims spontaneously stated that they preferred, for example, to record their own statement on video and then send it in. I do not remember if the issue of telephone conversations was discussed. During the pandemic, we observed that some of these

young people who had been sexually abused found it easier to talk about their sexual experiences remotely, rather than being in the same room. I think it gives them a certain independence. One last thing: the police officers conducting the interrogations often said that it was anxiety inducing for these victims – nervous teenagers – to be sitting in the interrogation room alone with the police officer, staring at each other and being expected to open up about what are often difficult experiences. Admittedly, these rooms are more pleasant nowadays and adapted to children. But the fact remains that it is a strange situation. Many of them said that it would have been beneficial to be able to go for a walk and talk about what they had been through. This is something that could, once again, be considered in the context of these technologies.

Question: *In many countries, we have dedicated places for questioning minors, for example, and we have standards in this regard. What do you think about this aspect of national procedure, which must be respected in different ways, particularly regarding children?*

How can we make better use of virtual reality equipment and all these types of tools to ensure that this type of psychological barrier is more effective, rather than appearing in court at a certain place at a certain time, and to make these interviews more effective? Do you have any comments or examples on this subject?

Julia KORKMAN: I would raise a concern here, although I do not know if there has been any research on this topic. Virtual reality gives people, especially children, the impression that it is a game. Twenty years ago, experiments were conducted in which children were interviewed using dolls. The idea was that this would make it easier for them to express themselves. However, the children began to do very strange things with the dolls, as they are closely associated with imagination. I would therefore be very concerned about using virtual reality with children, especially young children, but remote hearing is of course an entirely different matter. I would probably avoid avatars with children, at least, but that is just a hypothesis. It has not been tested empirically; it is just a guess. Nevertheless, some researchers have looked at remote hearing for children compared to onsite hearing. The research conducted so far has been quite positive. Children could be given a choice.



From left to right: Hannes WESTERMANN, David TAIT, Julia KORKMAN and Lisa FLOWER.

You could say to them, “There is a room where you can come with me and we can talk, or if you prefer, you can go to this room and be alone, and I will hear you from here.”. This can certainly be arranged. However, the risk always associated with remote hearings, which we have seen in the E-ViVi project, is that the child could be heard anywhere, at home for example. I am not sure that is desirable. You need to make sure the place is safe, that you are not bringing the trauma home, and that no one can affect the child during their testimony. This is the case in Sweden, for example, where there are two different systems for remote hearings. There is a link that anyone can use on their phone. We heard people in the subway, a mother whispering to them what to say while driving her car... Others, on the other hand, are heard in other courts, official courtrooms, and dedicated venues, which is certainly a more controlled way. I think that if these elements are in place, the modalities of the hearing, the research is very promising. However, we still have a long way to go before we can say that this is exactly how we recommend proceeding. We still need to continue research in this area.

Hannes WESTERMANN: Following on from that, you mentioned user satisfaction and efficiency. This is something that comes up often in my research on artificial intelligence. How you design many of these tools also depends on what you consider to be the underlying objective of the legal system. There can be many objectives, which sometimes overlap, but which can also be contradictory.

I am talking here about equality, efficiency, satisfaction, compliance with laws, settlements, etc. These are all different values that can sometimes overlap and sometimes contradict each other, and which undoubtedly have a major influence on how the legal system should be transposed into the virtual reality system. That is why I believe this technology gives us an opportunity to reflect on these fundamental issues and use them to shape the future of technology..

Question: *My first question was about remote hearings for vulnerable victims, such as rape victims. Then you mentioned that the perpetrator can fight against the biases that judges may have based on appearance. What about biases based on information about the victim or suspect, such as names? Does the name not come first or second in terms of bias issues?*

Julia KORKMAN: That is an excellent question, and it would be very interesting to conduct research such as which I presented, which is not my own. I simply read it with great interest. Nevertheless, having people take on the role, name, or physical appearance of someone else would allow them to take a step back. As Hannes said about empathy, this is an aspect of virtual reality that would be fascinating to study. Another possibility, which would probably be impossible in current jurisdictions in many places, would be to call people A and B, and not mention their names. In my country, people looking for a job or housing who have a name that sounds foreign, especially if they are male, are less likely to get it, according to research. A simple solution would be to remove this element. If that is impossible, then this type of intervention could be an alternative. How remote hearings have been experienced by vulnerable victims has been studied extensively. For decades, very interesting research has been conducted on this subject in Australia. Remote hearings can really be beneficial for victims, provided that victim support services are involved.

Lisa FLOWER: But we also need to be very precise and nuanced in what we mean by vulnerability. We do not gather all people with any kind of vulnerability together. We are more precise in our research.

Julia KORKMAN: And, of course, we must not make assumptions. Some rape victims, for

example, feel it is important to be present in court and face their attacker. But now that we have the opportunity to give people a choice, perhaps we should take advantage of it.

David TAIT: My understanding is that in Sweden, in sexual assault cases, the accused is sometimes allowed to leave the courtroom before the complainant witness enters. This has been proposed in Australia and could be one way of dealing with this issue.

Thank you all very much for coming. I hope you found this useful. We have examined various issues and how equality may have to juggle with other aspects, such as participant satisfaction and comfort, to maintain its primacy. We have attempted to deconstruct the hearing through the myth of virtual reality. We do not provide definitive answers to these questions. For now, we must content ourselves with exploring some of the constraints associated with these challenges and suggesting ways in which research and policy can help ensure that the future is truly one that promotes the best interests of the most vulnerable, but also justice.

Workshop 4

Augmented Reality and Restorative Justice: Visualising Consequences to Promote Empathy and Encourage Rehabilitation

Chair: Michel DACCACHE

Deputy Head of the Statistics, Studies, and Research Department at the General Secretariat of the Ministry of Justice (France)

Adélaïde VERVAEKE

Clinical psychologist, Doctor of Clinical Psychology, University of Rennes 2 (France)

Canelle BARINOIL

Clinical psychologist, IGE, University of Rennes 2 (France)

Nicola MALLOWAN

Associate Professor of Forensic Psychology at Buckinghamshire New University (United Kingdom)

Mavi V. SÁNCHEZ-VIVES

Professor of Neuroscience, ICREA Chair at the University of Barcelona (Spain)

Michel DACCACHE: I am Deputy Head of the Statistics, Studies and Research Department at the General Secretariat of the French Ministry of Justice. I am very honored and pleased to be moderating this workshop, particularly because I helped to bring about one of the virtual reality projects that will be discussed.

Throughout the day, we have discussed victims, evidence, and hearings. Now we are going to discuss the role of new technologies in rehabilitation, particularly using virtual reality in the treatment of perpetrators of domestic violence

or gender-based violence, as well as other use cases.

The title of the workshop we are holding this afternoon contains several words, each of which deserves a precise definition, given that we are entering a field where everything is complex. Obviously, I am not going to define each of these terms, but I will highlight a few issues and questions.

The title refers, first, to augmented reality. As mentioned earlier, virtual reality is part of a continuum of devices, in which there are different technologies that have a distinct impact, particularly on agency in virtual space. This is one of the issues that will be addressed by our various participants.

It then refers to restorative justice, another complex term. But one thing is certain: supporting defendants and convicted people in understanding the cause, context, and effects of their actions is an integral part of restorative justice.

Finally, it addresses empathy, which is always a source of complexity. Empathy refers both to emotional skills, the ability to experience what another person is feeling, but also to cognitive skills and the ability to understand what is going on in another person's mind. This may even go beyond the realm of social representation or even the ideology of discourse. Some of our speakers will explain this.

There are other layers of complexity as well. Our various speakers will discuss measures that are part of very different contexts and judicial systems. They are implemented in open, community settings and in closed prison



Michel DACCACHE



Adélaïde VERVAEKE



Cannelle BARINOIL



Nicola MALLOWAN



Mavi V. SÁNCHEZ-VIVES

environments, with different care arrangements and distinct offender profiles.

Finally, the research teams participating in this roundtable bring together different disciplines, which offer varied and sometimes divergent perspectives on the same subject: neuroscience, social psychology, clinical psychology, legal psychology, sociology, etc. These different points of view will enable us to better understand the hopes and reservations surrounding the use of virtual reality in rehabilitation programs.

We will first hear from Mavi Sanchez-Vives, who is a professor of neuroscience at the University of Barcelona. I wanted her to speak first for historical reasons. Spain is ahead of France when it comes to virtual reality, and the French project we will be discussing was largely inspired by the Spanish experience. Next, Adélaïde Vervaeke and Cannelle Barinoil, clinical psychologists at the University of Rennes 2, will talk about an experiment using virtual reality for perpetrators of domestic violence. Finally, we will hear from Nicola Mallowan, a lecturer and researcher in forensic psychology at Buckinghamshire University in the United Kingdom, who may temper our technological optimism with a more cautious view of the uses of virtual reality under certain conditions.

Mavi, you are a specialist in brain activity and the cerebral mechanisms of representation. You have studied the use of virtual reality in the rehabilitation of perpetrators of domestic violence. I should point out that this experiment has received international recognition, notably winning an award from the European Association of Penitentiary Administrations. You will present the various devices you have worked on and share your assessment of these devices from the perspective of neuroscience and your own experiences.

Mavi V. SANCHEZ-VIVES: Thank you very much. I am delighted to be here to talk to you about immersive virtual reality in the context of rehabilitation for perpetrators of domestic violence or spousal abuse. To do so, I would like to raise four points.

The first point concerns embodiment in virtual reality. You have probably heard about this in previous workshops, and in my opinion, it is an important starting point. Virtual reality has an impact on your brain. External elements replace internal sensations, giving you visual, auditory, and tactile sensations, as well as sensations related to temperature. This information sent to your brain ultimately makes you believe, even though it is virtual reality, that the simulation is true, that it is real.



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Mavi V. SÁNCHEZ-VIVES

Participants react physically. This is an important point because we want to use virtual reality to drive behavioral change. It is therefore necessary for this to lead to realistic responses. A certain degree of realism is required.

Another important aspect of this incarnation, with virtual reality, is that you feel like you

VR replaces inputs or afferences from the external world and of our own body

- Visual inputs
- Auditory inputs
- Tactile inputs
- Temperature.....

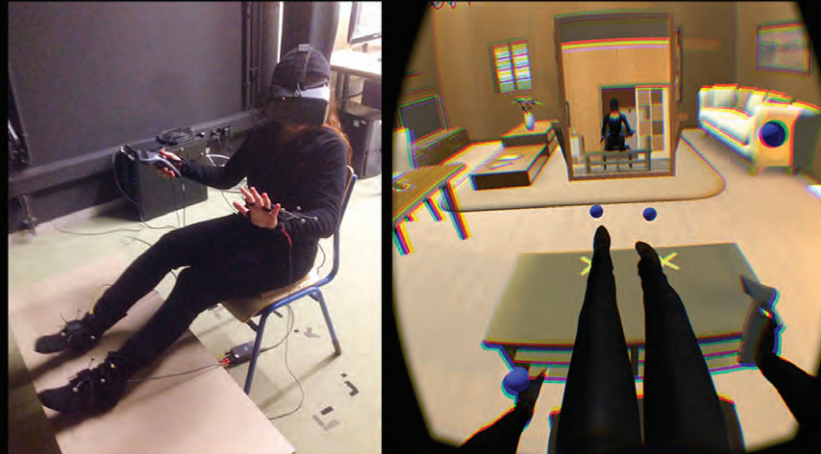


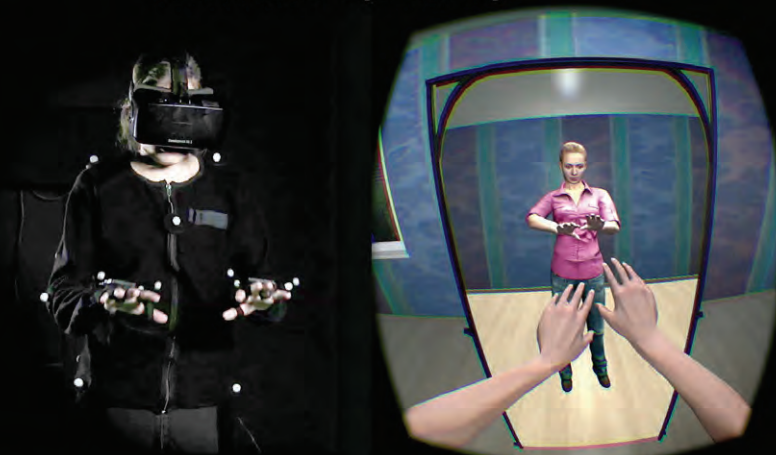
Fig. 52. Virtual reality (VR) replaces sensory input (or afferents) from the outside world and from our own bodies.

are seeing your own body from a first-person perspective, which sends a strong signal to the brain (Fig. 52). When you look down, you see your hands and your body making movements. Normally, the brain can never perceive a body in the first person, unless it is your own, and with virtual reality there is a cognitive change. You can have information related to touch and visuals that send very strong signals that make you believe that it is indeed your own body that you are seeing.

You can use a mirror to reinforce this. Even if you do not have blonde hair, even if you are not white (Fig. 53), what you see with virtual reality has an impact on your understanding and perception. It also shows that the brain is very plastic, that it can adapt. Body representation changes. We can change age, size, gender, and how these elements are perceived. So, the key takeaway is the plasticity of the brain.

Another important point is that the body we embody in virtual reality has an impact on how

EMBODIMENT: Body Ownership via 1PP + Visuomotor Synchrony



Slater, M., Spanlang, B., Sanchez-Vives, M. V., & Blanke, O. (2010). First person experience of body transfer in virtual reality. *PloS one*, 5(5), e10564.

Fig. 53. Embodiment: a sense of ownership of the body through a first-person perspective (1PP) and visuomotor synchronization.

we react to the elements we receive and how we interact. We can also change the impact on pain. For example, in an experiment published by the National Academy of Sciences in the United States, participants can be given the impression that they have a small body. This changes the perception of size. When we were small, we perceived spaces differently. We felt like we were in vast spaces, so with virtual reality we can play on this and change the perception of reality. This is therefore a cognitive impact that can be measured.

The same applies when playing with racial identity. When you change the embodiment in terms of racial identity, you can change your perception, which ultimately reduces racist bias. We can see things from someone else's point of view, which is really fantastic. This change in perspective has a clear impact on how we assess situations, which can change how we react in a specific situation.

For instance, this morning we heard about an experiment involving a police officer in the United States who behaved in a racist manner toward a black suspect. Police officers can be trained to change their perspective. This has been proven to reduce racist bias and drive behavioral change.

Having a body in virtual reality comes with many important elements. It can change our perceptions and experiences in real life, which means we can use virtual reality to good effect. In real life, we learn from the experiences we have. With virtual reality, we can increase the number of experiences we have and change in response to stimuli.

We knew that this tool was very powerful. That is why, a few years ago, in 2010, we began to ask ourselves how we could use this tool, which has an impact on empathy and emotion recognition.

We thought this could be useful in the rehabilitation of individuals convicted of domestic violence. Imagine if perpetrators of domestic violence could change their perspective and put themselves in their victims' shoes through virtual reality — it would change their behavior.

We therefore created virtual environments in which men saw themselves as women. They participated in this virtual reality experiment in which they embodied a woman. It should be noted that no one disliked this. They all accepted this experiment and participated in it.



We thought this could be useful in the rehabilitation of individuals convicted of domestic violence. Imagine if perpetrators of domestic violence could change their perspective and put themselves in their victims' shoes through virtual reality — it would change their behavior.

Mavi V. SÁNCHEZ-VIVES

And so, in this scene, a woman becomes the target of verbal abuse (Fig. 54).

It involves a man talking to a woman, asking her to look at him, for example. There is direct interaction between a man and a woman, followed by aggressive behavior. This is not physical aggression. The man becomes violent towards the phone next to him and behaves very intrusively towards the person he is talking to, but it is mainly verbal aggression.

We worked on this experiment for many years, with this scene, on the subjective and physiological elements, the brain responses, etc. What I can say briefly is that, in the control group, the men were able to really put themselves in a woman's shoes, see their bodies as those of women, and feel that this scene was very real. And in this situation, where they see themselves in a woman's shoes, their emotions are heightened. We were therefore able to deduce that this could have an impact on perpetrators of domestic violence, and we worked on this as part of non-violence training with men.



Fig. 54. A woman is the target of verbal abuse by a man.

Initially, we wanted to conduct implicit association tests, but this was not implemented because it was too complicated. You need to be able to use a computer very quickly. We ended up working on emotional recognition with experts in the field, and we found that it changed. This is very interesting because, in general, people who display violent behavior have difficulty recognizing the emotions of those they are interacting with. This is something we observed, which is consistent with all studies. But after this experiment, we observed a change in emotional recognition, which is essential because it directly impacts empathy.

We therefore observed improved emotion recognition and even took things further with experts. We conducted research on participants' brains, which confirmed that emotion recognition had indeed changed. This was directly visible in the participants' brain images. The entire virtual reality experience has an impact on empathy, and this can be measured scientifically.

Another very interesting experiment can be conducted from a child's perspective (Fig. 55).



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Mavi V. SÁNCHEZ-VIVES

This experiment really reinforced the participants' recognition of emotions, empathy, and behavior. You can find our published work on this topic of changing perspectives.

In terms of time frame, we first conducted these studies on men in a control group. We then carried out work on reintegration and studies with the reintegration service outside prisons. Finally, we conducted experiments in prisons, which were trying to deploy a program working on precisely this issue at the time.



Fig. 55. Different viewpoints of the same virtual reality scenes.

Everything I have told you involves numerous projects that were carried out in collaboration with prisons in Catalonia, the Ministry of Justice, and the Ministry of the Interior of Spain. The program was implemented in prisons by a multidisciplinary team, including psychologists, educators, and various groups of perpetrators of domestic violence.

One final remark about these projects: we want to bring this change in empathy, that is one thing, but we also want to reform people. Virtual reality allows us to reform people, to teach them to respond in a way that is not marked by violence. We can observe a change in response to the stimulus we give to participants. Virtual reality can also be used to measure the effectiveness of these programs. Has this rehabilitation been successful? It allows us to measure that.

One last conclusion about the Metaverse, the shared virtual environments that are widely used today. It has been noted that a problem of sexism has quickly arisen in Metaverse, with harassment, abuse and attacks against women. I would like to conclude by presenting a European project called Meta-too and its website: <https://meta-too.eu/>. The aim of this project is to investigate inappropriate gender-based social interactions in Metaverse and identify ways to change this and avoid such inappropriate behavior.

Finally, conferences. We have many options for using virtual reality and its applications. We discussed this in our group and drew up a list of possible uses: professional training, psychotherapy, rehabilitation, prison systems, etc. We worked on these points with various partners and at different events.

Finally, you can also train large groups in this type of environment. We can do more, and on a larger scale. I would like to thank all my colleagues and thank you for your attention.

Michel DACCACHE: This Spanish experience has clearly inspired the French experience, with a few notable modifications in terms of technology, target audiences, and support measures. I would now like to hand over to Adélaïde Vervaeke and Canelle Barinoil, members of the team involved in evaluating the virtual reality project led by the French prison administration.

Adélaïde VERVAEKE: Yes, we are talking about the REVIE experiment, sometimes

referred to internally as REALVIF, conducted by the prison administration. It is indeed the same research project, and both terms may be used. For context, it originated in 2019 from a collaboration between the prison administration laboratory and the company Reverso, with the aim of creating a virtual reality film for perpetrators of domestic violence. As a result, in 2021, an experiment was launched at four volunteer sites in France.

These four sites are SPIPs (*Services Pénitentiaires d'Insertion et de Probation*), or penitentiaries for integration and probation. These are institutions that take care of people under judicial supervision. Following this experiment, in 2021 and 2022, an initial pilot study was conducted to evaluate the protocol for using this virtual reality tool and its impact on the target audiences.

At the end of this initial experiment and pilot study, the results revealed interesting findings. However, the number of participants was not large enough to generalize these results. This led to the launch of the REVIE 2 evaluative research project in 2023. It will end in 2026, so we are still in the experimental stage for now.

To continue this brief overview, the results of the first experiment were indeed encouraging. There was good participation in the tool, with fairly positive feedback on the expected objectives, both from the beneficiaries and from the professionals who also had to invest in its implementation.

However, the pilot study also revealed some limitations, most notably the lack of standardized protocols. There was also some bias in the data collection process. Finally, the sample size was too small to allow for conclusive findings to be reached, which meant that the study had limited scientific value.

The study was therefore repeated with a much larger sample. It is no longer limited to four sites but is now nationwide. There are ten sites, i.e. ten SPIPs, participating in, which inevitably gives us a much larger pool of potential study participants. We retained the same objectives for this second experiment but expanded the target population.

Canelle BARINOIL: Indeed, the objectives — clearly inspired by the research projects of Ms. Sanchez-Vives and her team — were identical between the first and second experiments.



The first of these objectives is to evaluate the impact of the virtual reality protocol on the various dynamic risk factors for domestic violence. In other words, to explore whether virtual reality has an impact on convicted perpetrators and their behaviors.

Canelle BARINOIL

The first of these objectives is to evaluate the impact of the virtual reality protocol on the various dynamic risk factors for domestic violence. In other words, to explore whether virtual reality has an impact on convicted perpetrators and their behaviors.

This first objective was evaluated at several stages of research. First, a very short-term effect was observed after viewing the film, then a medium-term effect a few months after viewing, and finally a longer-term effect between six and twelve months after viewing. This approach was used to observe the potentially evolving impacts of exposure to the virtual reality protocol.

The second objective is to evaluate adherence to the virtual reality program on the part of both the perpetrators, i.e., individuals under judicial supervision, and the professionals who supervise them. It also involves exploring the potential implementation of this type of program in other prison settings.

Regarding the methodology of this new experiment, REVIE 2, several points have been improved — at least, we hope so. It involves a near-experimental research protocol. We have a control group, a group of people under judicial supervision for domestic violence, but who are not exposed to virtual reality protocols. For comparison purposes, we also have an experimental group, still the same population, but which is exposed to the virtual reality tool, which allows us to compare the two populations.

The experiment is rather long-term, with data collected at several points in time. And this data is mixed. On the one hand, this is qualitative data, with several individual interviews or semi

structured focus groups conducted with individuals under judicial supervision. On the other hand, there is also a great deal of quantitative data, with questionnaires administered to prisoners, offenders, and professionals to collect a significant amount of data.

Adélaïde VERVAEKE: In terms of participants, participation is necessarily voluntary, with informed consent on two levels. First, in terms of research, because they are participating in evaluative research, a consent form is hence required at that level, but also for participation in virtual reality.

In addition, it was also necessary to take the necessary measures to ensure that those who committed, or wished to commit, could do so, and that there were no medical contraindications. This seems quite logical, but when you are in detention, you can imagine the complexity that these constraints entail.

Participants were systematically anonymized. Each participant has a unique code, guaranteeing their anonymity. Only professionals working for the prison administration have a cross-reference table, allowing them to know which person has which code. We do not have access to this table on the research side.

The participants are all men. The research was not conducted among the female population. They are divided into four main groups: two experimental groups and two control groups.

There will be two options for treatment and methods. Either individual treatment, in which the person under judicial supervision will be received for an individual interview with the prison integration and probation counselor (*Conseiller Pénitentiaire d'Insertion et de Probation*) and will be exposed to the virtual reality tool on an individual basis. Or collective treatment, i.e., exposing individuals to virtual reality in groups, followed by several sessions of group discussion. This protocol applies to the experimental group, i.e., individuals exposed to virtual reality.

When they are not exposed, we will have the same two groups for the control groups. One group will complete the questionnaires and participate in the research individually but will not be exposed to virtual reality. Similarly, individuals will participate in group therapy for domestic violence issues without being exposed to virtual reality.

However, it was requested that individuals who did not participate in the virtual reality experiment meet the same criteria as those who did participate. It was necessary to ensure that the populations were comparable to guarantee that the results were reliable.

We will not be able to tell you much about these results as they are still being analyzed. But we can already tell you that we have much less data on the non-exposure to virtual reality group. There was a lot of enthusiasm for the experiment and the use of this tool. On the research side, we have significantly less data on the control group.

In concrete terms, what is this tool? It is a film, produced by the company Reverso, which is divided into eight scenes. The research team was not involved in this part of the project. The same film was used in the first and second experiments; there was no change in tools.



The film will therefore be divided into eight scenes, with three actors. These are not avatars in the REVIE virtual reality video, or REVIE 2. They are actors, performing scenes. They play three characters: the violent husband Max, the victim Andrea, and the couple's child and witness of the violence, Mathéo.

Adélaïde VERVAEKE

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The eight scenes will depict the cycle of violence in a quite schematic way. They are fairly graphic, and the violence escalates throughout. The story spans several years, as Andrea is pregnant in the first scene and Mathéo is around five years old in the last.

While watching, each participant will first play the role of someone outside the scene. They will observe a scene from the family's daily

life. Then, they embody Max in the next scene and in the last scenes, they will only play the role of victims. For three scenes, they will play Andrea and suffer verbal and physical abuse from Max. Finally, in the last three scenes, the person plays Mathéo and witnesses further violence. This is not the same violence that was portrayed when embodying Andrea.

Canelle BARINOIL: Concerning the timing of the experiment, always with a perspective on the first objective, which was to evaluate the impact of the virtual reality protocol on the dynamic factors of domestic violence, there were three main stages to the study. The first stage, T0, took place before exposure to virtual reality.

On the research side, we collected information sheets on individuals under judicial supervision, including information on the reasons for their convictions, as well as questionnaires at T0. The purpose of this stage was to establish a baseline level of information on the various dynamic factors presented below.

Then there is the experimental time, T1, which is the time when participants are exposed to the virtual reality films. A questionnaire is collected at T1, after viewing, to see how they position themselves in relation to these different factors. Finally, after three months, a questionnaire is completed at T2 to observe the evolution of these dynamic factors over time and see if there has been any change or evolution.

After that, there is an attempt to follow up over a period of twelve to twenty-four months. The focus here is more on reoffending within one or two years of the protocol.

Adélaïde VERVAEKE: The second objective is to assess the support of professionals and the possibilities for implementing this type of program in prison practices. To do this, we will ask the prison integration and probation advisors to complete an online questionnaire, so as not to overload the professionals participating in the experiment. The questionnaire will focus on the rollout of the system, their opinions, and their feedback on how easy it is to implement the tool in practice. What does the tool generate, what does it produce, and what could potentially be reworked? Participation will, of course, also be anonymous at this level.

Canelle BARINOIL: To implement this, there are two types of data. Qualitative data, which is more related to interviews. This involves meeting with people under judicial supervision and gathering their impressions after viewing the film, finding out how they perceived the behaviors of the different characters. So, we talk about Max, Andrea, Mathéo, their different actions, cognitions, emotions, etc.

A large part of our data is quantitative and empirical. It is collected through numerous questionnaires that examine the dynamic risks associated with domestic violence. This is what Mavi Sanchez-Vives talked to us about earlier, in relation to empathy, impulsiveness, reactivity, and emotional regulation. But also, psychosocial factors, not just psychological ones which are linked to attitudes and beliefs about domestic violence, intra-family violence, and ultimately, the dynamics of coercive control and motivation to change.

Finally, for the second objective, which necessarily focuses on individuals under judicial supervision and professionals, we developed a questionnaire to assess their support of this virtual reality protocol. During semi-structured interviews, we collected information on inmates' feelings about virtual reality. However, empirical data and questionnaires play a key role, with several things being sought in the questionnaires in terms of feasibility, public acceptance, etc.

Adélaïde VERVAEKE: In conclusion, data collection is now complete. Qualitative data collection ended in November 2025, and quantitative data collection is also complete. All that remains now is to carry out all the analyses, which generally takes the most time. This is

especially true given the number of analyses, as we have gathered 305 participants for this study. Not all the data will be usable, and some will have to be removed, but we are well on track.

The final research report will be available in the first quarter of 2026. The idea is also to be able, at the end of this research, to offer a guide to the best practices for professionals. We would like to help them set up this type of tool and possibly implement virtual reality in prison integration and probation services that do not currently benefit from it. Finally, once the analyses are complete, articles will also be written on the subject.

After watching the film or experiencing virtual reality, there is great value in discussing the experience with participants, conducting a debriefing, or at least exchanging views on what they have seen and experienced.

This work was done either by the research team, when they visited the site to collect data, or by the prison rehabilitation and probation counselors who support individuals under judicial supervision in their efforts to move forward. They are authorized to conduct this debriefing after the viewing. Under no circumstances are participants left alone with this, I would like to make that clear from a psychological point of view. Thank you for your attention.



This presentation, which perfectly illustrates how research can support the implementation of an experiment.

Michel DACCACHE



The idea is also to be able, at the end of this research, to offer a guide to the best practices for professionals. We would like to help them set up this type of tool and possibly implement virtual reality in prison integration and probation services that do not currently benefit from it.

Adélaïde VERVAEKE

Michel DACCACHE: Thank you for this presentation, which perfectly illustrates how research can support the implementation of an experiment. This experiment, in its expansion and generalization, has been informed by research findings. It is also noteworthy that you have taken an interest in the entire ecosystem of the tool, not only the target audience but also professionals and support workers in the broadest sense of the term. This ecosystem is undeniably an important element to consider and an example of the relevance of the constructive

criticism that research can bring to technological objects.

I will now give the floor to Nicola Mallowan, a forensic psychologist specializing in addiction issues, sexual violence, and the perception and representation of offenders. An interesting point in her career is that she also worked as an integration and probation officer, and she recently published an opinion piece asking, "Should virtual reality be used to rehabilitate people in solitary confinement?", written with someone who has experienced solitary confinement. In my opinion, this approach is particularly relevant, as it is a first-hand account of the experience.

Nicola MALLOWAN: I am an Associate Professor in Forensic Psychology at the Buckinghamshire New University, in the south of the United Kingdom. To begin with, I would like to say a few words about my background and explain why I am here today. Before entering academia, I was a probation officer for illegal substance abuse and helped reintegrate offenders into the community. I had to work with treatment providers on the screening of drug users and report on their progress.

In this context, I began my doctoral work twenty years ago, adopting a social psychology perspective to understand how the perceptions of others affect the outcome of drug treatment for these users. I have been teaching forensic psychology at the university for fifteen years and I attach great importance to contributing to the social reintegration of people leaving prison.

I would now like to talk to you about the research being conducted at our university. We are trying to determine whether immersive experiences, such as augmented or virtual reality, can play a useful role in restorative justice interventions, particularly for perpetrators of cyberbullying. We want to measure the impact of exposure to this behavior in augmented reality on empathy towards victims, from a collaborative perspective.

How did this idea come about? Last year, a British newspaper, The Independent, published a story explaining how virtual reality headsets were being used in American prisons to rehabilitate inmates who had been placed in solitary confinement for long periods of time. The university contacted me to comment on this story.

The first thing that shocked me was the image used in the article shown below. It



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Last year, a British newspaper, The Independent, published a story explaining how virtual reality headsets were being used in American prisons to rehabilitate inmates who had been placed in solitary confinement for long periods of time.

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reminded me of when I was young and we first saw images of animal testing on television and became aware of the conditions under which cosmetics were tested on animals.

As a psychologist specializing in social and forensic psychology, this caught my attention. I found it hard to believe that such headsets could be used as a teaching tool, like when you first show someone how to sit at the table, how to hold a conversation, how to use a vending machine, or how to look at themselves... I believe that human beings are social creatures who are rarely isolated, and that we learn to interact with others through social inclusion and integration, just as a baby learns from those around them.

Over the years, I met a person sentenced to 22 years in a British prison, including seven years in solitary confinement. I contacted him about the article and asked his opinion on whether he thought such a virtual reality headset would be useful for his rehabilitation. Like me, he was shocked and disturbed by the lack of humanity towards very vulnerable people. We wrote an article that did not advocate the use of headsets to rehabilitate those leaving solitary confinement.

Then, I tried to determine whether virtual reality had been effective in any field, and it has, for example, inducing emotional awareness in perpetrators of domestic violence. More recently, in response to the high level of sexual harassment on British subways, a campaign was conducted to determine whether these headsets could show someone what it was like to experience sexual harassment. This suggests

that virtual and augmented reality in the criminal justice system can be used for rehabilitation.

In preparing for this study, it became clear that harassing behavior has evolved over time and now includes harassment in cyberspace due to the accessibility of users and the easiness of gathering information. The impact of the pandemic has enabled us to establish virtual communication, and we now have virtually unlimited access to technology.

A doctoral student under my supervision is conducting research on stalking and harassment behavior, victims' perspectives, and ways to rehabilitate perpetrators of stalking and harassment, with a focus on technology. We tried to develop a rehabilitation intervention for cyberstalkers to see if it was possible to influence their empathy levels through immersion.

That is how the research began. The goal of this project is to determine whether virtual reality experiences can help perpetrators better understand the emotional and psychological harm experienced by their victims. This is important because online harassers minimize or overlook the impact of their actions, both in personal terms and in terms of breaking the law.

We also contacted charity organizations and found that some perpetrators have obsessive and impulsive relationships, which is quite common among perpetrators with neurodiversity. This affects how they understand other people's perspectives. Our objectives were to establish whether the use of virtual reality, in one way or another, can reinforce this emotional awareness and is likely to contribute to rehabilitation and reduce the risk of reoffending. In other words, is it possible to influence levels of empathy when exposed to this type of behavior?

We tried to set up an appropriately sized group, knowing that we could not just bring participants to the university. We did not know whether to target stalkers first before checking whether empathy levels could be influenced in the public.

We remembered a campaign run in 2011 that allowed the general public to download an application on their Facebook account called *Take This Lollipop*.

It involved showing a video of a cyberstalking containing the victim's personal information. This was at the very beginning of Facebook, when relatively few people had thought about privacy issues. The results were

quite shocking. When you watched this video, with an actor playing the role of the cyberstalker, you could see that he had access to your information, your friends list, photos of your children, and even a map with your address.

This video and the use of immersion were a way of establishing rates of harassing and stalking behavior among the public. The first survey measure would be to show some participants an emotionless video. The second level would be to show participants the other harassment video, without the immersion of personal information. In a third step, participants could add this application to their current Facebook account, and the unprotected information would be included in the video, giving them a more immersive experience.

Unfortunately, the *Take This Lollipop* application had been updated by its developers, and it is now more difficult to access this fully immersive experience without paying, so we were unable to include it in our research. We contacted the application's developers in the United States to see if we could remove this obstacle, but unfortunately, it was impossible.

We therefore offered two levels of audience engagement with the video, rather than three. First, an emotionless video, where some participants could watch a short landscape video, and in the second, participants could watch the "Take this lollipop" video showing the cyberstalker looking at his victim's page. We also created a hypothetical story about a victim of online harassment to allow participants to validate an empathy scale. Participants then watched a random video and were able to restore this empathy scale.



What were the results? Among the 140 participants from the general public, we found that levels of empathy toward the victim increased significantly after viewing the cyberstalking video. We also found that levels of empathy toward victims remained relatively unchanged after viewing the emotionless video.

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What were the results? Among the 140 participants from the general public, we found that levels of empathy toward the victim increased significantly after viewing the cyberstalking video. We also found that levels of empathy toward victims remained relatively unchanged after viewing the emotionless video.

Although we collected information on participants' gender and age, unfortunately most of our participants were women, so we could not really see any difference based on gender. However, research conducted in 2021 shows that the number of female cyberstalkers has increased due to the physical protection offered by cyberspace. The presence of women in the first study may be less problematic than it was when cyberstalkers were predominantly male.

What do these results teach us? They show that when people are exposed to immersive experiences of cyberstalking, their levels of empathy can be influenced. They become more empathetic towards victims. It also suggests that emotional content can lead to changes. However, we do not yet know whether this also applies to neurodivergent stalkers due to their issues, such as hyperfocus or obsessive behavior.

We have found that this provides insights into the contribution of virtual reality to restorative justice interventions, particularly when victims and perpetrators cannot be brought together. Our goal now is to determine whether the development of new tools can help us better understand cyberstalking and whether we can use them for this population.

We have observed that emotional content is likely to increase empathy. However, emotional impact matters more than isolated pieces of information. This suggests that augmented reality tools can support these goals, and interventions can help perpetrators recognize the harm they cause to victims. This would increase empathy, which is consistent with the needs of reintegration, particularly for perpetrators who have less emotional understanding, such as those who are neurodivergent.

We contacted practitioners to seek their opinions on the use of such approaches. They responded positively, noting that neurodivergent offenders often struggle to participate in face to-face programs due to their difficulties, lack of focus, etc. And sometimes, victims are frustrated by the repetitive behavior patterns of



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offenders. This therefore represents an opportunity, an alternative to traditional restorative justice interventions. Offenders will be able to understand the victims' perspective without encountering them.

What are the next steps? We have a new immersive room at the University where the headsets are available. We also want to work with the restorative justice service providers to determine whether such measures affect levels of empathy and emotional awareness. Our goal is to find existing videos, like those used in the campaign against harassment in the subway, to raise awareness of sexual harassment and examine differences in gender, age, neurodiversity, impulsivity, etc.

If you need more information, please feel free to contact me on LinkedIn. Thank you for your attention.

Michel DACCACHE: These presentations prompt me to ask questions about the ambivalent impacts of virtual reality, empathy, and the conditions for the successful implementation of a technology such as virtual reality in the treatment of offenders. They also raise questions about the role of justice and prison professionals in implementing and supporting these tools, which is an integral part of the conditions for the success of these technologies.

Q&A Exchange



Question: *Video projections are always very powerful. Earlier, another workshop showed a short film, unrealistic but nonetheless moving, of an accident in which a little boy is hit by a large truck. How can we assess the emotional impact of these tools? We are creating a standardized tool that will be applied to people with extremely varied psyches, which carries risks. The tool may go too far in terms of trauma, compared to what is desired. So even if you do not leave people alone with this tool, as you pointed out, the fact that you have to say this proves that it still has a powerful effect. Is this type of response studied systematically, and how can this aspect be modulated somewhat?*

Nicola MALLOWAN: I myself was disturbed while watching this video. And let us not forget that people in prison are highly vulnerable and have often experienced this kind of situation. They have been victims of trauma. Therefore, I attach great importance to debriefing, warnings, and implementation, to properly prepare everyone for what they are going to be exposed to. Emphasizing group work, therapy, role-playing... We are invited to a local prison every year, and we were able to attend a role-play in which someone had to reenact their crime, which was murder. He participated in this role-play and then we changed perspective and asked him to try to reenact the role of the victim, in a situation in which he had been afraid, as a little boy who was systematically beaten by his stepfather. These are highly traumatic issues. When we talk about prisons, inmates are not simply inmates taken into isolation. We must also think about their experiences, their backgrounds, and their traumas.

Adélaïde VERVAEKE: A large proportion of those in detention were themselves victims of abuse or violence as children. The film in question is shocking, we agree. However, they are prepared for it beforehand. It is voluntary participation, they know what they are getting into. Obviously, some inmates break down at the end of the film and need time to process what they have just seen emotionally and try to understand what triggered this emotion, but it is always followed up. In any case, precautions are taken beforehand. If we feel that a person is too vulnerable, for example, we may be consulted as psychologists by

prison rehabilitation and probation counselors. They ask us whether it is a good idea for a particular person who is already showing symptoms to participate. We systematically refuse. If the person is already showing symptoms of post-traumatic stress or clear trauma, we put our veto in. There is no point in digging any deeper; perhaps we need to work on what is already there before starting anything else.

What prison counselors can say, however, is that the film often allows them to address the issue of traumatized children. This does not come naturally to inmates. Often, after watching the film, they are able to express that Mathéo and Andrea's situation is abnormal, that it affects them, that it is sad, that the violence is gratuitous, and so on. But above all, they can convey the fact that they themselves, as children, found themselves in a situation where their father was often violent towards their mother, or even towards them. These were things that had not come out before. They come out through exposure to the film, which allows them to work through this violence. We now know that childhood trauma has consequences in adulthood, on emotional management and empathy, which can also make people vulnerable and lead them to act out at certain times.

Michel DACCACHE: In relation to these issues, it might be worth comparing virtual reality devices where the user is in a passive position with those, such as in Spain, where there is greater agency thanks to more interactive devices. It would be interesting to carry out this comparison, if it has not already been made.



It might be worth comparing virtual reality devices where the user is in a passive position with those, such as in Spain, where there is greater agency thanks to more interactive devices.

Michel DACCACHE

Adélaïde VERVAEKE: We indeed have different materials. Our film features actors, whereas other experiments tend to use avatars. This is also a comment that has been made by prisoners, who say that they do not necessarily recognize themselves if they are not white skinned, for example. There is also this difference. In addition, the setting does not necessarily correspond to the realities of a prisoner's life. We are in something like a relatively large family home with one floor. This is not the reality for many people in France today. There is also this disparity, which is based on the context in which the scenes are presented and on the fact that there is no choice, unlike with the avatar. It could be interesting to compare these data to see if one or the other has more specific effects on certain measures, bearing in mind that we do not have physiological measurements in our study, unlike what may be done elsewhere.

Michel DACCACHE: I have one last question about the impact of implementing this type of device on professionals. There is an obvious impact in terms of training and certainly an impact in terms of human relations, with the creation of a bond with the people being cared for, in your experiences and work. Could you share with us the feedback from professionals in the justice system and the prison administration on the implementation of this type of device?

Nicola MALLOWAN: There is real value in virtual reality in terms of training. For example, I work with students who will be future practitioners. In the past, we tried to explain what psychosis was, for example. It is difficult to understand what people go through when you have never had that kind of experience yourself. We used to have educational videos, but with virtual reality, we can now have immersive environments. It is a fantastic opportunity that allows our students to better understand the situation of those affected. And there clearly is a need for this.

Mavi V. SANCHEZ-VIVES: Regarding our situation, we want to provide therapists with useful tools, particularly for assessing how users and authors perceive these tools, to provide them with appropriate treatments. We are trying to find out if they are easy to use and if they ultimately have an impact. It should be emphasized that these tools are used by professionals, therapists, and educators, who can also provide support.



From left to right: Nicola MALLOWAN, Mavi V. SÁNCHEZ-VIVES, Michel DACCACHE, Adélaïde VERVAEKE, and Cannelle BARINOIL.

There are challenges, of course. We talked, for example, about the level of aggression. We perceive the level of aggression differently. Some people are less tolerant towards aggressiveness than others. So, we need to talk about it. We really want to find useful tools for users, to encourage behavioral change and provide support to therapists working in rehabilitation programs.

Cannelle BARINOIL: Virtual reality can help address the feelings of helplessness experienced by some prison rehabilitation and probation counselors, or people who work with perpetrators of domestic violence. This is a crime with a high rate of recidivism. These are people that are quite difficult to work with because the trauma is deep-rooted and profound. It is face to face work that is complex to develop. We can therefore offer them this concrete tool, which can be a driving force in the work of those providing support. Addressing these professionals' feelings of helplessness means giving them very concrete tools, such as headsets or other technology, which can help them in their work and enable them to go further in their work with these individuals, tackle the hard issues, and prevent reoffending in the long term.

Closing plenary

Chair: Valérie SAGANT

Director of the Robert Badinter Institute

Haffide BOULAKRAS

Deputy Director of the National School for the Judiciary (France)

Elsa GODART

philosopher, President of the Institute for Research in Digital Ethics (IRSEN) (France)

Marijn JANSSEN

Professor of Information and Communication Technology at the Department of Systems and Services Engineering, Delft University of Technology (Netherlands)

Valérie SAGANT: To close this conference, we will first hear from Haffide Boulakras. You are a magistrate and currently deputy director of the French National School for the Judiciary. You recently submitted a report prepared by a task force, which you led at the request of the Ministry of Justice, on artificial intelligence and its integration into judicial activities. In addition, you were hired by the Ministry to lead the project to digitalize the stages of criminal proceedings.

These are not exactly the topics that are at the heart of our concerns today, even though there are many related elements. I would like to ask you what the main lessons are from the

use of virtual reality tools by those involved in the justice system and, if applicable, what safeguards you consider important.

Haffide BOULAKRAS: Thank you for welcoming me and giving me the floor today. I believe that one of the statements I hear most often when speaking on topics related to digital justice is "Code is law". This grand assertion by Lawrence Lessig in the early 2000s is used for many purposes that I have rarely found to be particularly relevant. I think we are inferring something from it that is rarely related to the subject.

Except today. For the first time, I think that "Code is law", this quote from Lawrence Lessig, is a statement that says that in a world that is becoming cyberspace, code is becoming the law of this somewhat different universe. You can see how, in the age of virtual reality, code is becoming the universe described by rules that no longer have much, if anything, in common with the law that describes, for example, a court in the physical world.

The computing code will determine the distance between you and other people in a virtual courtroom and their attitude. It will also determine how a person is identified by an avatar. The code, in its specificity, will become the new law of the virtual topography of a courtroom. For once, in my opinion, this statement is entirely appropriate to the situation described today.

I am speaking primarily in my capacity as a trainer, as someone who provides continuing



Valérie SAGANT



Haffide BOULAKRAS



Marijn JANSSEN

education for French magistrates. Listening to all of you, I wondered how we could initiate a somewhat renewed training program on related topics, or what the uses of virtual reality might be.

I will begin with the context, which I really began to understand during our work on artificial intelligence. We are living in an era that has undergone a complete transformation. I would like to echo a powerful statement by sociologist Gérald Bronner, who said that we are beginning to reach a form of post-reality. Without wanting to alarm anyone, I do believe that the development of social media, the rise of artificial intelligence, and the extreme digitization of certain professional fields mean that, in several situations, you have an equivalence between a belief in unproven facts and what constitutes methodical reasoning.

What I believe, what I communicate, what I assert, what is in the narrative, is easily equivalent to what is demonstrated through professional reasoning. This also applies to a scene that is now becoming a digital scene; it is the same thing. It is important to understand how this context is necessarily extremely important to bear in mind in a world that is being displaced, which is that of virtual reality.

All of this corresponds to a context that could be called a post-reality context. I think it is fundamental, in view of my current responsibility, to keep this in mind when teaching at a school such as the National School for the Judiciary.

The second aspect, which I believe to be important, is the technical and technological context. Three years ago, we launched a day of brainstorming on virtual reality at the National School for Judiciary. All the instructors were there, equipped with headsets and controllers, eager but inexperienced and not very skilled. We were in the process of discovery. But the main idea behind this day was to ask ourselves: what are we capable of doing? And I realize that, even though we had some intuitions, the state of technology three years ago is not the same as the state of technology as we know it today. This context is also extremely important to keep in mind.

We have made progress in terms of technology, as I have clearly observed today. The equipment has changed; it is much smaller. The possibilities are no longer the same either. The

opportunity to see oneself projected into a virtual space has changed beyond recognition. We now have something that is much easier to believe in a virtual world. And the uses are completely different, and this will perhaps be the first point I will mention: we now have real and established uses.

Without going into detail about what happened during this brainstorming day at the National School for Judiciary in Paris, we decided that it was important for training purposes to learn from what others had already achieved. In France, as you have seen, there is a very interesting film about developing empathy around domestic violence or spousal abuse, mainly for the benefit of the perpetrators of such violence.

We imported this expertise and used it to develop a demonstration of this existing film during a series of training sessions. And we thought that we could do the same thing but in a slightly different field. We thus developed a virtual reality film within the school on driving under the influence of alcohol or drugs. And we designed a training course, which will take place shortly, enabling learners, i.e. mainly the people we train, to understand exactly what it is like to drive under the influence of alcohol or drugs. For now, that is as far as we have gone; we have not taken it any further.

Today, I observed that the uses have become fully structured. Even though this was done in the form of separate workshops, I would say that there are three main uses.

If I take, for example, the criminal ecosystem, virtual reality is currently being used very clearly during investigations. Although this has already been initiated over the last three years, I am quite impressed by what has been achieved in terms of ballistics expertise, the restoration of investigative elements, and the demonstration or non-demonstration of elements of guilt in proceedings, thanks to virtual reality. This is something quite incredible that we can now imagine, or even plan for, in the early stages of criminal proceedings, i.e., to assist in establishing evidence. This is the first stage, it is apparent, it is real.

The second stage, as I observed during this session, is the hearing stage. During the hearing, we now have the opportunity to accompany victims or witnesses to ensure that they remain emotionally detached during the hearing,

thanks to virtual reality. It allows them to gradually become familiar with what the hearing is like, as I have heard it described, that is, a moment that can be extremely intense emotionally. And getting used to limited emotional involvement, thanks to virtual reality, allows potential victims to familiarize themselves with the process.

I even read an extremely interesting paper arguing that we could limit the harm associated with what professionals may experience. In several cases, there is an intensity related to empathy on the part of professionals who do not directly experience the harm, but vicarious trauma is experienced. Indirectly, by reading the proceedings and experiencing the intense moment of the hearing, they have an accumulated impact that leads a few professionals to find themselves in a difficult situation. This paper argued that virtual reality could also allow, under the same conditions as those I have described for victim support, a limited but real emotional disengagement to deal with situations that are seen as emotionally difficult, even for professionals.



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Hafide BOULAKRAS

And finally, the third stage that I observed was the post-hearing stage. This stage provides support for perpetrators, particularly those who have committed domestic violence. As soon as there is a form of empathy to try to induce or include in the perpetrator, this support is offered to ensure that they step outside their condition and personal commitment to understand what a potential victim may have experienced.

There is something in the way technology is used, in the expression of needs, that was

already present three years ago, but which no longer resembles what I have observed today. This is true throughout the entire criminal proceedings.

I will give another example, which I witnessed during a trip to the United Arab Emirates. We now have full hearings there, in a virtual format, with people who do not travel, on disputes that are clearly limited. However, it is completely different. I am deliberately using this country as an example because it is a country that is difficult to compare with our own systems. Yet the step has already been taken in this system. This has only been possible in the United Arab Emirates because there is a counterpart to all this, which is an extremely strong digital identity. There is a strong possibility of authenticating and identifying an Emirati citizen and, in fact, the possibility of projecting the citizen into a virtual world to judge them on limited disputes.

That was perhaps the first point I wanted to make. Three years ago, what could be done with those tools was not very clear. Today, I observed that we now have comprehensive and complex use that allow us to achieve a great deal but they require reflection and perspective.

Like all of you, I came here with questions, and I will leave with new discoveries, technological hopes, and a vision of what is now possible. But I will also leave with doubts. My doubts, because I heard very clearly, and this is what justifies the training at the National School for the Judiciary asking pointed and sharp questions, the doubts that are linked to cognitive biases. They are linked to the subject of sovereignty and technological support.

Cognitive biases, as discussed during the second workshop, with a study presented that showed that in a virtual world, we could either reproduce or reinforce cognitive biases. This is a major issue, as it shows that just because we are virtualized, and therefore a little more distant, does not mean that we do not reproduce or reinforce these biases. There is therefore a need to take a step back and understand that these biases must be identified, set aside, removed from the hearing, and potentially explained to professionals.

The second issue that struck me as extremely important was that of sovereignty. The subject of judicial sovereignty is one that is sometimes overused and sometimes poorly explained, and that I have seen on numerous

occasions in the field of artificial intelligence. The more we move towards complex uses, and I deliberately take the example of the United Arab Emirates again, the more we will be exposed in the virtual world to procedural elements that may not have appeared until now.

When I am involved in prevention, supporting victims, or possibly preparing for a hearing and I do not include elements related to the procedure, ultimately, the sovereign hosting or data protection that I provide is of little interest. On the other hand, the more I move towards comprehensive and complex use, the more I expose a procedure to a virtual world, i.e., a digital world, the more I will need to be able to protect the elements I make available.



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Haffide BOULAKRAS

This is a subject that seems very far away from virtual reality, but it is not at all. All elements of criminal proceedings are sensitive data. In France, it is now quite simple, since we have a law that provides a comprehensive framework, the SREN law, which allows us to say that judicial data is sensitive data. And since it is sensitive data, regardless of how it is processed, whether by artificial intelligence or virtual reality, it must be hosted in a sovereign space.

A sovereign space means two things. It means that the physical space must be guaranteed to be on French territory, even if it is cloud-based. Secondly, I must guarantee immunity, be certain that any foreign power that, through its procedures, claims so-called extraterritorial powers, does not have the ability to retrieve from my platform the procedural elements that I place in the virtual world, whatever it may be. The corollary of the use of virtual reality will be sovereignty. This will come first and foremost,

it seems to me, through sovereignty linked to technological hosting.

The second topic related to sovereignty leads to another sociologist, Yann Ferguson, who specializes in artificial intelligence. I refer here to the contract of use. I heard, particularly during the second workshop, that projection into a virtual world could potentially enable us to do this or that, but we must first ask ourselves the question of judicial missions. This is precisely the prerequisite for sovereignty: asking ourselves, within a State, within a national space, what the purpose of justice is. Why do we have a particular judicial topography? What are our missions? From there, we can establish what Yann Ferguson would call a contract of use, that is, a changing human-machine relationship. However, it changes because we have decided to change it, not because it has been forced upon us. Whether it is artificial intelligence or virtual reality, they will force realities upon us from outside the physical world. We will first need to think about the world we want to project ourselves into.

Let me give you an example: artificial intelligence helps us save time. We can write faster. This means we need to rethink the relationship between the number of judges, clerks, and the limited number of staff working with judges, and even rethink their roles. But just because technology is coming, that does not mean we have to think about it in a way that is imposed from the outside. On the contrary, this aspect, these tasks, are mainly political. It is the Nation that must first consider the task and, based on what technology can offer, propose new tasks if necessary: a contract of use. I repeat, fundamental sovereignty of hosting and the contract of use.

Secondly, what I would envision for a school like the National School for Judiciary is, of course, training. I refer to the report on artificial intelligence, which concludes by calling for the creation of a campus, not for artificial intelligence, but for digitization. I understand what you are doing here, which is extraordinary. You are not thinking about artificial intelligence in itself. I believe that the mistake of our times is to say that because the most revolutionary thing is called artificial intelligence, we must focus entirely on it. Of course, it is fundamental and important, but we must not forget the rest of the digital world and see how virtual reality is part of it.



I believe that the mistake of our times is to say that because the most revolutionary thing is called artificial intelligence, we must focus entirely on it. Of course, it is fundamental and important, but we must not forget the rest of the digital world and see how virtual reality is part of it.

Haffide BOULAKRAS

We are therefore promoting the construction of a campus for digital technology, which should be up and running in 2026 if all goes well, and a gathering of schools of the Ministry of Justice, and missions to support all legal professionals, for the time being, on three traditional levels. Firstly, acculturation in all technical and legal subjects: defining virtual reality, artificial intelligence, a network, a computer, Outlook, etc. Secondly, support regarding existing tools, based on our own projections. How can virtual reality subjects be taught in specific ways? Finally, the third level is the expert level. The expert level consists of saying, and this is a bias in France, that magistrates, clerks, and those involved in the justice system must participate in the construction of tools. This comes back to the subject of the contract of use. We build tools because we know the missions, not the other way around. We do not build tools based on missions that we do not control.

Since this is a campus of digital technology, and therefore a combination of technology and collaborative learning, I am promoting not just virtual reality training alone, but training combined with artificial intelligence and an old familiar concept, something we heard about many years ago but which, in my opinion, is set to make a strong comeback: blockchain. Why? Because in a digital world, I am thinking of virtual reality particularly, magistrates will have to, and it will be imperative for them to understand the technology that is made available to them.

Of course, I have the option, among other things, of going to see a crime scene, but imagine the cognitive change. When I am at a crime

scene, I am no longer the magistrate who sees things from the outside; I am at the center of the exercise. There will be emotional and cognitive projection. I will equate what is shown and demonstrated to me, and I should have enough perspective to understand that what matters most are the elements of the procedure. And what confirms the truth that I observe in the procedure is what is shown to me by virtual reality here. These are two completely different levels.

To ensure that what is made technologically available to me is valid, has logs, and is historicized, I believe that blockchain provides us with elements of identification. I think it will make a very strong appearance in the procedures that will be submitted to us, and that a trained magistrate will be a magistrate trained in artificial intelligence, virtual reality, and soon, blockchain.

Valérie SAGANT: Thank you for these structural elements on the integration of these tools, particularly for French judges and prosecutors. Marijn Janssen, our next speaker, is a professor of technology and communication information at Delft University in the Netherlands. Your work focuses heavily on the challenges and modalities of governing these technologies, artificial intelligence of course, but also other technologies, notably blockchain.

You have taken an interest in the transformations of organizations brought about by these new technologies. You do not limit yourself strictly to judicial organizations, but study public organizations more broadly, an approach that is of great interest to us. You have emphasized the importance of the governance of these tools and will therefore be able to present the main lines of action in relation to this issue.

Marijn JANSSEN: Thank you very much for inviting me. After hearing all the discussions, I felt I was in the right place today and a bit at home. Do you know why I felt at home today? Because there are people who have a variety of different disciplines in this room. People look at it from different points of view together and want to make it work; that is a long-term effort, and we need each other. When I look at my own area, ICT and governance, it is always about combining disciplines. When I am talking to the computer science people, they might say, "Oh yeah, he's in the governance area". When I

am talking to the organization's people, they might say he is in the computer science area. Combining these areas is needed but can be quite hard because you need at least two disciplines to combine, and I also saw today that several people were able to combine several disciplines. Maybe they do not call it 'disciplines', but they can combine multiple views.

When we look into the future, Virtual Reality will likely be everywhere. For certain therapies, there are already boxes you can sit in, and you can have an integrated VR experience that includes smells, temperature, and wind. Well, they use it to help people who are ill, disabled, or have a problem, and it is worthwhile when they do. Well, can you imagine that in 10 years from now, or maybe 20 years from now, we will all have such a box at home because prices will go down. That is what is happening with those kinds of technology. We do not have to leave our house anymore.

Furthermore, I have seen several demonstrations containing avatars today. So, people can have multiple avatars that perform different tasks for them simultaneously. We do not know how the future will be, but we have to shape the future, as the future can be good or the future can be bad. We always love to have a good future, and we dream about it. We often only see the good things; however, the future can also be bad, and technology needs to be directed in such a way that it can be used for the good.

This morning, Professor Fredric Lederer said that we have to make mistakes and learn from them. And that is also very important for those kinds of technologies because we can outline the future, but we do not know how to get there. We cannot define our pathway as the best way to go forward. We really have to think about the steps that need to be taken, learn each time, and take the next step.

We already have some VR hypes in the past. About 10 years ago there were very expensive helmets that could be bought. Now we have a new wave, and the prices are dropping. VR helmets are becoming more common and easier to use, making them of interest to all kinds of parties. It is not only of interest for us sitting over here, but also for people who want to make a profit from it, and the famous Big Tech companies that also want to have a stake in it. The involvement of other parties always makes me



Can you imagine that a company from another jurisdiction will run the courtroom because they can sell your technology? They might define how you will use the courtroom and what to do.

Marijn JANSSEN

a bit nervous, because they might want to take over the courtroom. Can you imagine that a company from another jurisdiction will run the courtroom because they can sell your technology? They might define how you will use the courtroom and what to do, and they will want to attract your attention. That is why they are pushing you all the time with all kinds of messages. They even change your behavior for that. We have had scandals in the past. Cambridge Analytica could press a button and then let people vote for the left or the right. Can you imagine what can be done with a VR helmet or in a VR environment? They can also measure all the data and use it for all kinds of undesired purposes. Store the data confidentially so that you don't share it with each other, and it cannot be used for any purpose.

Always also think about the impact of technology: if you can do something with technology, what can others do? What other types of stakeholders have other intentions than you do in our geopolitical climate? It might also be worth knowing a little bit about it. Well, there are all kinds of things that are going on, but what is most important is that we can measure everything. Can you imagine that somebody has been put in jail? We ask them to wear a VR helmet in jail. We measure their temperatures, but also their brains, and many other things. People might think it is something good because we can use the data to help people develop a more positive attitude to avoid becoming criminals again. The other perspective is that measuring all this will be violating people's bodies and judging the data through prejudices and other biases. Conclusions can be easily drawn from

data that might not hold, as AI bias and hallucinations already show. Therefore, technology needs to be governed

You also need to put the rules in your technology because technology will rule you. Think again about your cell phone, your laptop, and similar devices and how they influence your behavior. Take the situation here, in this room, how the tables and the seats are arranged. That also determines how we are seated and how we can interact with each other. Technology and how it is shaped will influence the way we interact, our conventions and informal rule and what we can do with it and we are really in a situation currently but we have so many things the Internet of things collecting the data artificial intelligence for that processing the data and so easy. 10 or 20 years ago we had the same technology here, but we did not have the processing power and we could not store all the data, nowadays we can just store all the data. Do you have any idea about how much can be measured using your cell phones? And how many things do we measure? Nowadays, we can measure a lot, and it is becoming increasingly standard. Think about what we can do with all that data in a VR environment in which we can almost mea-



You also need to put the rules in your technology because technology will rule you.

Marijn JANSSEN

sure everything. I always have to think about the films you probably know, like *The Matrix*, or the book *1984* written by George Orwell.

Is that realistic? Well, it becomes quite realistic to live in a VR world like that and to shape it like that. Do we like it? Well, in the past, we did not like it. Maybe we will like it later, since our ideas and perceptions change over time. We have to know the public values underlying the practices.

When I take transparency, which is an important public value. Our research on transparency shows that transparency is a very complex concept that is not easily unraveled



If we start collecting all the data in the courtrooms, we put VR in all the courtrooms, and then we automate it using the current platforms, who can have the easiest access to all the data? Think about the consequences of this.

Marijn JANSSEN

(Matheus & Janssen, 2020). Do you have any idea how difficult it is to create transparency? It is easier said than done to put into action to really know how transparent it is. We have multiple stakeholders, and each might perceive transparency differently and have different expectations for transparency. We have stakeholders who want to have different things. Victims or criminals, they want to see different things. They will also look at different data. They will also look at different ways to use VR, both positively and negatively, from their own stakeholder perspective, and try to influence it. What do you think about it? If we start collecting all the data in the courtrooms, we put VR in all the courtrooms, and then we automate it using the current platforms, who can have the easiest access to all the data? Think about the consequences of this. Will it be the judge, the platform operator running the courtroom, or someone else determining what we can do in the VR court? And how the data will be measured, data stewardship will be arranged, and data can be used for decision-making?

We should be well aware that using technology can have both positive and adverse effects. We can use the *duality of technology* as a theoretical lens to understand the interactions between organizations and technology (Brous et al., 2020). The duality of technology suggests that gaining the benefits of VR can produce unexpected social changes that lead to structural transformation of the court and organizations involved. We know that technology is neither a neutral tool nor a fully determining force. Technology is both created and changed by human action and, once in use, becomes



From left to right: Haffide BOULAKRAS, Valérie SAGANT, and Marijn JANSSEN.

part of the structural conditions that shape and constrain possible futures.

We also must think about the organizational arrangement of the technology, and personally, I think we already have, given the many pilots and demonstrations today, and the many different applications and platforms used over here. We have to think about whether we can already do things together. Why do we have so many platforms? Do we need them? Well, I did research on the metaverse, and one of the most difficult challenges is the need to move between virtual worlds (Kshetri et al., 2024). When you are in one situation in a certain court, you might have to change your role and move to another situation. For this, you need some kind of interoperability. *Interoperability* is at technical, semantic, pragmatic, and organizational levels, because organizations also need to agree on how they will exchange information or move as a judge or lawyer. Tomorrow you may have to be in a courtroom for criminal court which is a different situation, and you will be in a different world (court), and if we all develop that in a separate way we will have a problem in the future and we are very good at developing often tools at an local level and we do it but we very difficult to integrate it at a later level.

Why do we have so many legacy systems? I do not know how many software systems are in this building, or how many legacy systems there are, but there are probably a couple. A system is developed bottom up and working well, then we develop another system and another system, resulting in a complete fragmentation. Instead, we should look at the coherence and existing systems and see how we can standardize them and determine how to exchange data. In the metaverse, it is almost impossible to take your stuff with you from one virtual world to another virtual world, whereas you might want to move from one virtual courtroom to another one.

The final point I want to mention is that systems should be placed in context, address sensitive matters, and integrate different views and values. This is named the domain of *Value Sensitive Design* (VSD) (Friedman et al., 2002; van den Hoven, 2009). This theory accounts for the inclusion of values in a principled and comprehensive manner throughout the design process (Friedman et al., 2002), thereby enabling public values to be reflected in system design (van den Hoven, 2009). I already mentioned transparency as an important value, but there are many other values like ensuring privacy



We need evaluation metrics to determine the impact of technology use on public values. These insights can be used to arrive at courtrooms that meet our societal values.

Marijn JANSSEN

and security of the participants, inclusion and reduced physical constraints to enable participation, fairness, accountability, showing alternative scenarios of what is happening in a balanced way, providing equal time to the various players, avoiding bias, and you can think about many other values that might play a role. As an engineer, I am used to thinking about public values and translating them into requirements, although this is not easy and requires a deep understanding that a single value, like inclusion, can have a profound impact (Sulastri et al., 2024). Therefore, we need to collaborate with ethical experts who are well-versed in values. Together, you need to translate the value into your design, with a clear explanation and supporting designs. So, you have to ensure that the values are integrated and adhered to. You have to think about what the right way will be, and we have to evaluate it as well, which means we need evaluation metrics to determine the impact of technology use on public values. These insights can be used to arrive at courtrooms that meet our societal values.

Today, we are making small steps, and each step will change the courtroom of the future. All those steps together will transform the courtroom in such a way that it will be completely different from what we are used to. Having a sound vision and understanding what is desirable and what should be avoided in the future are key aspects that we already need to take into account nowadays. Transforming cyberjustice is daring and needs the involvement of many disciplines, which must be brought together. Technology applications can have both positive and negative impacts, and we need to evaluate

the innovative applications from the many public values. We need to learn from each other's progress and evaluate new applications from a public value perspective. Each time, improving the situation and moving to a better situation. Having a critical view and at the same time collaborating with each other is needed⁹.

Valérie SAGANT: Thank you, Marin Janssen, for sharing your own reflections on what this day has inspired in you. We will conclude this conference by inviting Elsa Godart to draw our attention to the ethical issues raised by the development of immersive worlds. Elsa Godart is a philosopher and psychoanalyst, the author of numerous books, co-founder and current president in France of the Institute for Research on the Ethics of the Digital Subject (IRESN). Here is the text of her closing lecture, immediately followed by a proposed ethical charter for immersive justice, an original contribution that she is offering us exclusively.

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Ethics, subjectivity, and immersive justice

Elsa GODART

Elsa GODART's text was read by Valérie SAGANT in her absence.



Elsa GODART

"Technology is never neutral."

Herbert Marcuse

Immersive justice refers to all uses of virtual reality, augmented reality, and extended reality in criminal and civil proceedings, particularly for scene reconstructions, virtual visits, immersive courtrooms, and experimentation with procedural justice. A great deal of work has been done on the challenges posed by such practices, which are more or less developed in terms of cognitive and spatial gains¹⁰. We are seeing the first cases where judges and jurors are using virtual reality headsets during trials. In June 2024, a judge in Florida made history by using such a headset during a criminal trial to assess a scene involving the use of force. This opens up a *new frontier of evidence*¹¹. The question is how virtual reality can be considered *augmented evidence* and how it could be used in "the analysis of complex cases such as homicides, accidents, or mass crimes."¹² This raises many ethical issues: between simulation and concealment, what is the reality? Until now, human justice has been based on subjective judgment. To what extent would an increasingly "objective" justice system be desirable? Precisely, would a justice system that uses virtual reality be more "objective" or would it simply be conducted within an objective framework that aims to destroy subjective positions in favor of technical ones? Herbert Marcuse

reminds us that technology is never neutral; we can never dissociate digital technology from ideological discourse.

First reactions: between technological fascination and ethical vigilance

As we conclude, many questions arise: how does virtual reality transform or intensify the subjectivity of those involved in the justice system? We need to examine how immersive experience reconfigures the way they perceive, judge, and inhabit their role.

This conference shows how virtual reality opens up a whole new field of ethical questions for the justice system, particularly in the reconstruction of crime scenes. But, echoing my work on the metamorphosis of subjectivities in the digital age, it also shows how technology risks augmenting not only the perception of facts, but also emotions and biases by playing on subjective issues.

Virtual reality is not simply a *re-presentation* (in the sense of making present again) of a scene that imitates reality; it is already in itself an interpretation of that reality in its very composition. In this sense, simulation is on the same level as concealment. Designers are not neutral and configure a scene according to their own perception. Moreover, by immersing the subject in a context that mimics reality to the point of *trompe l'oeil*, it transforms the subject's relationship to reality. Thus, it provokes a form of *fictional presence*, which is never neutral. Finally, the subject becomes caught up in their own emotions at a given moment, differing from

10. The studies emphasize the gain in understanding: virtual reality makes it possible to "walk" through a crime scene, test trajectories, firing angles, and fields of vision, much better than with 2D plans or photos (UNESCO). Reconstructions are increasingly based on 3D scans, point clouds, and forensic data, which reinforces the sense of objectivity and accuracy of the evidence (MDPI).

11. « Scanner électronique 37 : la nouvelle preuve », ANZPAA.ORG.AU.

12. Id.

those experienced at another moment. We are witnessing a kind of *virtual truth* that says something about reality without ever really being it, while deceiving the subject in a sensitive, neurological, and emotional way.

Subject & immersion: how virtual reality is transforming the subjectivity of those involved in the justice system

At the end of the conference, it seems to me that a second central question has emerged: that of the ethics of immersion and what is known as virtual truth. What ethical responsibilities do the designers of these immersive environments have? And how much responsibility lies with those who may recommend or even prescribe immersion? We need to shift our focus to the very conditions under which these experiences are produced and mediated, and examine the ethical issues involved.

The ethics of immersion and “virtual truth”

In *Le droit des gens virtuels*¹³, I showed that the boundary between real experience and digital experience becomes blurred when the environment becomes immersive. By using immersive devices, the justice system is therefore introducing a new regime of truth: a truth that is *experienced* and not just *shown* or *imagined*.

This creates a new kind of responsibility. Firstly, that of designers. They are no longer just creating images; they are crafting sensory experiences that can affect memory, perception of time, empathy — and, consequently, judgment itself. Designers' biases cannot be avoided because they are inherent in the very creation of the experience itself.

Secondly, the responsibility lies with decision-makers such as magistrates and experts, because recommending immersion involves exposing a subject and, in a sense, acting upon them. This exposure can alter their mental state and how they interpret the scene.

Virtual truth is not the same as factual truth. In this sense, *realism* should not be confused with *truth*. It is the effect of technical



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Elsa GODART

construction and therefore, ultimately, of human interpretation, while erasing the visible part of this human construction. A reconstruction must remain a constructed narrative that involves a choice of points of view, lighting, elements, etc. This is precisely where the ethical issues surrounding the neutrality of images lie. Above all, the various actors in this reconstruction must be able to experience it in their own way, with different interpretations, to encourage dialogue.

Increased subjectivity: transformation of the self, the others, and the scene

Here, we examine what could be called increased subjectivity. How does immersion in virtual reality change subjectivity, the perception of the self, others, the crime scene, or the courtroom? If technology transforms the subjectivity of those involved in the justice system — judges, lawyers, defendants — what redistribution of power and what new inequalities might emerge?

Based on the *Métamorphose des subjectivités*¹⁴, we can show that immersion changes the perception of the self (selfhood), the other, and the judicial space. We can assume the following effects in terms of subjectivity.

First, images are never neutral. Unlike language, where the subject creates their own mental images through imagination, an image *breaks into* the psyche. It imposes itself on the subject without their consent. And it marks them (*tupos* — imprint). Let us remember that it is images, not words, that cause trauma.

Next, identity disruption may occur. The reconstructed scene acts like an emotional mirror. Some subjects (such as victims, witnesses and defendants) may find that their subjective position is either reinforced or destabilized. We

13. Elsa Godart, *Le Droit des gens virtuels. Une éthique pour les générations futures*, Hermann, 2025.

14. Elsa Godart, *Métamorphose des subjectivités*, vol. I, II & III, Hermann, 2020.

can observe a stronger sense of identification, projection, or empathy. Studies have shown that VR increases empathy and identification by making things more “physical.”¹⁵ Thus, by putting themselves in the shoes of the victim, the defendant, or the police officer, both jurors and professionals begin to *experience* the scene as if it were their own story, a scene that affects them as if they had lived it. There is no longer any distance between reality and its interpretation.

Otherness itself is reconfigured. Immersive imagery can increase compassion or compassionate bias (as distinct from empathy). It can make certain narratives more credible simply because they are visually compelling.

Finally, there is the reality effect. In my work on *sincerity* as an ethical condition¹⁶, I have shown how virtual reality can create the illusion of transparency of the real world when in fact it imposes a scripted narrative. And this *representation* becomes more real than reality itself. A kind of surreal reality based on realism and simulation. Added to this is the importance of deepfakes from generative AI, where the line between simulation and emotional staging becomes very blurred. We can already see some abuses: on May 9, 2025, “in the Phoenix courtroom, a video generated by artificial intelligence, featuring his brother, Christopher Pelkey, announced to the shooter that he was forgiven. The judge said he greatly appreciated the video, then sentenced the shooter to 10½

years in prison, the maximum sentence, which was higher than that requested by the prosecutor. A few hours after the May 1 hearing, the defense attorney filed an appeal. Defense attorney Jason Lamm will not be handling the appeal but said a higher court will likely be called upon to rule on whether the judge improperly relied on the AI-generated video in sentencing his client. Courts across the country are grappling with how best to handle the growing presence of artificial intelligence in courtrooms¹⁷. »

What is the truth of reality? Is reality not always an interpretation?

In fact, under the guise of seeking objectivity, immersive justice cannot erase subjectivity; rather, it awakens other forms and manifestations of subjectivity by modulating emotion, empathy, feelings, and perceptions of oneself and others. This brings us back to our concept of *augmented subjectivity*¹⁸.

The ethical question to ask is therefore: What room is left for human interpretation when the immersive experience imposes perceptual certainty from the outset?

Redistribution of power and new inequalities

While technology transforms the subjectivity of those involved in the justice system, it also transforms power relations. As part of our work at IRESN on digital issues¹⁹, we have emphasized the significance of the disparities between various digital users and the associated power dynamics.

Technical expertise tends to become an asset. Those who are familiar with immersive environments have both a cognitive and emotional advantage. However, these devices may affect defendants, witnesses, or jurors differently, leading to emotional and perceptual inequalities.

Immersive justice thus risks reinforcing the epistemic power of those who design or interpret reconstructions, such as technical experts, engineers, and specialized magistrates, to the detriment of ordinary citizens who are unfamiliar with these technologies.



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15. In *journal de technologie et de propriété intellectuelle*, « La réalité virtuelle comme support de preuve », 30 January 2025.

16. Elsa Godart, *Éthique de la sincérité. Survivre à l'ère du mensonge*, Dunod Poche, 2025.

17. APnews, May 2025.

18. Elsa Godart, *Je selfie donc je suis. Les métamorphoses du moi à l'ère du virtuel*, Albin Michel, 2016.

19. Institut de Recherche en Éthique du Sujet Numérique (IRESN) (Research Institute on the Ethics of the Digital Subject) : www.iresn.fr.



Given the need to reconcile technical progress with moral responsibility, structured ethical reflection must be given its rightful place.

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Ethics & regulation: principles and safeguards for immersive justice

This section raises the question of ethics and regulation: what principles and safeguards should be put in place to ensure that the use of virtual reality remains compatible with the fundamental values of law — equality, freedom, dignity?

The conclusion is clear: uses are still emerging and have not yet been fully exploited. However, given the need to reconcile technical progress with moral responsibility, structured ethical reflection must be given its rightful place. What could be the path to rigorous thinking about the judicial use of these technologies?

In line with the principles, I set out when establishing the Institute for Research into the Ethics of the Digital Subject (IRESN), several limitations are emerging in relation to our seven principles (Hippocratic/innocuity; ipseity; virtue ethics; consent; shared responsibility; decency and anticipation).

Principle of ipseity

Virtual reality transforms perception and emotion. It *imposes itself* on the subject eliminating the need to construct an image of oneself. It is a mark of both augmented subjectivity and its limitations, in that it does not allow the subject to form their own interpretations or mental images. Consequently, it changes the way the subject experiences itself in the legal space²⁰.

20. Work in immersive psychology shows that virtual reality increases empathy and identification to the point of altering perceptions of oneself and others (Chango, 2025; UNESCO VR Courts, 2023). Hyperrealistic reconstructions activate a “quasi-perceptual experience” comparable to a direct lived experience (Northwestern JTICP, 2025). Immersive exposure to traumatic scenes can lead to emotional overload, dissociation, or traumatic reactivation (Powelson & McLean, 2025).

Recommendations:

- For **subjective sovereignty**: the subject must remain in control of their subjective identity. This involves informing them, obtaining their informed consent and offering them the possibility of withdrawal at any time.
- To achieve this, priority should be given to a period of subjective preparation before immersion; a supervised immersion exit protocol; a ban on potentially retraumatizing immersive experiences without specialized psychological support; and the possibility for any actor to refuse immersion (without this affecting the proper administration of justice).

Principle of consent

This principle ensures that the subject is free in relation to immersive experience. The immersive justice experience engages the body, emotions, perception and imagination, involving the whole person. This requires specific consent based on an understanding of the potential consequences. The subject must remain in control of their perceptual and emotional tolerance thresholds and must be aware of the potential exposure.

Recommendations:

- For **non-imposed immersion**: no defendant may be forced to *re-live* a potential scene through an immersive device.
- For **protection against traumatic re-experiencing**: all victims must be safeguarded from any immersive exposure that could reactivate the trauma. This is particularly with regard to the risk of post-traumatic stress disorder.
- For **the freedom of conscience of jurors**: they must be able to decline the immersive experience at any time, without facing any consequences.

Principle of decency

No immersive device should expose an individual to emotional intensity that could traumatize them or influence their subjectivity²¹.

21. Immersive evidence tends to be overvalued by jurors: the “I was there” effect creates an impression of truth (Kremens, 2025). Staging (lighting, angles, camera movement) influences judgment without this always being perceived (UNESCO, 2023). Virtual reality reinforces pre-existing biases: racialization of the threat, overestimation of danger, etc. (UCL Surveillance Lab, 2022).

Recommendations:

- For **narrative neutrality**: any added emotional staging — sounds, music, dramatic chromatic effects — must be prohibited to preserve the integrity and sobriety of the representation.
- For **traceability**: each modeled element must be identifiable, documented, and verifiable, to guarantee the transparency of the immersive device.
- For **neutral visualization**: reconstructions must use standardized lighting and exclude any character animation, except where duly justified for scientific reasons.

The principle of decency also raises the question of punishment. Do we have the right to cause virtual suffering or death when we know that virtual reality “tricks” the brain into experiencing the simulated sensation?

Principle of shared responsibility

The ethical responsibility lies with designers and prescribers, as well as users. Immersive justice involves a whole chain of people, including engineers, 3D modelers, forensic experts²², magistrates, lawyers, psychologists, and data analysts²³. This profoundly transforms traditional responsibilities. In this context, immersive justice presupposes a principle of “shared responsibility²⁴”. Responsibility must no longer be solely legal, but also epistemic and technical: everyone must be accountable for the reality they create or alter.

Recommendations:

- For **evidentiary documentation** purposes: any immersive reconstruction must be accompanied by a clear engineering report setting out the sources used, the technical choices made, and the limitations and uncertainties of the model.

22. What is known as forensic science is the discipline that deals with the search for and use of evidence in order to uncover the truth. “It encompasses all the scientific principles and technical methods applied to criminal investigation to help prove that a crime has been committed and assist the justice system in determining the identity of the perpetrator.”: www.cyforensic.cyu.fr.

23. Virtual reality creates a new “evidence production chain” where the origin, technical choices, and omissions become decisions that carry responsibility (Flor et al., 2025). Lawyers use virtual reality as a rhetorical tool, creating new asymmetries between parties (LawCrossing, 2023). The absence of an international standard leaves de facto responsibility to technology teams (comparison between Germany and Ukraine, 2025).

24. Elsa Godart, *Le Droit des gens virtuels*, op. cit.

- For **certification**: any immersive reconstruction must undergo an independent certification process to ensure compliance with scientific, technical, and ethical standards.

- For **adversarial proceedings**: any immersive reconstruction must be subject to a procedure that allows the parties to examine, challenge, and discuss its foundations, technical choices, and interpretations.

- For **interdisciplinary collegiality**: any immersive reconstruction must be examined by a mixed panel comprising lawyers, psychologists, and engineers, who should work together to assess its legal validity, psychological impact, and technical reliability.

Virtuous principle: what kind of perceptual fairness?

Virtual reality must never be used as a tool that shapes the truth of the trial, but rather a complement that is explicitly identified as such: a simulation tool, not a means of proof. Virtual reality never shows *reality*: it shows a constructed point of view. All vision is intentional, situated, and oriented. Immersive justice must acknowledge this and make this construction explicit²⁵.

Recommendations:

- For **scenographic transparency**: any immersive reconstruction must be accompanied by a protocol detailing the scenographic choices made, as well as a modeling log. Visual indications must also be included that explicitly distinguish areas of certainty from hypotheses.

- For **interpretive plurality**: any immersive reconstruction must present alternative versions to ensure that different perspectives are considered, especially between the prosecution and the defense.

- **We must break the illusion that *seeing* is *knowing*.**

Principle of anticipation

The principle of anticipation involves taking a long-term view of time and considering the future

25. Immersive realism creates an illusion of neutrality, when in fact it is the product of framing choices (Northwestern JTICP, 2025). Many critics emphasize the need for comprehensive metadata: source of each 3D object, degree of uncertainty, reconstructed assumptions (UNESCO, 2023). High-profile cases (USA, Australia) show that incomplete reconstructions can be misleading.

of a practice, decision, or innovation beyond its current use. For example, this means asking a broader question: what kind of justice do we want for tomorrow? Returning to the initial question:

Human justice is based on subjective judgment. To what extent would justice that is more objective be desirable? Does virtual reality really make justice more objective, or does it merely place it in a framework that seeks to eliminate subjective perspectives in favor of technical ones?

The justice system must equip itself with an institutional framework adapted to these changes. This requires, first, the creation of digital ethics committees bringing together lawyers, psychologists, philosophers, and engineers to combine their expertise and anticipate the subjective and normative effects of immersive devices.

It also implies the implementation of a subjective assessment protocol, both before and after immersion, to measure its psychological effects and ensure respect for the integrity of the individuals concerned.

It is also necessary to recognize a specific legal status for simulation: it does not constitute evidence in the traditional sense, but rather a tool for understanding.

Finally, a training framework must be established. Judges, lawyers, and experts must learn to view immersion as a construct, not as truth. For, to quote Aristotle, habit can be virtuous²⁶.

Looking to the future: citizens as actors in a digital justice system

This last perspective raises the question of the future: what role should citizens play as actors in an increasingly digital justice system? Should we draft some form of declaration of digital or virtual rights adapted to this new context?

Based on *Droit des gens virtuels*²⁷, digital justice must recognize digital citizens as full subjects and be capable of preserving their fundamental principles: their individuality, free will, feelings and emotions, moral conscience,

desires, language, etc., rather than considering them as mere receivers.

To achieve this, it is necessary to preserve the ability to control immersive environments, in accordance with the principle of consent; to ensure protection against emotional manipulation, in accordance with the Hippocratic principle; and to affirm the right to non-immersion, in accordance with the principle of decency: no citizen should be forced to live in a simulation.

Towards a Declaration of Digital Judicial Rights

In line with my work, I propose drawing up a Declaration of Immersive Rights for citizens subject to legal proceedings:

- **1.** Right to subjective integrity: no simulation may alter one's perception of oneself without consent and knowledge of its limits.
- **2.** The right to non-immersion: no one may be forced to enter a virtual scene.
- **3.** The right to emotional neutrality during judicial proceedings.
- **4.** The right to transparency regarding algorithms and immersive scenarios.
- **5.** The right to plurality of representations: **a single reconstruction cannot** be the sole source of truth.
- **6.** The right to digital decency.
- **7.** The right to psychological support in the event of trauma caused by immersion.

General conclusion

The application of virtual reality to justice raises profound questions about the subjectivity of those involved and, consequently, the conditions of judgment. Our work on augmented subjectivity, selfhood, and the ethics of the digital subject offers a possible framework for considering these changes: Between the promise of greater understanding and the risk of perceptual distortion, the justice system must opt for the path of clearly controlled, humble, and ethically regulated technology. In order to do so, the system must be capable of setting limits for itself.

26. "Thus, virtues are not born in us either by nature or contrary to nature, but nature has given us the capacity to receive them, and this capacity is brought to maturity by habit." Aristotle, *Nicomachean Ethics*, trans. J. Tricot, Paris, Vrin, coll. "Bibliothèque des Textes Philosophiques" Book II, 1, 1103a - 1103b; <https://www.philotextes.info/spip/IMG/pdf/ethique-a-nicomache.pdf>.

27. Elsa Godart, *Le Droit des gens virtuels*, op. cit.

Ethical Charter for Immersive Justice²⁸

Preamble

The integration of immersive technologies (VR, AR, XR) into the justice system, whether for purposes such as scene reconstruction, training, virtual hearings, or evidentiary visualization, is profoundly transforming our relationship with the law, reality, and subjectivity. Because they bring about perceptual, emotional, and cognitive changes, these technologies raise questions about the place of subjectivity, the risks of persuasion, the construction of evidence, the emotional vulnerability of those involved, and procedural fairness.

The goal of the *Ethical Charter for Immersive Justice* is to ensure that these technologies align with the fundamental principles (e.g., dignity, fairness and freedom), protect human subjectivity, and promote an ethic of responsibility. The charter is intended for all stakeholders, including magistrates, lawyers, experts, engineers, modelers, psychologists, law enforcement agencies, and institutions.

PRINCIPLES

1. PRINCIPLE OF IMMERSIVE CONSENT

No subject may be immersed without free, informed, reversible, and contextualized consent. Immersion is more than just viewing: it is a lived experience involving the body and emotions.

Consent must be:

- free (without coercion or procedural pressure),
- informed (explaining what is real, reconstructed, or hypothetical),
- reversible (exit possible at any time without justification),
- contextualized (renewed if the simulation changes)

This principle is fundamental to the legitimacy of immersive use.

2. PRINCIPLE OF IPSEITY

Protect subjective integrity in all immersions. Ensure that the subject remains the subject of their experience and does not become absorbed into the simulation.

Recommendations:

- Pre-immersion preparation.
- Provide psychological support if necessary.
- Prohibition of potentially traumatic immersions without supervision.
- Inalienable right to refuse.

3. PRINCIPLE OF DECENCY

Limit the emotional or narrative intensity of the simulation. VR can amplify feelings of pain, fear, compassion, and revulsion. Decency implies restraint in staging.

Prohibitions:

- Dramatic effects, such as music, saturated colors and accentuated sounds.
- Unnecessary emotional avatars.
- Scripts that influence judgment.

Evidence must not become drama.

²⁸. Proposal by the author, presented at the Cyberjustice Europe Conference on December 3, 2025.

4. VIRTUOUS PRINCIPLE

Make visible the elements shaping the vision, such as points of view, technical choices, and omissions. Any reconstruction is an intentional construction of reality, never reality itself.

Recommendations:

- Clearly indicate areas of certainty, uncertainty, and hypothesis;
- Model log (sources, instruments, and parameters);
- Access to alternative versions (defense/prosecution).

Immersion should not take precedence over one's own interpretation.

5. PRINCIPLE OF SHARED RESPONSIBILITY

Responsibilities should be redistributed among lawyers, engineers, experts, modelers, and psychologists. Immersion mobilizes a chain of actors, each of whom must be accountable for the reality they produce, transform, or interpret.

Recommendations:

- Multidisciplinary certification of immersive scenes.
- Traceability of technical choices.
- Mandatory adversarial confrontation.
- Epistemic responsibility (fidelity to reality) and not just legal responsibility.

6. HIPPOCRATIC PRINCIPLE OR PRINCIPLE OF INNOCUOUSNESS

Protect victims, witnesses, and sensitive individuals from any dangerous exposure. Due to its hyper-realism, VR can re-trigger trauma.

Recommendations:

- Prior psychological assessment.
- Non-immersive alternatives.
- Prohibit direct exposure if there is a proven risk.
- Post-immersion psychological support.

7. PRINCIPLE OF EQUAL ACCESS AND PROCEDURAL SYMMETRY

Ensure that VR does not become a technological privilege. There cannot be two speeds of justice.

Recommendations:

- Ensure equivalent access for both parties.
- Public funding or legal aid if necessary.
- Neutral presentation accessible to all including those susceptible to cybersickness (virtual motion sickness).

8. PRINCIPLE OF ANTICIPATION

Only use immersion when the benefits outweigh the risks. VR should not be used systematically. It should be strictly reserved for cases where:

- it provides a real cognitive gain;
- it does not introduce additional bias;
- it does not override legal interpretation.

Technology must serve the law, never the other way round.

9. PRINCIPLE OF TRACEABILITY

Every immersive element must be verifiable, replicable, and contestable.

This applies to:

- source data,
- 3D models,
- reconstruction algorithms,
- display settings,
- successive versions of a scene.

Immersive justice must be treated as scientific evidence.

10. PRINCIPLE OF TECHNICAL SOBRIETY

Technology must never take precedence over human justice. This principle reminds us that:

- immersion is a tool, not a truth.
- simplicity must be preferred to unnecessary sophistication.
- the judge must remain in control of the interpretation and legal narrative.

Justice must not become sensational: it must remain understandable, humane, and measured.

Conclusion

This charter establishes an ethical framework for immersive justice respecting human subjectivity, procedural truth, and the dignity of judicial actors. It can serve as a basis for:

- internal regulations;
- an ethics committee;
- professional training;
- a national or international recommendations;
- an article or book chapter.

Q&A Exchange



Valérie SAGANT: Following this masterful conclusion, which brings to a close a number of discussions opened earlier today and points the way towards practical action to ensure the responsible integration of immersive technologies into the administration of justice, the speakers of this closing session are ready to answer your final questions for today.

Question: *I would like to thank you for ending on such a powerful note and to take advantage of the fact that this conference is being organized in conjunction with CEPEJ. The whole point of reflecting together within the framework of the Council of Europe, as was said in the introduction, is to combine very practical reflections, and therefore presentations of very concrete tools that have been demonstrated, with the need for reflection.*

We need to reflect together on principles. We are talking about technologies that are already here and that will profoundly transform justice. We cannot do this without principles. This reflection is extremely stimulating and, when we talk about this possible draft declaration of digital judicial rights, I could not help but think of the CEPEJ's 2018 ethical charter. This reflection could consist of supplementing this ethical charter — which remains highly relevant and entirely adequate — to adapt it to these new technologies, particularly virtual reality.

Valérie SAGANT: I would like to remind you that the CEPEJ, the European Commission for the Efficiency of Justice, is an institution of the Council of Europe. It brings together judges and prosecutors from all the countries represented in the Council of Europe and reflects on guidelines and principles for the administration of justice in all spheres. It is a great source of inspiration.

Francesco DEPASQUALE: Madam President, we may be an inspiration, but right now, it is you who are inspiring us with all the information you have shared with us. This conference has been a source

of inspiration for us. It inspires us for the future, for the work that lies ahead. I sincerely thank you, and all those who contributed to this meeting, for your ideas and your visions.

We should indeed be working on all these ideas and projects, and I hope to be able to do so. I hope that our committee will have the opportunity to reflect on these issues on which you are leading the way. Thank you very much, and I look forward to continuing the work we have started today. This is just the beginning. We have planted a seed, and now we must water this plant and watch the tree grow, with the hope that we can work on it together.

Valérie SAGANT: Thank you indeed to all the experts for presenting your experiences and tools. Are there any final questions from the audience at this stage?

Question: *I am leaving this room with more questions than I had when I arrived. I listened carefully to all the presentations and tried out virtual reality. Everything you showed us is very impressive. My question is more philosophical than practical. All the methods and data presented today come from the justice system. As professionals, we have a significant amount of information to process and analyze. Law schools can ensure that legal professionals contribute something that is truly useful. A police officer or gendarme often must think about the elements you mentioned and include them in a file. This is information for a magistrate, judge, or prosecutor to use in decision-making in many of the scenarios presented today.*

And the question I would like to ask you is this: are we, as a Society, prepared to change our perspective, consider this new information and these new perspectives, and therefore also change the way we proceed in our courts? Perhaps even rewrite history in relation to certain events, because we now have new information at our disposal.

Hafide BOULAKRAS: As with any training, the ideal is for our professionals to acquire the ability to ask the right questions. The idea is not for all professionals to become technicians skilled enough to understand how a virtual reality system works,



Francesco DEPASQUALE and Sonya DJEMNI-WAGNER.

but rather to have the ability to explain it on a level other than the technical level. What we want is for our professionals to understand the big picture, to be able to answer some of the questions they ask themselves, and when they don't know the answer, to know what questions to ask so they can put them to the experts who support them.

Earlier, I mentioned, somewhat provocatively, the return of blockchain, but for one simple reason. In the future, the use of virtual reality will make it necessary to explain how this technology works. The European Court of Justice (ECJ) has issued a ruling on the explainability of artificial intelligence, or algorithms. This ruling states that a banking institution that imposed business secrecy in its country must now explain why it uses an algorithm to refuse credit to a person who has applied for it. There is now — at least for the ECJ — a requirement for explainability whenever technology is used that has an impact on the rights of certain individuals. In this case, it involved a bank and an individual applying for credit. Imagine if it were a judge.

Imagine a judge who has just used a virtual reality tool to help prove guilt. The judge must either be able to explain how the tool works on his own or ask an expert to provide relevant evidence to enable a debate on the use of the tool. There is a need for equality of arms when it comes to the use of a tool, which should not be imposed, but should simply be there to help.

Marijn JANSSEN: I work a lot with law professors, and they are often specialists on specific topics. What we often find is that we do not understand each other. It is quite amusing because we look at other elements, we have other perspectives, but in the end, we manage to find a solution. That does not mean, however, that we necessarily understand our counterpart's discipline.

I would say the same thing about our students.

They are not going to understand every facet.

However, students must be ready and equipped to cooperate. They need to understand the environment and what is going on to be ready to cooperate. That is what we are doing to some extent today at this conference. We do not represent the same discipline, but we are gaining something from it because we are trying to understand.

Furthermore, it is not just technology, it is a collection of technologies. Artificial intelligence is a collection of technologies. I am not going to talk about a process or an artificial intelligence process, software, or software package. That is not the issue. The technical issue at stake is understanding the whole, having an overview, talking about principles and regulation.

We need to regulate now. In some cases, we are already behind. And that is something you can do. The knowledge is in this room, with people who are very experienced in this subject. We need to regulate and finalize the work in progress. Obviously, we are doing it step by step. It is not

always a question of jumping in headfirst. It is also a question of listening.

You need to listen and cooperate, collaborate, and then understand the whole picture and how it works. And sometimes you need to work very closely with certain disciplines in certain areas. In my field, for example, data protection, the technological work must be done with IT specialists. We need to know the protocols and all the ins and outs.

You mentioned blockchain earlier. What is it?

It is about secure storage. We need to find a way to translate all this. And to do that, we need collaboration between these disciplines. The disciplines must come together to cooperate.

You mentioned earlier that I talked a lot about risks, that it had a negative connotation. However, truthfully, the presence of risks is a very good thing. It means that we have lessons to learn. This is thus a topic for the coming years, perhaps even for the coming decade. In any case, these are very important issues for the future that deserve to be explored. There is a huge amount of work ahead.

Valérie SAGANT: I would like to follow up on what has just been said by reiterating the call for multidisciplinary research in these areas. It is important to bring together a significant number of research teams to address these issues.

I would like to once again warmly thank the Council of Europe and the CEPEJ for their support and partnership. This event was co-organized with the Cyberjustice Laboratory at the University of Montréal, directed by Karim Benyekhlef, represented today by Valentin Calippel. For our team, the Robert Badinter Institute, the chairmanship was held by Harold Épineuse and Olivier Chevet. You may also have seen Amarale Janeiro, Léa Delion, Claire Ruiz, and others who helped organize the event. If all goes well, we hope to continue holding a Cyberjustice conference every two years.

Valentin CALLIPEL: Indeed, on behalf of Professor Karim Benyekhlef and the Laboratory, I can confirm that this is a tradition that will be renewed in conjunction with the Robert Badinter Institute and the Council of Europe.

Valérie SAGANT: Thank you to everyone, including the translators, and have a safe trip back to your respective countries.

Cyberjustice Europe 2025 Conference program

Virtual and augmented reality in justice: uses and issues

3 december 2025

Palais de l'Europe, Strasbourg

8h45

Welcome

9h30-10h

OFFICIAL OPENING

- Hanne JUNCHER, Director of the Security, Integrity and Rule of Law Directorate (Council of Europe)
- Francesco DEPASQUALE, President of the European Commission for the Efficiency of Justice (CEPEJ)
- Karim BENYEKHEF, director of the Cyberjustice Laboratory (in video)
- Valérie SAGANT, Director of the Robert Badinter Institute

10h-11h10

OPENING PLENARY

- Chair: Harold ÉPINEUSE, Deputy Director of the Robert Badinter Institute
- Antonio CAPOBIANCO, Professor at the Geometric and Graphical Computing Team, University of Strasbourg (France)
- Fredric I. LEDERER, Chancellor Professor of Law and Director of the Center for Legal & Court Technology (CLCT) at William & Mary Law School. (United States)
- Mel SLATER, Professor of Computer Science at the University of Barcelona and Co-Director of the Event Lab (Spain)

11h10-11h30

Health break

11h30-12h45

PARALLEL WORKSHOPS

Workshop 1

Immersive environments for professionals, victims and witnesses: preparation, protection, and support

- Chair: Harold ÉPINEUSE, deputy Director of the Robert Badinter Institute
- Rannveig SIGURVINSDÓTTIR, Associate Professor, Department of Psychology, Reykjavik University (Iceland)
- Aislinn McALEER, Performance Improvement Officer within Victim Support Scotland (Scotland)
- Francine RYAN, Senior Lecturer in Law and Director of the Open Justice Centre, The Open University Law School (United Kingdom)

Workshop 2

Virtual reconstructions: augmented evidence for augmented justice

- Chair: Olivier CHEVET, Head of Studies and Research, Robert Badinter Institute
- Till SIEBERTH, Professor of Photogrammetry at the Oldenburg campus of Jade University of Applied Sciences (Germany)
- Chiara VILLA, Department of Forensic Medicine at the University of Copenhagen (Denmark)
- François LALÈS, agistrate, former investigating judge within the jurisdiction of the Caen Court of Appeal, and David BRUTIN, Professor of Mechanical Engineering and Scientific Director of the University Institute of Industrial Thermal Systems (IUSTI) at Aix Marseille University, Court Expert (France)

12h45-13h45

Lunch break

13h45-14h30

YOUNG RESEARCHERS PANEL

Winners of a call for submissions launched by the organizers and supported by the Université de Montréal's LexUM Chair on Legal Information.

- Chair: Valentin CALLIPEL, Head of Mission at the Cyberjustice Laboratory (Canada)

Migration justice and digital platforms: towards increased protection or virtual discrimination?

- Azin KARAMI, PhD student in public international law at Aix-Marseille University (France)

From physical courtrooms to digital twins: exploring immersive uses of courtrooms in the justice system

- Sébastien MEEÛS, PhD student in law at the Université Libre de Bruxelles (ULB) in joint supervision with the Université de Montréal (UdeM) (Belgium)

Legal and practical issues of justice in the Metaverse

- Michela TRINCHESE, University Researcher at the National Research Center (CNR) (Italy)

14h30-15h45

PARALLEL WORKSHOPS

Workshop 3

Towards hearing in virtual reality?

- Chair: David TAIT, honorary Professor of Criminology at the Research School of Social Sciences, Australian National University (Australia)
- Lisa FLOWER, Associate Professor of Sociology at Lund University (Sweden)
- Hannes WESTERMANN, Assistant Professor of Law and Artificial Intelligence at Maastricht University (Netherlands)
- Julia KORKMAN, Professor of Forensic Psychology at Åbo Akademi University in Turku, Program Manager at HEUNI (European Institute for Crime Prevention and Control, affiliated with the UN) (Finland)

Workshop 4

Augmented reality and restorative justice: visualising consequences to promote empathy and encourage rehabilitation

- Chair: Michel DACCACHE, Deputy Head of the Statistics, Studies, and Research Department at the General Secretariat of the Ministry of Justice (France)
- Adélaïde VERVAEKE, clinical psychologist, Doctor of Clinical Psychology, University of Rennes 2 (France)
- Canelle BARINOIL, clinical psychologist, IGE, University of Rennes 2 (France)
- Nicola MALLOWAN, Associate Professor of Forensic Psychology at Buckinghamshire New University (United Kingdom)
- Mavi V. SÁNCHEZ-VIVES, Professor of Neuroscience, ICREA Chair at the University of Barcelona (Spain)

16h-17h30

CLOSING PLENARY

- Chair: Valérie SAGANT, Director of the Robert Badinter Institute
- Haffide BOULAKRAS, Deputy Director of the National School for the Judiciary (France)
- Elsa GODART, philosopher, President of the Institute for Research in Digital Ethics (IRSEN) (France)
- Marijn JANSSEN, Professor of Information and Communication Technology at the Department of Systems and Services Engineering, Delft University of Technology (Netherlands)

Editor-in-chief: Valérie SAGANT

Scientific design and coordination: Olivier CHEVET, Valentin CALLIPEL,
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3RD CYBERJUSTICE EUROPE 2025 CONFERENCE VIRTUAL AND AUGMENTED REALITY IN JUSTICE: USES AND ISSUES

While artificial intelligence dominates the media and scientific spotlight, the advent of immersive worlds remains relatively marginal in discussions about digital technology. This is undoubtedly because virtual and augmented reality technologies are still too expensive and not user friendly enough to attract widespread attention and mass consumption. But this situation is already changing, with equipment becoming cheaper and smaller, new uses being invented, and applications multiplying in sectors as varied as industry, education, health... and now also justice.

It would therefore be a mistake not to take an interest now in the first experiments with virtual and augmented reality that are being used in the legal system, even on a purely experimental basis. These technologies, which use computer-generated visual and audio stimuli, have the potential to transform users' lives: they alter our perception of reality, offer tailor-made individual or collective experiences for specific purposes, create unprecedented relationships between the physical and digital worlds, and offer new ways of interacting with our environment.

All of these situations may, if not challenge, at least question our traditional conceptions of the exercise of justice by renewing them. In line with our mission to explore the possible futures of justice, this third Cyberjustice Europe Conference, organized by the Robert Badinter Institute, the Université de Montréal's Cyberjustice Laboratory, and the Council of Europe, gave the floor to research teams and experts who have studied the uses of immersive worlds in order to identify technical, procedural, ethical, and legal issues with regard to fundamental rights, with a view to guiding their possible use in the context of justice missions.



Postal Mail

Institut Robert Badinter
Ministère de la Justice
13, place Vendôme
75042 Paris Cedex 01

Visit our premises

47 bis, rue des Vinaigriers
75010 Paris

contact@institutrobertbadinter.fr
institutrobertbadinter.fr



INSTITUT ROBERT BADINTER Études et recherches sur le droit et la justice

The Robert Badinter Institute (formerly the Institute for Studies and Research on Law and Justice - IERDJ) aims to foster knowledge and discussion on law and justice by initiating original and forward-looking thinking, funding and supporting research projects, and widely sharing knowledge on standards, regulation, and the functioning of justice across all scientific disciplines.

A public interest group created in 2022, the Robert Badinter Institute is the result of a merger between the Institute for Advanced Studies on Justice ("Institut des hautes études sur la justice") and the Law and Justice Research Mission ("Mission de recherche droit et justice"), two entities that have long been internationally recognized.