

## РОЗДІЛ 10. СУДОУСТРІЙ; ПРОКУРАТУРА ТА АДВОКАТУРА

УДК 347.97

DOI <https://doi.org/10.24144/2307-3322.2025.89.4.1>

### VIRTUAL REALITY IN JUDICIAL PROCEEDINGS: A VIEW FROM GERMANY AND UKRAINE

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**Heetkamp S., Bohatchuk D. Virtual reality in judicial proceedings: a view from Germany and Ukraine.**

The paper explores the integration of virtual reality (VR) technologies into judicial proceedings. The study begins with an analysis of the use cases of VR in the judicial processes in Germany and other countries where there are known cases of using VR tools for such purposes as crime scene reproduction and evidence representation.

The mentioned use cases of the implementation of VR in court proceedings include, in particular, the employment of VR for the reconstruction of the crime scene of the murder of two police officers in Kusel, the trial against former guard at Auschwitz-Birkenau concentration camp Reinhold Hanning, a fatal speeding accident investigation in Wiesbaden (criminal cases in Germany), and the U.S. civil case Stephenson v. Honda Motors Ltd. of America. Additionally, the paper considers some ongoing pilot projects and initiatives that use VR in the legal field, particularly for courtroom simulations, legal education and professional training.

The paper then analyzes the current status and potential for implementing VR within the judicial system of Ukraine. The research explores the views of Ukrainian legal scholars who have studied the perspectives of VR.

Finally, the research outlines the key advantages and challenges associated with integrating VR into judicial proceedings. While VR offers significant advantages, it also raises complex legal and ethical challenges. Judges must be prepared to adjudicate disputes and address complex legal issues arising from the use of VR technologies, which simultaneously requires the adoption of appropriate legal regulations that can be interpreted and enforced by the courts.

The paper concludes that the effective integration of VR into court proceedings should be supported by dedicated legal frameworks that define the legal status of VR, regulate the admissibility and procedural status of VR-based evidence, and address data protection and other concerns related to the use of VR in court proceedings.

**Key words:** virtual reality, court, justice, technologies

**Гіткамп С., Богатчук Д.П. Віртуальна реальність у судовому процесі: погляд з Німеччини та України.**

Стаття досліджує інтеграцію технологій віртуальної реальності («VR») в судовий процес. Дослідження починається з аналізу практичних кейсів використання віртуальної реальності в су-

дових процесах у Німеччині та інших державах, де відомі випадки застосування інструментів віртуальної реальності для таких цілей, як відтворення місця злочину та презентація доказів.

Серед згаданих прикладів застосування віртуальної реальності в судовому процесі, зокрема, використання віртуальної реальності для реконструкції місця злочину вбивства двох поліцейських у місті Кузель, судовий процес проти колишнього охоронця концтабору Аушвіц-Біркенау Райнхольда Ганнінга, розслідування ДТП зі смертельним наслідком у місті Вісбадені (кримінальні справи в Німеччині), а також цивільна справа у США «Stephenson v. Honda Motors Ltd. of America». Крім того, в статті розглядаються деякі поточні пілотні проєкти та ініціативи щодо використання віртуальної реальності в сфері права, зокрема, для моделювання судових засідань, юридичної освіти та професійного навчання.

Далі у статті проаналізовано поточний стан та перспективи інтеграції віртуальної реальності в судову систему України. У дослідженні розглянуто погляди українських науковців-правників, які вивчали потенціал віртуальної реальності.

Наприкінці дослідження окреслено ключові переваги та виклики, пов'язані з інтеграцією віртуальної реальності в судовий процес. Хоча віртуальна реальність пропонує значні переваги, вона також породжує складні юридичні та етичні виклики. Судді повинні бути готовими до розгляду спорів та вирішення складних правових питань, пов'язаних з використанням технологій віртуальної реальності, що вимагає водночас і прийняття відповідних нормативно-правових актів, які б могли тлумачитися та застосовуватися судами.

У статті зроблено висновок, що ефективна інтеграція віртуальної реальності в судовий процес повинна спиратися на спеціалізовану нормативно-правову базу, яка має визначати правовий статус віртуальної реальності, регулювати допустимість і процесуальний статус доказів, заснованих на віртуальній реальності, а також вирішувати проблеми захисту даних та інші проблеми, пов'язані з використанням віртуальної реальності в судовому процесі.

**Ключові слова:** віртуальна реальність, суд, правосуддя, технології

**Introduction.** Modern technologies are advancing and progressing rapidly. Virtual Reality (VR) technologies are being developed and actively implemented in various fields. VR can be defined as follows: “the use of computer modeling and simulation that enables a person to interact with an artificial three-dimensional (3-D) visual or other sensory environment” [1]. VR can immerse users in a computer-generated environment that simulates sensory experiences, including sight, sound, motion and touch, and is typically created using specialised hardware and software components such as head-mounted displays (headsets), tracking sensors, input devices (handheld controllers or gloves), powerful computers or gaming consoles, applications [2].

Although VR is actively becoming more widely used and is expected to have a growing impact on the legal field, there is still very little research in Ukraine on the legal aspects of VR or the use of VR in legal practice. Certain aspects of VR in the context of law and its implementation in the justice system have been researched by several Ukrainian legal scholars, including Sibilla Buletsa [3], Svitlana Kostenko [4], Viktor Zaborovsky, Alina Stoyka [5]. However, there is no comprehensive and fundamental legal research on VR in Ukraine. In Germany, VR has been the subject of legal research by several legal scholars, in particular Simon J. Heetkamp, Eric Hilgendorf, Gerald Spindler, Kai Cornelius, Lava Gaff, however research on this topic remains fragmented.

The purpose of this paper is to analyze the potential of VR within the judicial system, examining whether and how the judiciary can not only reflect the growing use of such technologies but also actively benefit from their integration.

**Main body.** Advanced legal systems, such as that of Germany, are exploring the integration of VR into the justice system.

**Use Cases of VR in the Judicial Systems of Germany and Other Countries.** A notable example of developing integration of VR into judicial system occurred in July 2022 at the Kaiserslautern District Court, during the criminal proceedings concerning the murder of two police officers in Kusel [6; 11, p. 11-12]. In this case, the presiding judge wore VR glasses in a courtroom to virtually walk through and examine the crime scene, the virtual reconstruction of which had been created by the Rhineland-Palatinate State Criminal Police Office and the Federal Criminal Police Office [6; 11, p. 11-12].

Virtual reality, based on construction plans and laser scans of the concentration camp, was also used in the criminal trial at the Detmold District Court in Germany of 94-year-old Reinhold Hanning, who

worked as a guard at the Auschwitz-Birkenau concentration camp and has been accused of abetting murder in 170,000 cases [7; 11, p. 12-13]. A VR model created by the Bavarian State Office of Criminal Investigation, shown on a projector and screen, demonstrated what could be seen from the watchtowers where Hanning had been on duty, in response to his argument that he was unaware of what was happening in the camp [7; 11, p. 12-13].

In 2023, VR technology was also used in Wiesbaden, Germany, to reconstruct the scene of a fatal speeding accident [8; 9; 11, p. 13-14]. The reconstruction utilized video from 360-degree cameras positioned in the vehicles and at the location of a pedestrian witness to clarify what could be seen from various perspectives at the time of the accident, in particular from the driver's viewpoints [8; 9; 11, p. 13-14]. In this case, an expert witness wore VR glasses to demonstrate and explain the court how the accident happened.

VR technology is being used in criminal investigations and court proceedings in other countries.

In Switzerland, for example, VR is used to reconstruct crime scenes, in particular to help witnesses visualize what happened and recall details even if the scene itself has been changed [10; 11, p. 14].

In December 2024, a judge at the Broward County Circuit Court in the United States used VR technology during a hearing, wearing a VR headset to view the crime scene from the defendant's perspective in a defense expert's reconstruction [12].

VR can be used not only in criminal proceedings and by investigators [13] but also in civil proceedings, although its use remains rare in this jurisdiction. One such case, known to the authors, took place in the United States: the case of *Stephenson vs. Honda Motors Ltd of America* [41, p. 11]. In this case, the plaintiff claimed that her Honda motorcycle was defectively manufactured or designed, which caused her to fall [11, p. 15]. The defendant presented a VR to demonstrate that the terrain on which the plaintiff was riding the motorcycle was too rough [11, p. 15]. The case was dismissed [11, p. 15].

One of the authors of this paper, who has worked as a judge in civil cases (Simon J. Heetkamp), considers that the use of VR in civil proceedings can be a valuable tool to make things more visible and understandable, e.g. to supplement the many photographs submitted as evidence which could be unclear in terms of how they belong together, in terms of the positions from which they were taken, lighting, etc. [11, p. 15-16].

Interestingly, in 2023, a Colombian administrative court judge even held a court hearing in VR, some say: in the Metaverse (in Meta's VR application Horizon Workrooms) [14].

Various initiatives and projects are focusing on the potential of VR tools for reconstruction of crime scenes and evidence [15], for instance the robotic system for creating "virtual tours" of crime scenes [16] or the project by researchers at Staffordshire University, supported by funding from the European Commission, for creating a VR system that allows jurors to relive crime scenes [17].

VR has vast potential also for the use in courtroom simulations, legal education and professional training.

In an initiative piloted in collaboration with the International Criminal Court VR was used to help survivors of conflict-related sexual violence to prepare for giving testimony in a court by familiarizing them with the courtroom and available protective measures [40].

VR offers transformative potential for the training of judges, as well as for education of law students. Thus, in Germany, one of the authors of this paper (Simon J. Heetkamp) has implemented the project of an "AI-supported witness avatar in a virtual courtroom" in order to give students, legal trainees and future judges the opportunity to virtually practice questioning witnesses by "communicating" with the avatar, which is coupled with a large language model and prompted in advance [18].

Projects applying artificial intelligence and VR, such as "CourtNAI", which is being tested for trainee lawyers at the Oldenburg Higher Regional Court and focuses particularly on the simulation of court hearings and witness examinations, are currently being piloted in Germany [19]. One of the authors of this paper, Prof. Dr. Simon J. Heetkamp, is an external expert to the mentioned project. There are many other examples of the use of VR for simulation of court proceedings and training of law students and lawyers at the beginning of their careers in other countries [20; 21]. The potential of VR for the improvement of the professional skills of police officers is also being discovered [22].

**Prospects for VR in the Judicial System of Ukraine.** Let us examine whether, and in what ways, VR is being used within the Ukrainian judicial system, as well as its potential to contribute to the functioning of the system. Ukraine does not have the respective vast experience of implementing VR in justice system so far, however, the high potential for its use in future can be predicted [4, p. 117].

While still in the initial stages, VR is being introduced into the Ukrainian legal landscape in a way that reflects the system's peculiarities, specific challenges and constraints.

Thus, in 2017, there were announcements about the launch of a project to video record court proceedings using "VR 360 virtual reality technology" (not actually VR as such, as in the abovementioned), which creates the effect of an observer's presence at a hearing and allows one to "see everything" by dragging the computer screen or rotating the smartphone in different directions [23; 24].

The potential of VR in the educational process in higher education institutions as well as for training of judges and other legal practitioners is also being considered in Ukraine [25; 26; 27].

The perspectives of VR in the field of law is being explored by Ukrainian scholars.

Ukrainian scholars note that VR technologies propose high accuracy for recreating the conditions of the crime scene, including weather, lighting [4, p. 117], season, part of a day.

The scholars also consider the potential of VR for improving criminal proceedings, including training of investigators, for example, for practicing various investigative approaches in the course of interrogation in different situations [5, p. 80-81]. The potential of VR for investigating crime scenes and circumstances and even crime prevention is considered as well [5, p. 81].

Besides, the possibilities of 3D scanning for creating three-dimensional models of objects in criminalistics are analyzed, in particular for fixing signs of crimes and crime scenes, for comparative research (e.g., superimposing a scanned model of a boot on a model of a footprint to see if the points match), for diagnostic studies, and for the presentation of evidence [28]. The following advantages of using 3D scanning to create 3D copies are specified by the respective Ukrainian experts: better preservation of evidence, for example in 3D evidence libraries, easier measurement of such 3D evidence, non-intrusiveness which minimizes the risk of destruction of evidence, high accuracy, volume of the image compared to flat images, a qualitatively new level of visibility of evidence demonstration, for example by an expert in court [28].

War affects the peculiarities of the use of VR in Ukraine. Given the challenging circumstances of war, VR can be used for training soldiers and developing important skills on the battlefield, for defining people who are best suited for the respective tasks in warfare [29; 30]. There are possibilities of using VR for the rehabilitation process of soldiers and civilians [31; 32], for the treatment of post-traumatic stress disorder [33; 34], for the reduction of stress-related symptoms [35], for the education of children with the aim of protecting them from mines and explosive weapons [36].

The potential of VR for police officers, in particular, to train and experiment with new crime prevention and suppression strategies in a safe and controlled environment requires additional attention.

**Advantages and Challenges of VR in Judicial Proceedings.** In general, VR technologies offer significant benefits to the legal field by transforming the means by which lawyers can present and perceive legal information at various stages of the court proceedings, in particular for providing additional evidence to represent locations and visualize objects or to support or object to witness testimony, for collecting, analyzing and preserving evidence at the investigation stage, as well as for training and professional improvement of legal practitioners.

VR can allow for a better understanding of the facts, allowing for a more accurate assessment of the characteristics of the objects perceived within the virtual representation, and for additional information to be gained from analysis, reducing the time spent understanding the details [11, p. 16-17]. VR technology offers the possibility to improve the understanding of highly complex evidence, such as medical procedures or architectural designs, and allows not only to see them, but also to interact with them [2]. In crime scene and accident reconstruction, VR can recreate the locations and events over time, replicating lightning, time of year, weather and other changing characteristics, as well as showing the events and objects from different people's perspectives [2]. VR can help to ensure the anonymity and concealment of the identity of a witness where this is necessary for his or her protection or for privacy reasons.

At the same time, there are significant limitations and risks associated with the use of VR in the justice sector. Disadvantages include the high cost of using VR technology, the need for considerable time and technical expertise to implement VR, and the not excluded possibility of human factors [11, p. 17-18]. High costs and the required special technical expertise, which not all courts or participants in the judicial process have, create further issues of equal access to justice [13]. The challenge of ensuring the accuracy, authenticity and reliability of virtual simulations, and guaranteeing their unbiased quality, could require the involvement of additional technical specialists at additional costs and other resources

that not all participants may be able to afford [12; 13]. The development and establishment of standards and protocols, particularly for the presentation of evidence in court, could be recommended to ensure the accuracy and integrity of VR-supported evidence [13].

In addition, there may be rather subjective psychological aspects of the influence of VR. On the one hand, VR may affect the testimony of witnesses by making them think that they remember things they saw in the virtual reality without really seeing them in the real world [11, p. 17]. On the other hand, experiencing a crime scene could also have a strong emotional impact on a judge, affecting his or her ability to remain objective and impartial [12]. Ethical considerations for judges, who will have to immerse themselves in the VR environment in order to consider the VR-supported evidence, should also be taken into account.

Judges today should be aware of the development and the functionalities of VR, because in any case VR will reach the courts in a way that the judges will have to give the legal perception to these technologies and judge the cases arising from their use, for example, the cases of injury or fraud in VR [37, p. 1055]. This requires not only an understanding by judges of how such technologies work [37, p. 1055-1056], but also appropriate legislation regulating the issues arising from the development of VR to be enforced by the courts.

Despite the benefits of the use of VR, there are many issues connected particularly with the lack of legal regulation of this emerging field. The issues that will sooner or later have to be addressed by judges.

VR presents many legal challenges. There are issues of who should own the objects created in VR, how to protect intellectual property rights from unauthorized use in VR without the consent of the right holder, the unclear legal status of transactions conducted in VR, as well as the reliability of identification of users conducting these transactions. Key concerns also involve protection of privacy and personal data collected in VR, the confidentiality issues [3, p. 192-193]. Virtual interactions may be subject to contractual terms and conditions that may restrict the privacy, property and liberty rights of users, who may not always be fully aware of these terms and conditions [37, p. 1056]. The terms and conditions of VR applications must be understandable and transparent, and the consent given thereto must be free and informed. Appropriate cybersecurity is essential in VR environments to protect against cyberattacks that can damage users security and privacy. Another controversial issue is the liability for actions in VR that are considered crimes and other offences when they happen in the real world (robbery, murder, sexual assault and other such acts). Clarifying the respective rights, obligations and responsibilities, in particular, of those developing, providing, operating, deploying and using VR is necessary to ensure the lawful use of these technologies.

Existing legislation can be applied to VR, but it requires appropriate interpretation by the courts and further adaptation. In both Ukraine and Germany, existing legislation, particularly in the areas of personal data protection, intellectual property, consumer rights, and liability, can be applied to legal relations arising within or in connection with VR. For example, Article 14<sup>3</sup> of the Law of Ukraine “On Advertising” directly states that “[a]dvertising with the use of electronic communications (including e-mail, messaging services, search services, websites and web pages of legal entities and individuals on the Internet, chatbots, automatic messages, communication with the use of telephone numbers, services using augmented and virtual reality technologies, and any other information (digital) technologies), which is distributed and consumed in Ukraine, shall be subject to the requirements of this Law, the legislation of Ukraine on protection against unfair competition and other laws of Ukraine” (unofficial translation) [39].

The Strategy for the Digital Development of Innovations in Ukraine up to 2030, approved by Order No. 1351-r of the Cabinet of Ministers of Ukraine dated 31 December 2024, defines “creating conditions for the development of innovations in the field of immersive technologies” (including VR) as one of the 17 strategic goals for implementing the said strategy in Ukraine [38].

Both Ukrainian and German procedural codes, particularly in the context of criminal proceedings, do not explicitly provide for the use of VR technologies, for instance, in the representation of evidence during trial. However, neither legal framework expressly prohibits the use of such tools in court proceedings.

Further possible integration of VR into court proceedings requires the appropriate legal framework to elaborate the legal definition of VR, to define the legal status and the criteria for admissibility of evidence based on the use of VR, to adapt existing court procedures and establish procedural rules for



consideration of such evidence, as well as to address data protection and other concerns related to the use of VR in court proceedings.

**Conclusions.** The rapid development of VR technologies requires consideration of potential integration of these technologies into judicial processes. Judges and other legal professionals should develop their understanding of both the technical and legal implications of the use of VR. As VR instruments are being piloted within the judicial systems of technologically advanced countries such as Germany, they demonstrate significant potential to transform judicial procedures, particularly in the areas of evidence visualization and analysis, legal education and professional training. However, this integration also presents complex legal challenges, including the need to define the legal status of VR within legal proceedings and to establish appropriate legal frameworks to regulate its use. The adoption of the laws specially dedicated to regulation of the VR issues and development of guidelines for judges, experts, attorneys and other participants of court proceedings with regard to application cases for VR in court could be recommended.

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