Crime Scene - VR

Immersive Learning Experience on Criminal Forensics

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ABSTRACT

This work aimed to develop an immersive experience simulating an authentic criminal forensics situation and observe student perceptions. A detailed pre-production phase created the VR scenario using a real case for reference. The experience was built with Unreal Engine and was applied in a postgraduate course. All respondents found the experience immersive and motivating, aiding their learning. Minor usability issues were reported, but no significant adverse effects like nausea or dizziness occurred.

CCS CONCEPTS

Software and its engineering; 500, Software creation; 500, Designing software; 500.

KEYWORDS

Immersive Learning, Virtual reality, Criminal forensics, Student engagement.

ACM Reference format:

FELIPE Cortizo E. Silva, Patrícia R. P. Custodio, Adriana da Silva Goulart, Cinthia B. Spricigo. 2024. Crime Scene – VR: Immersive Learning Experience on Criminal Forensics. In *Proceedings of 26th Symposium on Virtual and Augmented Reality (SVR 2024). Manaus – AM, Brazil, 2 pages.* https://doi.org/

1 Introduction

In this work, we describe the Crime Scene VR application, developed by the team at the Extended Reality Center of PUCPR. It is a virtual reality experience, designed to work on Pico Neo3Pro devices, produced to immerse students of a criminal forensics course in an authentic crime scene. Crime Scene VR provides an immersive experience in a simulated crime scene, based on a real case, aimed at exercising the forensic ability to locate evidence of a crime. For the instructor, this is an opportunity to create an authentic learning situation, which is difficult to reproduce in a real environment. Immersive experiences have the potential to generate engagement in realistic learning situations in a safe environment.

In the immersive experience described here, the crime scene is set at night on a dirt road and involves the homicide of a man represented as a mannequin. In the experience, the student can move around the scene, turn on a flashlight, move the victim's body, pick up objects, and place identification tags on evidence.

The objective of this work was to develop an immersive experience that simulated an authentic criminal forensics situation and to observe students' perceptions.

2 Materials and Methods

A pre-production phase was carried out for the project, during which the general parameters of the experience were defined, and the visual and sound elements to be developed were analyzed. In this initial stage, a real case was used as a reference for the design of these elements, using detailed photographs of a crime scene for modeling and texturing the scenario and the victim with Blender and Substance Painter tools (Fig. 1). Additionally, the creation and mixing of sound elements were done with Studio One software, aiming to produce a soundtrack and auditory effects that matched the desired setting for the virtual reality (VR) experience. The necessary level of graphical fidelity was also determined, balancing sufficient realism for user immersion without achieving total photorealism due to the limitations of the available VR hardware. The user interface (UI) was designed and defined, with icons and other visual elements developed in Adobe Photoshop. After defining the gameplay flow, an initial prototype was created using version 4.27 of Unreal Engine, chosen for its compatibility and ease of integration with the PICO Neo 3 Pro API. The development phase, including prototyping, lasted three weeks, during which the interaction mechanics between the player and the environment, as well as the visual and sound assets and interactive objects, were implemented.

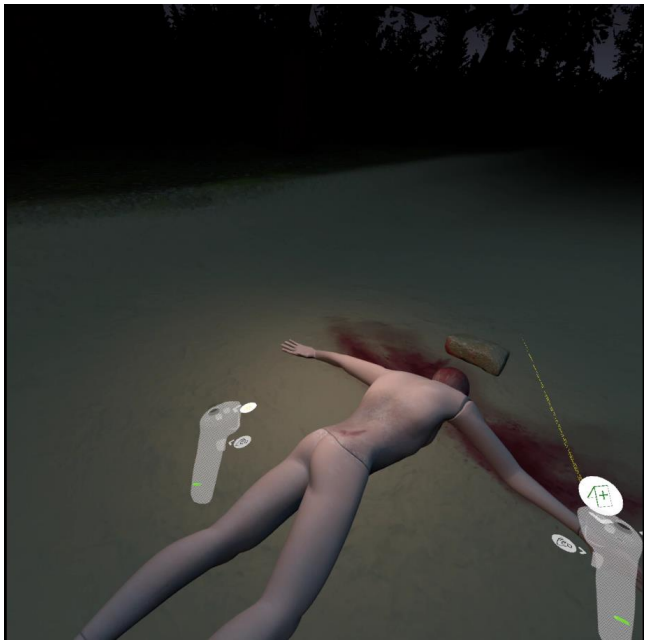

Figure 1: Illustration of the Crime Scene VR experience.

The experience was applied in a class of the postgraduate course in criminal forensics, for a group of 11 students. The class took place in a carpeted, unfurnished room, allowing students to move freely without risk. Ten students agreed to participate in the first-person experience using the VR device, with the screen mirrored on a TV so that other students could follow the colleague's experience and interact verbally with them. Six of the students who used the experience agreed to answer a questionnaire about their perceptions. The six respondents were aged between 21 and 60 years. The questionnaire used a 5-point Likert scale, ranging from Strongly Disagree (1) to Strongly Agree (5).

3 Results and Discussion

Regarding questions about immersion and the effect of the experience on learning, all respondents partially or totally agreed with the statements: I felt like I was really at the crime scene; the experience was interesting to me; I felt motivated by the experience; I felt I was able to learn during the immersive experience. One respondent was neutral, while the others agreed totally or partially with the statement: with this experience, I feel more confident to analyze similar real situations. One respondent contributed to the open-ended question provided, about opinions and suggestions: "I believe this virtual environment should continue to be used, the experience was incredible and very practical." It was observed that students remained in the experience for at least 10 minutes each, verbalizing their perceptions of the evidence found in the environment to the rest of the class, that is, who participated in the experience in the third person. Students naturally formed discussion groups, looking for evidence, discussing the nature of the victim's injuries, and deciding where to place the identification tags.

The opinions of these initial users and their behavior during the class suggest that the experience has sufficient factors that contribute to presence and agency, which are engaging elements of immersive learning experiences [1]. The students also found the experience interesting and useful for learning, and they did not report issues such as nausea or dizziness, which is always a concern with immersive experiences.

Concerning usability, two respondents partially agreed with the statement: I had difficulty handling the VR headset controls and felt information overload during the experience. The only symptom reported by respondents while using the experience was postural instability. The opinions of these first users and their behavior during the class suggest that the experience has sufficient factors contributing to presence and agency, which are engaging elements of immersive learning experiences. Students also found the experience interesting and useful for learning and did not report problems such as nausea or dizziness, which is always a concern with immersive experiences.

4 Conclusion

The Crime Scene VR application has proven to be an engaging tool for teaching criminal forensics. The experience, which allows students to interact in a highly immersive simulated crime scene, received positive feedback regarding the sense of presence and impact on learning. Students reported feeling as if they were truly inside the crime scene, found the experience interesting and motivating, and expressed confidence in applying their learning in real-life situations. Despite some difficulties with the controls and information overload, the application was considered useful and practical, without causing significant issues like nausea. The activity also fostered discussions and collaboration among participants, highlighting its potential as an educational tool in forensic science courses.

ACKNOWLEDGMENTS

The authors acknowledge the support and engagement of the PUCPR XR Center Development Team in the creation of this VR experience and the financial support from the PUCPR Vice-Rectorate for Educational Development.

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