Forensic Science Education by crime scene investigation in Virtual Reality

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***Abstract*—This paper proposes a prototype of crime scene investigation with virtual reality (VR) applications, aiming to reconstruct the crime scene from the famous O.J. Simpson crime case. The prototype contains two scenes, both scenes containing multiple forensic science technologies for the user to practice, alongside with obvious hints to guide the user throughout the VR experience.**

Keywords—Forensic Science, Education, Virtual Reality, User Experience, O.J. Simpson, Crime Scene.

I. INTRODUCTION

Crime scene investigation plays a big role in forensic science education, but the cost, accessibility and breadth of experience imposes obstacles onto the topic, since reconstructing a crime scene and constantly repairing the scene can be costly, and real crime scene investigation doesn't happen very often.

Virtual reality (VR) is an emerging technology that could come in handy in these types of situation, where it's ability to construct a new virtual world, but still allow users to feel like they're in reality is very helpful. We decided to bring this technology into forensic science education, where a crime scene will be featured in this prototype, and the task for the user is to use the given tools to gather evidence in the scene. Further more, we decided to go a little bit further, not only creating a tool for forensic science education, but also adding some general questions for ordinary civilians, allowing them to understand some basic knowledge about crime scenes, which can be helpful if in any case they run into a crime scene and accidently cause trouble.

After some discussion with an expert[1] in forensic science, we decided to use the infamous O.J. Simpson murder case, as O.J. Simpson himself was proven not guilty by forensic science. Judging by our topic, it's the most suitable case to replicate and reconstruct with VR.

II. PROPOSED DESIGN

A. User Study

First, we made a questionnaire survey asking questions about if our potential users have experience with VR or crime scene investigation, and whether they're interested in what we're trying to accomplish. Most of our feedbacks were positive, where although they aren't familiar with neither VR nor crime scene investigation, they're still interested in the thought of crime scene investigation in VR.

B. Hardware and Software

Unity Version 2019.4.21f1 was used to construct our sceneries, using most assets from Unity Assets Store. The first scene was a replicate of the famous scenery from the O.J. Simpson's case, where his ex-wife and her friend were brutally killed in front of the fence of her house. The second scene came from our imagination, believing that the polices had to find more evidence inside the house. Multiple evidence were placed in the house without much evidence, allowing the user to judge by themselves whether the evidence they gathered are useful or not.

Oculus Quest 2 was used to conduct our VR testing.

C. Experience

The user will first spawn in the first scene, which is the replicate of O.J. Simpsons crime case, shown in picture (b). The first encounter by the user will be a table with some tools on it, shown on picture (a) where the user is allowed to practice using these tools as they will come in handy later on. In this scene, the user will be asked to take photos of the scene and the footprints, shown in picture (d), as well as taking a glove[2] that was left near the body. Last but not least, the user is asked to use the fingerprint brush to gather fingerprints from the staircase. Once the user believes that he/she is done with the scene, he/she can continue to the next scene from where he/she started.

1. Cheng-Lung Li, student of the famous forensic scientist Hennry Lee.
2. The famous glove from O.J. Simpsons crime case.

In the second scene, there will be more tasks for the user, where the user will spawn in front of the house, shown in picture (c), and once he/she walks in, he/she needs to gather information by themselves. There will be some clues on where to look, but whether those evidence he/she gathered will be useful all depends on himself/herself. Some key evidence to look for will be the other pair of glove, a thread of hair, a knife next to the sink, shown in picture (e), shoes which matches the footprint in the first scene, and some clothes in the wardrobe. Some of these assets can be used with luminol testing, which shows the blood on top of these evidence, helping the user to judge whether the evidence is useful. In this scene, the user will only be given 3 minutes as initially our VR experience can only last no more than 5 minutes for the long queue waiting.

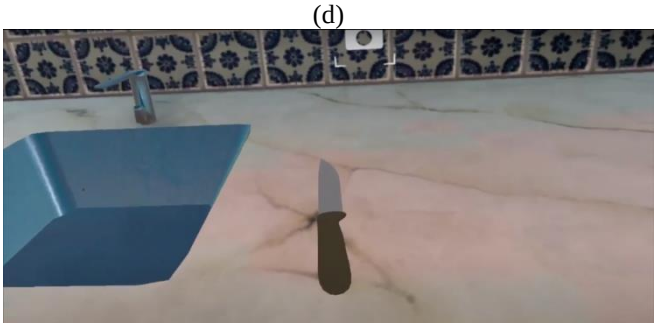
Through out the 2 scenes, there are a few multiple choices floating around, shown in picture (f), allowing the user to answer in the middle of their investigation. All of them are related to the police force, and most of them are related to forensic science questions.

(a)

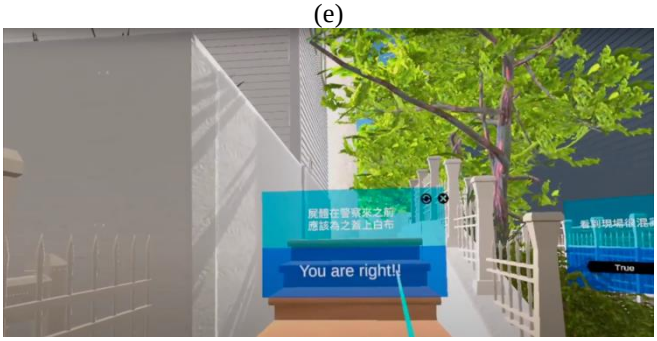
(b)

(c)

(d)



(e)



(f)

III. Discussion

Unfortunately, due to the infamous Covid-19 virus, we weren't able to allow any other users except ourselves and our professor to fully run through our VR experience. Therefore, despite the fact that we've already designed some questionnaire for user feedback after running through the experience, we weren't able to gather any results from this prototype. However, multiple positive feedbacks were given in internal testing.

Most of the important knowledge about crime scene investigation and basic knowledge about forensic science were covered in this prototype. However, there were still some minor improvements that we could've made, such as putting the fingerprints at more places and some more reasonable places, which was pointed out by one of the experts in the field of forensic science. Also, the multiple choices seemed redundant, and therefore we could've added more knowledge to it. Nevertheless, these problems are quite minor, and it

doesn't affect the main purpose of this prototype, but for future work, we can improve on the mentioned problems.

For future work, our overall experience have little relation with the O.J. Simpson crime case, with only the scenery and some background knowledge behind it. We can improve by relating more of the evidence with the case, since O.J. Simpson was proven not guilty with forensic science, but this wasn't mentioned in our work.

IV. CONCLUSION

Overall, although there wasn't a lot of user feedbacks, the positive feedback from internal testing showed that our VR experience still fits the main purpose of which is was designed for -- forensic science education.

However, this prototype still requires some improvement as the overall experience still looked pretty naïve, not professional enough for polices to use this prototype as crime scene investigation practice.

We hope that with this paper, there will be some insights for future VR developers as to how VR can be used in forensic science and how to improve.

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