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Immersive Security Personnel Training Module for Active Shooter Events

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Abstract

In recent decades, there has been a sharp increase in active shooters events in schools and colleges. As a result, there is a need to prepare for these events by including valuable information and knowledge needed for safety preparedness. Emergency response drills are needed in training for active shooter events. Leveraging virtual reality (VR) provides an immersive context to training by providing an innovative and engaging way to excite the user in learning. Immersive VR training is a valuable tool to train people for preparation of active shooter events as it offers hands-on learning experiences for situations, which are difficult to replicate in real-world conditions. This paper presents an immersive security personnel training module for an active shooter event in an indoor building. We have developed an experimental platform for conducting immersive training that gives a fully immersive feel of the situation and allows one to perform virtual evacuation drills. The immersive security personnel training module incorporates four sub-modules namely 1) Situational assessment module, 2) Individual officer intervention module, 3) Team Response Module, and 4) Rescue Task Force module. This immersive VR training platform will allow for collection of data on various what-if scenarios in response to active shooter event in a building. The collected data can be used to sharpen the skills of a security personnel on how to follow correct procedures and improve response time. The immersive VR training will lead to immersive learning where the trainee is virtually immersed in a safe and instructive environment that allows them to practice their skills without causing harm to themselves.

1. Introduction

The stakes are very high when it comes to anti-terrorism training and active shooter response training. These situations are very difficult to realistically replicate for training purposes. Traditionally, an active shooter emergency response plans are taught to occupants via an interactive video, drills, etc. These plans have limitations with regard to knowledge acquisition, engagement, and situational awareness. The use of immersive VR environments allows for the testing of situations that could not be tested in real life due to legal issues and possible health risks to participants. Immersive VR training works well for many types of situations such as:

- Active shooter response training
- First responder response training
- Bio-terrorism threats training
- Disaster planning training
- Security and situational awareness training
- Office and warehouse training
- Construction site safety training
- Evacuation training
- Fire response training
- Workforce training

This paper presents an experimental design approach for conducting immersive training for an active shooter event for an indoor building. We have developed an immersive virtual reality training module for active shooter events using Unity game engine by integrating it with Oculus hardware for course of action, visualization, and situational awareness for active shooter events as shown in Figure 1. The immersive security personnel training module aims to get information about the emergency situation inside the building. The dispatched officer will verify the active shooter situation in the building. The security personnel should find a safe zone in the building and secure the people in that area. The security personnel should also find the number and location of persons in possible jeopardy. Upon completion of the initial assessment, the first security personnel shall advise communications and request resources as deemed necessary. This will allow determining whether to take immediate action alone or with another officer or wait until additional resources are available. After successfully gathering the information, the personnel need to update the info to their officer through a communication device.

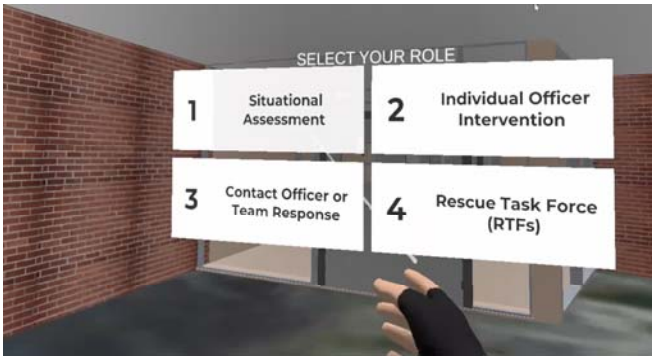

Figure 1. Immersive VR security personnel training environment for active shooter response for the building on campus

The rest of the paper is structured as follows. Section 2 briefly describes the related work for immersive VR training module, active shooter response, and disaster response training. Section 3 describes the benefits of immersive VR training module. Section 4, describe the design and implementation of the immersive security personnel

training module for active shooter events. Section 5 discusses the drawn conclusions. Finally, Section 6 states acknowledgments.

2. Related Work

There has been an increase in active shooter response training due to challenges in preventing mass shootings. Enforcement officers have been revising tactics useful in response to ensure that protocols can be followed during an active shooter events. Immersive virtual reality training modules for active shooter events in a collaborative VR environment [1,2] have been developed for emergency response in a building. There is a need to implement active shooter policies, health care experience [3] and training [4] as well as conducting experiments where participants can engage in active shooter response [5] simulation. Tactical drills by military are conducted to study active shooter response [6]. Past disasters such as night clubs have been also studied to study how humans behave during disaster situations in a collaborative VR environment [7].

Sharma et al. [8,9] have developed a megacity environment in a multi-user environment for emergency response, training, and decision making. They have incorporated both user controlled agents and computer controlled agents. The computer controlled agents or AI agents incorporate behaviors such as hostile agents, non-hostile agents, leader-following agents, goal-following agents, selfish agents, and fuzzy agents. The user controlled agents act as autonomous agents and incorporate behaviors such as police officer, medic, firefighter, and swat official. The survivability of peoples during active shooters events have been studies with mental health services [10] and safety initiative [11]. Immersive VR has been used as an education and emergency response tool for an aircraft evacuation [12], a building evacuation [13], a subway evacuation [14], a megacity evacuation [8], a university campus evacuation [15].

3. Benefits of Immersive VR training module

The introduction of VR technology has changed the way for training for emergencies and improving skills of a user by incorporating immersive learning. The user is virtually immersed in a safe, instructive, and engaging environment that allows them to practice their skills and learn safety protocols and procedures. The Immersive VR security personnel training module leads to:

3.1 Increased retention of knowledge

The security personnel are able to explore the environment and become familiar with the space without being physically present in the environment. It allows for constructivist learning where the user is immersed in the environment and learns through exploration. The learning-by-doing mode leads to hands-on training while exploring various what-if scenarios. The immersive VR allows the trainee to become more familiar and comfortable with the environment as there is engagement through interaction. More interaction in the environments leads to more retention of knowledge and learning. The "sense of presence" in the VR environment allows for more immersive learning experience.

Trainees can also learn from the process of navigating or exploring the virtual environment. Through VR navigation a trainee can gain valuable virtual experience trough discovery or experiential learning. An interactive VR navigation allows the user to explore and walk through the environment unlike a textual or pictorial description that requires reading or non-interactive skills. One of the obvious advantage of immersive VR is that it allows a learner to experience and assess things that are un reachable or un realizable in the physical world. Developing a virtual world allows the learner to explore and interact with the information from unlimited number of viewpoints of the three-dimensional environment. As a result, the learner is able to view things from all three dimensions as well as inside and outside a building. Thus, it allows for constructivist learning because it enables the learner to have multiple perspectives of the world and thus encourages diverse ways of thinking.

3.2 Safe and engaging environment

Learning by doing is a mode of learning where the user is more engaged in the learning process. The immersive nature of VR makes it ideal for focused safety training for active shooter events. The immersive nature of different what-if scenarios makes it possible for a trainee to make as many mistakes as possible. It is often observed that a user learns from its mistakes. The immersive VR allows one to construct multiple scenarios of dangerous situations that might be observed in day to day lives and one can safely allow them to make mistakes without putting people lives at risk.

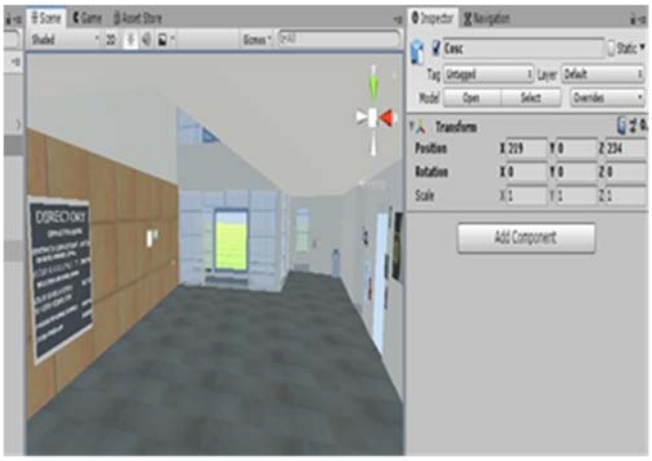

Figure 2. Unity 3D scene

3.3 Effectivity and Scale

Immersive VR learning allows for VR safety training in both scalability and effectivity. For example, videos and online training courses are not as effective as instructor lead training. However, videos and online courses are cost effective to disseminate and share across people. But they lack focus and engagement in training and often leads to less knowledge retention as people get bored with the too much monotonous information. Figure 2 shows the immersive security personnel training module for active shooter events developed in Unity 3D. The development of the module in Unity 3D allows for exporting the VR environment to immersive, non-immersive, and mobile environments.

3.4 Greater efficiency in exposing real-world hazards

One difficulty with emergency training is the difficulty to replicate real-world situations. It is impossible to conduct an evacuation drill with fire and smoke due to safety and legal issues. But it can be safely done in a VR environment that allows one to collect data on human behavior and how one responds to emergency situations. The more the user feels immersed in the environment, the more likely is to gather data on how humans are likely to behave during emergency situations. As a result, immersive VR allows for conducting emergency training for evacuation or active shooter events as they are most cost effective and take less set up time.

4. Immersive Security Personnel Training Module

The proposed immersive training module for active shooter events incorporates two modules for civilian and security personnel as shown in Figure 3. Civilian module is based on run, hide, and fight mode for active shooter response. On the other hand, the security personnel training module incorporates four sub-modules namely 1) Situational assessment module, 2) Individual officer intervention module, 3) Team Response Module, and 4) Rescue Task Force module. When the user clicks on the security personnel module, it leads to four sub security personnel modules as shown earlier in Figure 1.

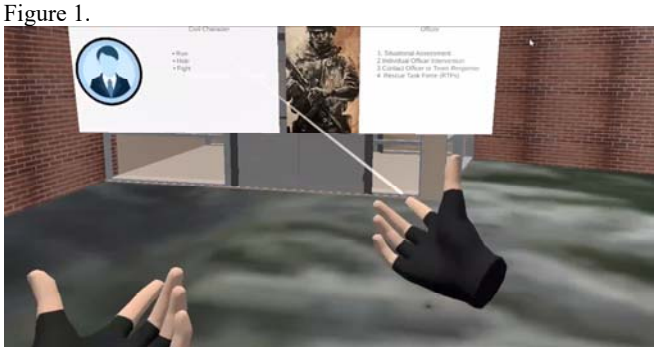

Figure 3. Immersive civilian module (left) and security personnel module (right).

4.1 Situational Assessment

The goal of this sub-security personnel module is to gather situational awareness inside the building. The security personal is dispatched in the incident scene to verify that an active shooter situation exists through information provided by communications personnel or from witnesses or by reports or from sounds or gunfire. The security person will find information regarding location of the suspect, people injured, weapons, find safe zones, etc. Upon completion of the initial assessment, the security person shall advise communications and request resources as deemed necessary. The security person shall also determine whether to take immediate action alone or with another officer or wait until additional resources are available. Figure 4 shows the menu with instructions for the security person in the situational assessment module.

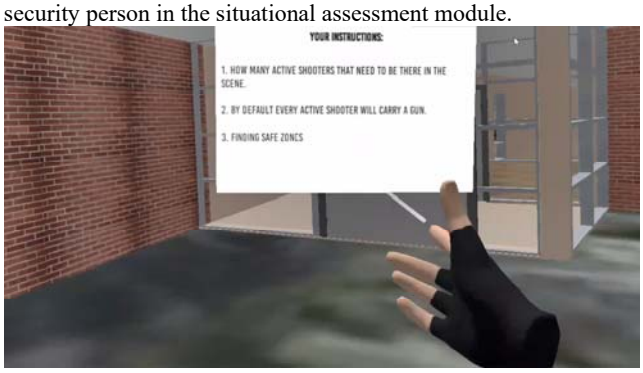

Figure 4. Menu with instructions for the security person

4.2 Individual Officer Intervention

The goal of this sub-security personnel module is to determine if immediate action is necessary and reasonable to stop the threat. The security officer should communicate that the active shooter situation exists and provide information about the identity, location, manner of dress, physical description, weapons, equipment such as body armor, persons injured or under threat, their locations, emergency resources required, and recommended points of entry. The security person should verbally identify himself as law enforcement officer if in plain clothes for civilians who may be armed in the environment. If security person is unarmed, then the critical role in active shooter response is locating points of evacuation and directing people towards safe zones. Also, when possible, the officer should assist with the injured and directing incoming teams to silence all personal electronic devices, take cover, and remain silent. Figure 5 the security person taking a response on the threat.

Figure 5. Active shooter response for the security person.

4.3 Contact Officer or Team Response

The goal of this sub security personnel module is to locate and stop the threat. Even if the threat has been terminated, the security officer is required to render the location safe, assist in screening and the orderly evacuation of persons to a designated safe zone, and locating other persons who are still hiding. The security officer shall provide clear communication to supply the information regarding location of victims, medical needs, estimated number of suspects, their description and weapons if known. The security officer or team should employ tactical advantages such as avoiding the use of the main entrance to provide an element of surprise and to bypass potential booby traps or ambush. Once the location of the suspect(s) is known and any immediate threat is eliminated, the security officer or team should proceed to clear all portions of the location in the event that more suspects are in hiding. The security officer or team shall switch its focus to providing trauma care as necessary when the primary mission is completed.

Figure 6. Active shooter response for the security person.

4.4 Rescue Task Force (RTFs)

The goal of this sub-security personnel module is to provide trauma care and help evacuate victims. The Rescue Task Force (RTF)

module is deployed as officers and resources arrive at the incident scene. RTFs shall be deployed only after the security officer or team has made entry and provided a status report by notifying the command post of the location of victims, and established safe zones. The security person should find wounded and injured persons, and if reasonable, quickly treat for obvious life-threatening injuries. The security person should continue for rescue and recovery operations. Figure 6 shows the security person module for the RTF sub-module.

5. Conclusions

This paper presents experimental setup for conducting immersive security personnel training module for active shooter events by allowing the security person to be trained for the following four sub training modules namely 1) Situational assessment module, 2) Individual officer intervention module, 3) Team Response Module, and 4) Rescue Task Force module. The platform allows for conducting hands-on training for security person for different what-if scenarios. The platform allows multiple users to collaborate together to handle the emergency situation in a safe and secure environment without any safety and legal issues. This platform can be used as a teaching and educational tool for active shooter response training.

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