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## Using Situated Learning to Create an Avatar in VR for the Prayer of "Tawaf"

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### Abstract

This research was inspired by the increased emphasis in recent years on providing a more learner-centered education, and it uses a virtual reality learning environment to do so via interesting problem-solving exercises. In this investigation, we focus on a human-based avatar in a 3D virtual reality setting for an immersive and simulated experience. The use of an avatar to lead students through a virtual reality setting as they act out an issue holds great promise for contextual learning. The interactive nature of simulations makes it possible for students to fully experience a challenging scenario. Situated learning allows students to actively participate in the learning setting, in this case, the study of the Muslim rite of tawaf as part of the hajj. Later, it will give students a head start on their training with avatars by allowing them to digitally practice the tawaf. As a result, students will be able to experience the tawaf ritual in all its virtual glory. Finally, a VR practice tawaf prototype will be created that may be utilized by a wide range of pupils, from younger children to older adults.

### Introduction:

Adult students and those in higher education have benefited especially from this transformation, which has occurred over time. Participatory learning and active involvement in the educational process have the potential to improve retention of material and may be pleasurable. Studies by Bares et al. (1998) and others Motivating our study is the need to investigate strategies for contextual learning in a 3D setting (Rickel et al., 1997). Supporting a learner-centered strategy, 3D virtual reality uses avatars to put students in the action. This research aims to create a web-based, 3D avatar-based, immersive simulation of the tawaf portion of the hajj by combining a learning theory like contextual learning. The intended audience included high schoolers as well as retirees. The Imam of the Islamic Centre at

UniversityTechnology MARA provided the primary motivation for this research. Tawaf is a major part of the Hajj experience and is a requirement for all participants and trainees. The Islamic Centre's trainers had a tough time facilitating the tawaf exercise because of the enormous number of participants. Complementing the course with a 3D simulation with an avatar before engaging in practical training might lead to a fruitful learning experience. The portions of this study are as follows; section 2 provides a brief overview of the previous literature review. In addition, our process for creating the project was outlined in Section 3. The bulk of this work, including discussion of outcomes and interfaces, may be found in Section 4. In the last part, we draw some conclusions.

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## Literature Review

This study was conducted according to the following literature reviews and related works.

### The 3D Virtual Reality and Avatar

Virtual reality (VR) is an interactive computer-generated environment that successfully tricks the user into seeing, experiencing, and interacting with it as if it were a real one. Two of the five senses, sight, and hearing are prioritized while engaging in virtual reality on a computer. The bare bones version of the term "virtual reality" refers to a kind of three-dimensional picture that may be examined in an interactive fashion on a personal computer by means of the keyboard and mouse. In contrast, an avatar is a graphical depiction of a person that can be seen by and interacted with by other users in a virtual world. (Galanin and no, 2007). In this sense, the user is an "object" that may be represented in a somen way. The "avatar" of an online user is the persona associated with their "handle," or screen name. People in virtual worlds represent themselves using digital representations called avatars (Castranova, 2003). Millions of people use avatars in virtual worlds to communicate, work together, and create friendships every day. The most well-known example of a virtual world is the online platform Second Life, which simulates a physical environment in which several users, or "avatars," may interact in real time. (Castranova, 2005). In fact, virtual worlds' conduciveness to play has been compared to creative engines due to the flexibility to explore and the resulting high rates of invention. (Ondrejka, 2007). The Earth and a human body are not analogies that are used by any of these instruments. In these virtual 3D environments, users may take part in social activities while assuming the appearance of their virtual selves (avatars). Because of this, the negative consequences and limitations of the body are taken out of the social equation in artificial environments. (Castranova, 2005).

### Virtual Reality Modelling Language

VRML, or the VRML97 version, is a programming language for creating and interacting with virtual reality environments that can be accessed through the World Wide Web. (WWW). It is a rulebook for establishing a file format for 3D visuals that can be interacted with. A user may access VRML content by installing a VRML browser add-on to their existing web browser. choose an HTML website to

trigger the download and display of a VRML file (Loughran and Stahl, 1998).

### Situated Learning

According to Lave's (1998) situated theory, in contrast to the abstract and out-of-context nature of classroom learning, learning as it really happens is a function of the activity, environment, and culture in which it occurs. According to the principles of contextual learning, is a by-product of the context in which learning takes place and the kind of learning being done (Lave & Wenger, 1991). It is also a hypothesis on the way human minds work, as it holds that our perceptions of the world shape what we know. (Clancey, 1995). Situated learning is predicated on the idea that every learning experience is embedded in a unique setting. (Alessi & Trollip, 2001). As a result, the conventionally linear method of teaching is not required in a contextual learning environment (Launch, 2006). A practice-based method is employed in situated learning, which may not follow the conventionally linear model of classroom education. Situated learning also centres on the idea of students interacting with others who share their interests. Tacit knowledge is the third ingredient. Tacit knowledge is described as information that is "individually held, acquired through experience, and socially embedded." (Nonaka & Takeuchi, 1995). Launch (2006), using Henning's study, concludes that part of situated learning relates to the process of learning to utilize a tool or artifact in a real-world scenario to achieve a real-world aim. Key strategies often used in situated learning environments include stories, reflection, anchored instruction, cognitive apprenticeship, modelling, collaboration, coaching, scaffolding, and judging, multiple practice, exploration, and articulation, according to research compiled by Launch (2006) from McLellan, Brown et al.

### Situated Learning in Virtual Reality Learning Environment

To studying about the hajj, comparable software is available on sites like hajj.al-islam.com. One drawback of this website is that the tawaf activity can only be shown in a 2D drawing. Bares et. al. has created software that integrates theories of learning with VR settings. including al. (1998) for CPU CITY and Shih& Yang (2008) for Virtual English Classroom 3D (VEC3D). CPU CITY was created by Bares et al. (1998) in a 3D learning environment dedicated to teaching students about computer architecture by presenting them with a virtual computer that includes a CPU, RAM, and a

hard drive. The purpose of this program was to teach users, via the use of an avatar, what goes into the process of computing. While, a virtual character, allows students to engage with the virtual reality setting by picking up, transporting, and depositing data packets into registers. Based on preliminary findings from the CPU CITY testbed, liveable learning environments provide a promising new paradigm in educational software. (Bares et. al, 1998). Virtual Environment for Collaborative 3D Learning (VEC3D) was created by Shih and Yang in 2008. VEC3D's primary objective was to create a 3D Virtual English Classroom that provided a fun and engaging setting for learning English. The Virtual Educational Community in 3D (VEC3D) was a virtual campus where students could engage with teachers and other students to improve their English language skills. VEC3D is revolutionary because it allows students to participate in a virtual, 3D learning environment via immersion and interactivity. (Shih& Yang, 2008). According to the study's authors, VEC3D provides students with a fresh platform for engaging in synchronous communication and real-time interactions in both written and spoken formats.

## Development Method

### Project Development Method

A methodical approach to curriculum creation was described using the ADDIE process paradigm. There were five stages total: planning, brainstorming, creating, and checking in on how things went. However, the scope of this study is limited to the stages of a project's life cycle.

### Analysis Phase

This stage will make use of the secondary data. The information we gather will be scrutinized, investigated, and combined. This project will apply and combine all data and information relevant to Hajj performance and web-based 3D simulation.

### Design Phase

The interface design for the simulated 3D world was informed by storyboarding as its result. A storyboard was a visual aid used to plan out a visual narrative, such as an animation, video game, or interactive media experience. sequence.

### Development Phase

The 3D model was developed with the use of animations and a training scenario built in 3D space. According to Parallel Graphics (2007), the

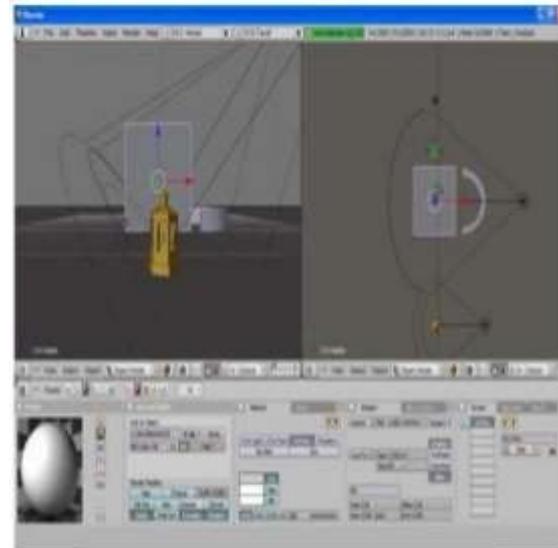
following data flow was used to create the Virtual Manual

### Project (VMP):

The import of VRML97-formatted 3D data. Second, Using the Virtual Manual Generator to Make a Virtual Manual (VM) (VMG). Third, VMG data is added to the VM development. In Figure 1VM Project, the main data flow is shown by the branch in the top right corner. Five, the ability to export VRML97-formatted 3D data from any system. Using an Online Optimization Model for Data Processing (IMO) Starting a new Virtual Machine (VM) project and including VTE-added 3D data. Expanding the depth of these updated models in code.

## The 3D Environment Software

Blender 2.42, an open-source tool compatible with a wide range of systems, was used to create this work. About 61.4 MB is required to install this program. The three-dimensional setting for the tawaf ritual must include a person who can interact with it. regulating one's surroundings by, say, circling the Ka'ba.



**Fig. 1: The 3D environment construction one**

In Figure 1, we saw how Blender 2.42 may be used to improve the area surrounding the Ka'ba. The cube in the background, and the yellow structure in front of it, represent the Ka'ba and the tomb of Ibrahim, respectively. Hirji Ismail was marked with a monument in the plaza outside the Ka'ba. Yes, that is an improvement. The process of creating a 3D model during development. Figure 2 depicted the tawaf activity's beginning line. The tawaf ritual

required seven circuits of the Kaaba. Figure 2 shows an avatar representing a human model who is prepared to do tawaf. The user's avatar served as a moving target for the camera, allowing for a constantly shifting perspective. Only the camera's viewfinder could see the photos. Rukku Hajar Al-Aswad served as the starting point. The clap counter was located upper right. Users' tawaf round counts were shown. When a round was over, the lap counter would advance by one. Whenever the user moved the main window, the map view at the top left of the interface updated to reflect the new perspective. You can really get a sense of practicing tawaf in the genuine area thanks to the immersive audio in this scenario. Hajar Al-Aswad is a rock located in the Ka'ba's (the black cube's) corner. The proper direction of travel around the Ka'ba is counterclockwise. Users had to restart the process from the beginning if they were going in the incorrect direction.



Fig. 2: The 3D environment construction two

## System Interfaces

Building a 3D model of the tawaf zone was the primary goal of this project. Details on the project's completion, including the design and development of user interfaces, will be provided in this part.

### System Interfaces:

The system's interface provided a concise overview of the interplay between the design and analysis phases, the results of which were represented in a three-dimensional model of the Ka'ba guy avatar dressed in ihram was shown in the user interface. The interfaces' backgrounds were designed to seem like the real situation.



Fig. 3: The 3D environment construction

Hajj performance training and 3D environment visualization starting page, as shown in Figure 4. The Kaaba and its surroundings, including a beautiful sky, were featured prominently on the homepage. The user has the choice of clicking the tawaf or the help button.



Fig. 4: Ka'ba and the view around it

Figure 5 showed an in-world avatar praying the tawaf. As seen in the diagram, the avatar will be stationed at the tawaf ritual's outset. There is a lap counter, which may be seen at the very top right of the screen. The user's computer's first tawaf simulation interface looked like Figure 5 when the user downloaded and ran the simulation. Additionally, the regulations for doing the tawaf will be shown. The user may do the tawaf action in the Ka'ba environment at last.



Fig. 5: Starting page of tawaf simulation.

## Conclusion

This research demonstrated how tawaf instruction may progress in a virtual reality setting. By putting avatar in the 3D environment, hajj trainers may immerse with the simulation and enhanced their understanding on the ritual tawaf easy. The project's tawaf activity visualization is also noteworthy. may be more like the real thing than what you would see at a typical training facility. Hence, with this method as an aid or part of the curriculum when conducting the Hajj course, the trainer may infuse the learning process while at the same time emphasizing the involvement of trainees socially during the tawaf activity. The use of an avatar in a 3D virtual environment has enormous promise for promoting contextual learning. Learners may engage actively with the located role-based environment via the use of avatars to conduct activities in 3D virtual reality. Learners may be inspired to engage with what might become a standard in education software by using innovative graphics features like VRML.

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