The use of Virtual Reality in BIM

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Aim of the Project

The project aims to create a document that can be used by companies and students as a stepping stone to learn more about VR in BIM. This was done by completing the following objectives.

- To create a detailed literature review that provides detailed already-known information on the topic.
- To use VR in Revit to demonstrate the immersion VR offers
- Use surveys and interviews to collect the most modern information about VR in BIM.
- Use case studies to show real life examples of VR in BIM.

Background

VR can be described as the use of computer modelling and simulation that enables a person to interact with an artificial 3D visual or sensory environment. It is a buzzword in the modern tech industry and can be seen in many applications in the medical industry, pilot training, and employee training. There are generally three kinds of VR headsets including mobile, standalone, and tethered BIM is also an evolving technology and can be seen as an advanced version of CAD. It differs from CAD as CAD typically only allows for the creation of a 3D object while BIM models components also share relationships and can contain information like price, material, and maintenance information. BIM has a wide range of uses for professions across fields of practice like design, construction and maintenance, and operation of a building. Some BIM software's include Revit, ArchiCAD, and BrisCAD BIM. When the two are integrated it can lead to improving visualisation and allow companies and clients alike to get a better sense of scale when it comes to the placing of important features in buildings like concrete pillars or mechanical components like boilers. Safety aspects in a building can also be assessed and critiqued using VR in BIM like conducting fire drills in VR. It can also save companies time and money when pitching sales to potential clients and reviewing models.

Methodology

1. A strong literature review was to be created with some of the main points shown in the background of this poster. This was done using websites, academic journals, and other research papers to find the most recent information about VR in BIM.
2. Next a survey was conducted among professionals who have used VR in BIM to find their general opinion of the technology.
3. An interview was conducted further to answer some questions that arose from the survey like what makes a good VR experience in BIM? How to prevent motion sickness? And how companies can implement user training?
4. An experiment using VR in BIM was to be conducted to review first-hand experience of the technology.
5. Case studies were also used to support the already found information and also broaden the knowledge of using VR in BIM.
6. The findings from the research were then collated and conclusions were made about the technology.

Surveys and Interviews

The survey was distributed to six professionals in industry that have used the technology as part of their workflows. The survey contained 15 questions to find some of the following information.

- Their general opinion of using VR in BIM.
- If they thought it was a useful part of their workflow.
- What problems occurred when using VR in BIM?
- What headsets and software did they use?
- What recommendations they would make to improve their experience of VR in BIM.

Once the survey was complete, these objectives were completed but also left more questions. Therefore, an interview was conducted with an experienced researcher in industry who had used VR in their workflow. The interview contained 9 questions with the aim to answer the following.

- What makes a good VR system in BIM?
- How can motion sickness be prevented?
- How can a company ensure user training?
- General opinion of VR in BIM being used in projects.

Experimentation

An experiment of using VR in BIM was also attempted using Revit and a Mobile headset known as the Destek V5 shown in the image below.

Figure 1: Destek V5

This headset was chosen as it was cheap, mobile and easy to use. A model created form semester 1's BIM module was used as the model being viewed. An isometric view of this is shown below

Figure 2: BIM Model used

Results

Survey Results:

The survey results were displayed in the forms of pie charts, bar charts, and text answers. Some of the results found included the following.

- 84% of respondents said that VR in BIM was a useful part of their workflow.
- 80% of respondents said their clients thought it was useful.
- Some limitations experienced by the respondents included lack of training, quantity of equipment, lack of software and motion sickness.
- Rendering software's such as enscape appears to be an important part of a good VR experience.

Interview Results:

- The three most important factors to ensure a good VR experience are the VR headset, the rendering software used, and the hardware used.
- Motion sickness can be prevented by ensuring an appropriate headset is used with the correct frequency and resolution (1080px and 90hz). Also, by remaining seated during the experience.
- User training for VR in BIM can be provided by implementing workshops led by experts, giving them access to videos and guides and by allowing them to learn from each other.

Experiment results

The experiment results proved to be partially unsuccessful even though a VR experience was created in BIM. It proved to be unpleasant from the lack of appropriate equipment therefore causing motion sickness and lacking immersion.

Figure 3: Image of VR Render

Conclusion

- VR is a Useful tool in BIM when implemented correctly with the correct headset, software and hardware.
- VR in BIM proved to be a useful tool to communicate project information and progression to clients.
- VR can be easy to use for individuals that have never used the technology before.
- The most important features to ensure a good VR experience in BIM are VR headset, Hardware used and Software used.

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