Lecture 13:
Future Mixed Reality Educational Spaces Campbell et al

COMP 30025J

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ABSTRACT

- Tele-presence framework to facilitate teaching in future mixed reality spaces

- Providing a middle ground where the advantages of MOOC's can be balanced with advantages of traditional teaching spaces

- Mixed Reality Campus; this was carried out using 3D modelling tools and runs a simulation using a game engine that supports the Oculus VR HMD / VIVE HMD

- Future Mixed Reality Space that combines these technologies and will allow both lecturers and students to maintain a joint space supporting the constructivist teaching and the traditional approaches

CONCLUSIONS

- This new technology has shown the amazing possibilities of this technology which could see cost of education drop significantly

- Education is a fundamental human right and essential for all other human rights [Assembly, 1948]; In reality even when provided for free by the state, the quality of education can differ widely across the planet

- VR becomes the perfect tool to meet the requirement of Vygotsky's zone of proximal development [Vygotsky, 1987].

INTRODUCTION

- A perception now exists that a third level education is the requirement for any form of employment (Credential inflation)

- Third level education costs have been rising for decades and colleges have been expanding. Debate about this increase leading to an education bubble [Li et al., 2014] have become commonplace and this phenomenon exists worldwide [Lee et al., 2014]. phenomenon worldwide [Verbik, 2015].

- MOOC look like the answer but at undergraduate level can have drop out rates of 97%

- A future learning space must be able to blend both traditional classroom and innovative online learning environments. In terms of Vygotsky zone of proximal development[Vygotsky, 1987] both spaces aid a learner in reaching a new developmental stage.

BACKGROUND

- Reference Sutherland from the beginning ☺

- Simulators have been using computers for some time, and the concept of using a computer in general as a mediated class room for universities is not new[Hiltz, 1986]

- The advantage of using an immersive VLE using a constructivist approach, thus allow students playing the VR environment and learning as a result has been demonstrated to be useful[Pan et al., 2006].

- Future learning space modelled for this paper used the University College Dublin School of Computer Science as its model. Multiple universities and institutions have already done this is for their spaces in Ireland, China and United States

- 2D projection which has been given the name 2D Hologram [Harris, 2013] when in reality it is just an advanced form of the peppers ghost illusion that has existed for more than a century.
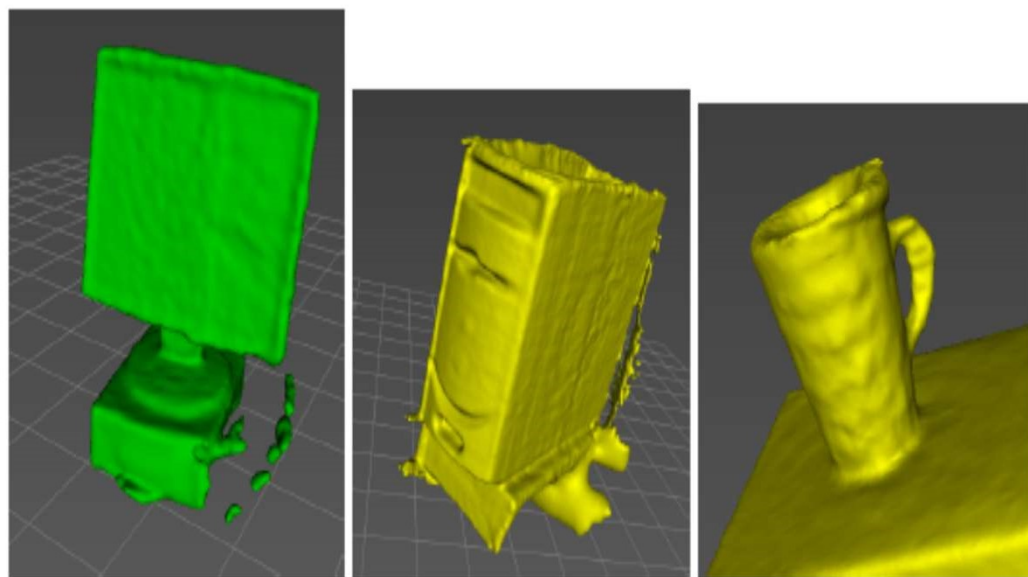
THE FUTURE LEARNING SPACE

- Unity3D Engine used for VR space

- The major advantage of Unity engine is its plug-in architecture. Unity allows the developer to extend the built-in functionality of the engine by creating and linking external libraries

- Recommendations
  - Low Poly
  - Static lights

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Photogrammetry versus point-cloud from laser scanning

LIBRARIES FOR FUTURE LEARNING SPACES & (4.1 Networking done easy)

- Bases space was developed to create class room

- Libraries then used to extend the space

- Enable networking within the environment, a builtin networking tool called UNET

- Tested using FlexiHub

- UNET will be utilised due to its ease of use and any issues regarding video frame rate will be remedied with custom C sharp scripts (This turned out in the last month of testing to be better to use Photon)

4.2 White board of the future

- Leap motion controller in combination with HTC VIVE
    - Change marker colours on the y, along with opacity and tip radius.
    - Copy and paste pdf documents and jpg images.
    - Images, documents and writing turned into UI elements so they can be easily dragged around.
    - A 3D pen so student and lecturers can visualise concepts in real time 3D (ala TiltBrush by Google

4.3 Webcam Integration

- The future learning space allows for the use of multiple webcam devices to render as separate image textures in-game

- Webcam was through the use of the built in VIVE headset camera

- Webcam integration will also be built upon in future to allow for a speaker to be projected allowing for a holographic effect
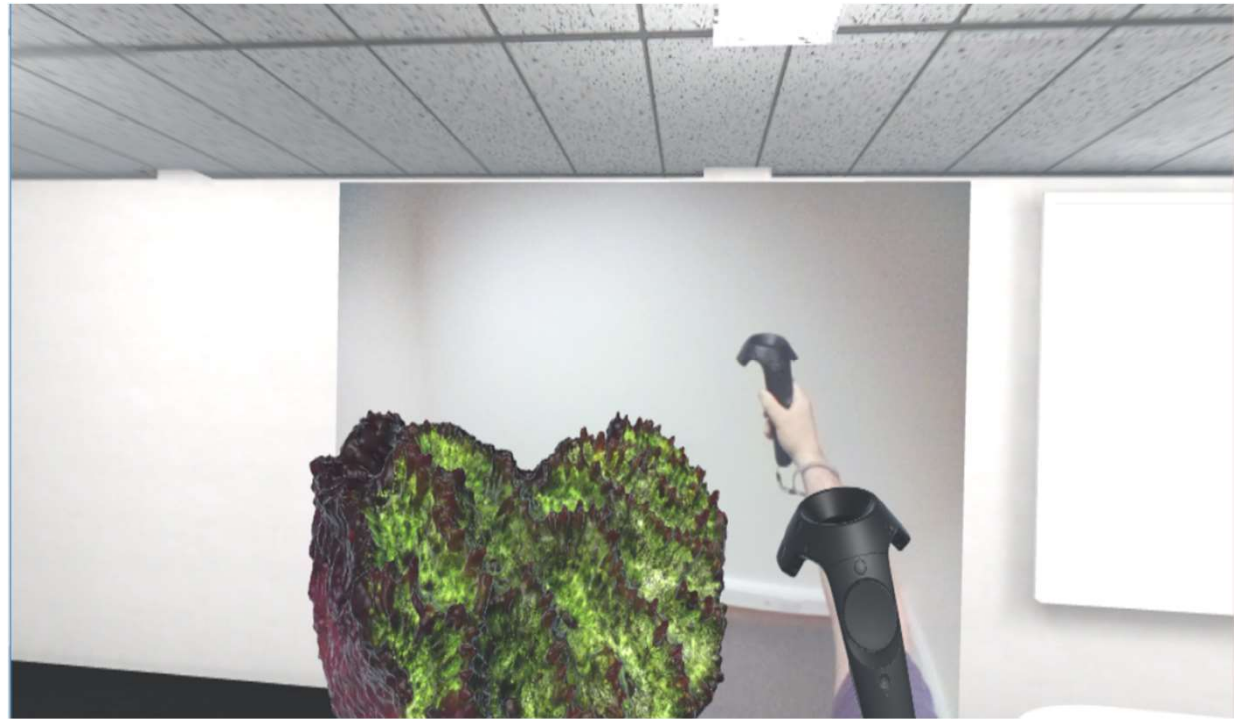
4.4 SteamVR and VIVE integration

- The SteamVR plugin allows users to experience the lecture theatre in Roomscale, while the Leap Motion plugin will facilitate hand gesture communication alongside virtual writing and 3D modelling interactions

- The use of hands has the potential to offer more immersive learning experiences and in turn allow the student to retain more of their knowledge, as it allows a far more intricate form of object interaction

- SteamVR plugin is also easy to implement after importing the packages. The SteamVR plugin allowed the use of the "camera rig" Unity prefab to quickly put the user into the scene while any custom controller functions required a script to be applied to each individual controller

Virtual Reality Questions

- "How can VR and AR be used for Teaching ?"
  - Future space creation **, Campbell et al** gives one example
  - Use of game engines to create a environment **Lewis and Jacobson**
  - **Cruiz-Neira et al , Prince et al** , **Campbell et al** for how telepresence can be created
  - Examples for education at the end of **Krevelen and Poelman** paper