Quick and dirty volumetric video recording for performance capture

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Background

Volumetric video capture is the technology to record a subject (for example a human performer) from multiple angles, and then digitally combine this into a volumetric display. Such a video can be played back and viewed from any angle. The technology is so far highly experimental, but have been used in some applications to create art performances and characters in computer games and movies. Usually this is done with a large number of cameras and in general a very expensive studio set-up. It is primarily pre-recorded, but streaming of live volumetric capture have been done and will probably be important in the future. One interesting application of live streaming is virtual reality or augmented reality meetings. Another is recording lectures for play back in VR or AR. The ultimate vision is to create the "hologram meetings" that have been portraited in many science fiction stories.

Project description

As mentioned above, the technology is still highly experimental and usually expensive and fixed in studios. The purpose of this project is to explore the possibilities, methods and techniques for creating quick and dirty volumetric recordings. Simple cameras such as Kinects or Realsense could be used, as well as simple configurations with only three cameras, and either free or custom-made software. Such a set-up could be cheap (approximately 20 000 SEK) and could take an hour to set-up in any room.

Two previous master thesis projects have established some methods, and these should be used as a starting point. How can the methods and technologies be further refined and made more efficient? The recording quality from these previous projects have been quite raw; how much better can the image quality be with this simply equipment?

We assume that the project will primarily focus on pre-recording of video, but a very interesting extension is the live streaming of volumetric video. A blue sky vision is to be able to live stream into a cheap AR headset such as the Aryzon, so the recorded subject can be seen as a volumetric display ("hologram") in another environment.

The steps of the project would be the following.

1. Review (together with supervisor) required hardware, and decide on additional purchases
2. Set up hardware for volumetric recording (in the Kuggen Medialab at Lindholmen)
3. Test existing software and evaluate need and possibilities for creating custom software
4. Record volumetric video sessions and display them in VR or AR via Unity or Unreal Engine
5. Refine quality
6. Test streaming of volumetric video

The project is mostly relevant for interaction design, user experience and game design.

Previous and future work

In 2019 and 2020, two master thesis projects worked on a similar project, so there exists previous hardware and material, and project reports to have as starting points.

Since the project could continue after your thesis work we strongly suggest that all material from the project is considered open source and/or licensed under creative commons. This needs to be discussed before the project starts.

Suggested reading (watching) material

Blade Runner 2049
Virtual character implemented with volumetric capture. Video giving an idea of the experience:
https://youtu.be/z2BkCEPImGA?t=117

EF EVE
One of the existing platforms. Video giving an idea of one of their streaming tests:
https://www.youtube.com/watch?v=D8QRdOSBLPQ

Microsoft Ignite keynote in AltspaceVR
Microsoft show cased some of their volumetric capture in this discussion with James Cameron, in VR:

https://youtu.be/r-QGgCixk80?t=2640

Target group
The proposal is relevant for students from DV, D and IT.

Special prerequisites
Skills in Computer Graphics, Unreal Engine or Unity is a big advantage.

Proposal author
Thommy Eriksson thommy@chalmers.se