METU, Department Of Computer Engineering

Graduation Project
Proposal Form

Project Information

Title

Carbon Copy World (CCW)

Target

Public [ ]   Restricted [X]

Proposer Information

Name(s)	Ülkü Meteriz Cantürk Şen Batuhan Mert Varilci Necip Fazıl Yıldıran
E-Mail(s)	ulku.meteriz@ceng.metu.edu.tr canturk.sen@ceng.metu.edu.tr e2099455@ceng.metu.edu.tr necip.yildiran@ceng.metu.edu.tr

IP (Intellectual Property) Information

WMG, The University of Warwick has the right to use project outputs.

Project Description and Background Information

Description

Virtual reality environments are becoming more popular in training, simulation, animation, entertainment and recreating cultural heritages which are lost or becoming extinct. Visuals that are generated in virtual environment are mostly created using computer aided modelling techniques. In this project, we aim to offer more realistic virtual reality experience by using real world environment as the source of 3D viewing.

Similar Products/Projects

There are works on usage of Kinect sensor as a source of point cloud video. Although they give an idea about the usage, all of them are in a primitive stage when compared to the aim of our project.

There is a firm, Lytro, working on light field imaging which allow them to create virtual reality environment using the real world as the source of visual data. However, they use camera arrays which ends up as an expensive and inaccessible solution. [1]

Justification of the proposal

There is not an affordable and accessible way to capture real world data to use as 3D model.

Our project aims to:
- recreate the real scenes in the virtual environment which will allow people to experience more realistic views
by using visual data captured from real world rather than using models,
- create a user interface which can be used by people who are not necessarily expert on the field of computer
science,
- use affordable equipment while reaching its aim.

Contributions, Innovation and Originality Aspects of the Project

Currently, there are similar solutions to the problem we aim to solve in some aspects. In addition to these solutions, our project will have clearer view in a wider range of viewpoints than existing 3D point cloud videos. This project will be also an affordable option for those of people who are interested in this area with respect to the referenced one [1]. We offer a usable product which allow people with low knowledge about the basic hardware and the software.

We are aiming to create meshes from point cloud with a different technique. Also, we are aiming to automatize the alignment process of two or more point-clouds. This will lead us to reveal novel techniques on the mentioned jobs while working on our project.

Technical Aspects of the Project

We are going to employ image processing algorithms and computer graphics tools in our project. When considered the hardware side, we will employ depth sensors and color cameras to capture visual information from real world.

Targeted Output, Targeted User/Domain Profile

The people who want to record real world's visual data and make the record available in virtual reality environment can use the product. The groups we are mainly aiming to help are:

- The people who want train others by using a unique training session which no trainer is involved repeatedly,
- The people who want to simulate a scenario which is not existing currently,
- The psychologists who want to treat their patients in a realistic manner [2],
- The museums which want to offer visitors the opportunity to experience viewing certain activities.

The product will be a pipeline of executable programs to record and view the recorded data.

Project Development Environment

The following software technologies will be used while development:
- Visual Studio 2017
- Unity Game Engine
- CloudCompare
The following programming languages will be used while development:
- C#
- C++

External Support

In our project, we are going to use the following hardware:
- Microsoft Xbox One Kinect Sensor (x2)
- Xbox Kinect Adapter for Windows (x2)
- Oculus Rift DK2 (x1)

We are going to use following software:
- Unity Game Engine
- Kinect for Windows SDK 2.0

Visualisation Group, WMG, The University of Warwick will provide the following hardware for 1 year period,
which is to be shipped back when the project is completed:
- Microsoft Xbox One Kinect Sensor (x1)

- Xbox Kinect Adapter for Windows (x1)
- Oculus Rift DK2 (x1)

We kindly request the following equipment from our department:
- Microsoft Xbox One Kinect Sensor (x2)
- Xbox Kinect Adapter for Windows (x2)
- Tripod (x3)
- Switch (x1)

We believe that the requested devices can also be used by some other teams in the following years since they provide basic functions on computer vision. In the case department could not provide the mentioned equipment, we are going to buy the equipment.

Prof. Alan Chalmers [4] from Visualisation Group, WMG will co-supervise the project. We are planning to have weekly meetings with him on Skype and get advices on the progress of the project. The output of the project will be used by WMG for projects that is aiming to recreate cultural heritages on virtual environment.

References

[1] "The Making of Hallelujah with Lytro Immerge" - https://vimeo.com/213266879

[2] "Fobiler sanal gerçeklikle yenilecek" - http://aa.com.tr/tr/bilim-teknoloji/fobiler-sanal-gerceklikle-yenilecek/656739

[3] "Multisensory Virtual Experience of Tanning in Medieval Coventry" - https://diglib.eg.org/handle/10.2312/gch20171297

[4] https://www2.warwick.ac.uk/fac/sci/wmg/people/profile/?wmgid=474