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DEPARTMENT OF COMPUTER SCIENCE

WHOOSH DIVISION

OcuViz - EpiUse Labs

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1 Introduction

When presented with fairly large or small numbers we as human beings tend to struggle. One struggles to grasp the sheer magnitude of how much a trillion dollars is for example or the distance light travels in a second.

The aim of OcuViz is to create a platform for the visualization of data in 3D space using virtual reality to provide an immersive and presence depth.

2 General Information

2.1 System Overview

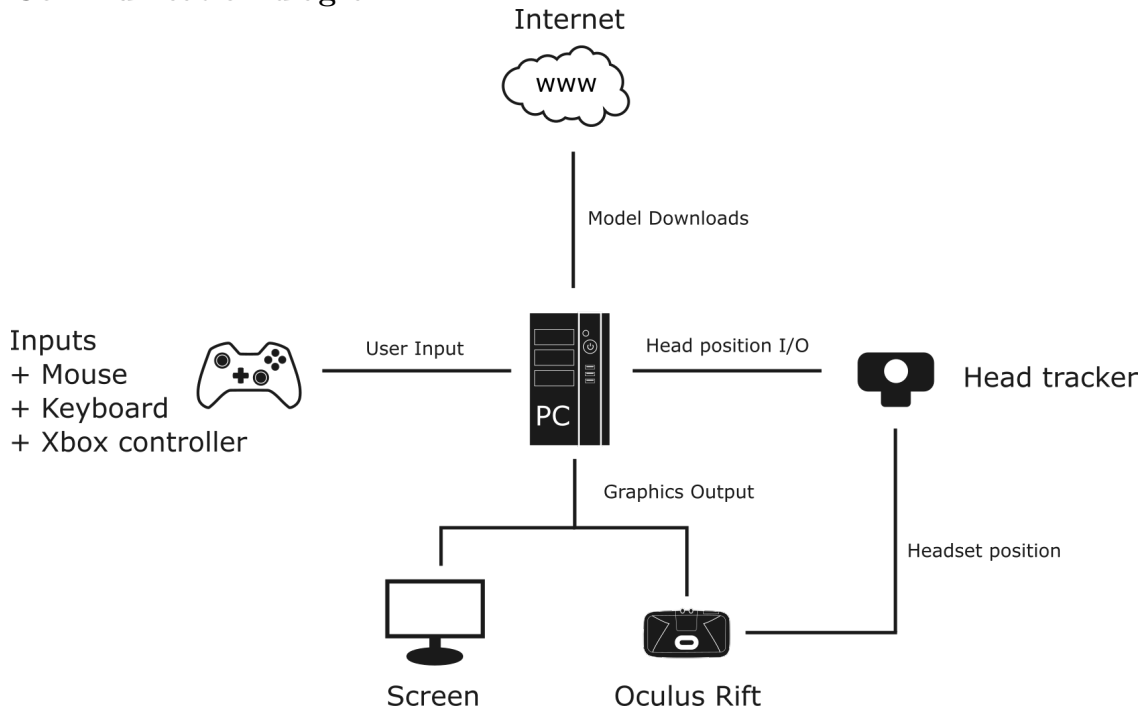
OcuViz is a platform for the visualisation of data in a virtual 3D space to allow users to conceptualise large numbers more accurately and naturally. Leveraging the power of VR we are able to create awe-inspiring and immersive scenes for users to experience. As well as, allowing users to create their own scenes through either modular CSV files which are interpreted into 3D scenes or a simplified editor without requiring the user having to be a graphics experts.

2.2 System Configuration

Minimum hardware requirements to run OcuViz

- VR Headset: Oculus Rift DK2
- GPU: GTX 970 or AMD R9 290
- CPU: Intel Core i5-4590
- RAM: 8GB
- USB: 2 USB 3.0 ports
- OS: Windows 7 SP1

Communication diagram



OcuViz receives input from the user through either keyboard, mouse and xbox controller. Or from the head tracker camera which sends location based input to OcuViz with regards to user height, head orientation, etc.

OcuViz is able to retrieve models for scenes from either local storage or via the internet where it can download specified models.

Finally graphics output is pushed to both the screen and the Oculus Rift headset.

2.2.1 Installation

OcuViz Prerequisite

- Oculus Rift Runtime Setup - <https://www3.oculus.com/en-us/setup/>

OcuViz will be provided in both portable and installer formats. To install simply unzip the files (portable format) or follow in the installation instructions.

3 Getting Started

OcuViz is straight forward to use. Ensure your Oculus Rift Headset, controller and head tracker are plugged in. Then launch Oculus Store. Ensure that your headset is showing a blue light. If not check Oculus Store to see the issues that exist. Also accept the health warning message displayed by the h Finally simply run OcuViz.exe to use the software. No login is required and would not make sense for this system.

Launching OcuViz

OcuViz aims to be a user friendly experience. To start using OcuViz is a straight forward procedure.

1. Ensure Oculus Rift headset, head tracker and controller (or keyboard and mouse) is plugged in.
2. Launch Oculus Rift Runtime.
3. Check that Oculus Rift headset is showing a blue light.
4. Accept the health warning message if one is displayed on the headset.
5. Run OcuViz.exe

4 Using the system

There are multiple ways to use the system. Upon startup, the user would have to use the menu scene to select one of the following:

- A predefined scene
- Use the editor to create a scene
- Select a recently created scene or
- Specify a directory containing a CSV file which will describe the scene's content.

4.1 Predefined Scenes

4.2 Editor

4.3 Recent Scene

OcuViz tracks all scenes recently used / created. It allows for quick access to such scenes preventing the user from needing to search for a scene via explorer.

4.4 Scene Descriptor File

In this use case, the user would specify the location of the scene descriptor file containing all the data to be rendered. But before we continue, we need to introduce the concept of an Entity.

An Entity is the final object that appears in the scene. An Entity is created using a line in a CSV file (these parameters will be specified shortly). You can further add

to an Entity by using other lines to change colour, add texture, or even create a collection of the Entity containing multiple copies. In order to tell OcuViz what you want to decorate, an EntityLink is used. This is the unique name given to the Entity being rendered. So decorations are applied to an Entity that contains the given EntityLink.

Now onto how to specify an Entity. You can have one of the following base Entities:

- Shape: 3D objects such as spheres and cubes
- Light: different light sources in the scene, including directional and ambient lights
- Model: 3D models such as .obj files that are created

Certain Entities such as Shapes can then be further decorated with additional properties:

- Colour: the colour of the Entity
- Texture: add a texture to an Entity.

These decorated Entities can be used as prototypes for creating a collection of Entities. There exist two kinds of Entities:

- Collection: a basic collection with predefined types
- CustomCollection: a specialised collection with only the prototype as a predetermined property.

Scene-specific properties can be altered too. These are:

- SceneName: the name of the scene
- BackgroundColour: this changes the background colour of the scene.

4.4.1 Shape

Shape,EntityLink,type,GRAVITY,mass,xlen,ylen,zlen,xpos,ypos,zpos

The above is the format required to specify a shape. Note the lack of spaces in the format. The parameters are discussed below.

Shape: This specifies the type of Entity being created. This value never changes for all shapes.

EntityLink: As discussed above, this string is used to identify the entity being created.

type: This says the type of shape being created. Types acceptable are

- plane
- cube
- sphere

- capsule
- cylinder
- quad

GRAVITY: This is a flag indicating whether the Entity should use gravity or not. Values accepted are true or false.

mass: Floating point value indicating the mass of the Entity in kilograms.

xlen: The length of the Entity in the x plane in metres.

ylen: The length of the Entity in the y plane in metres.

zlen: The length of the Entity in the z plane in metres.

xpos: The position of the Entity in the x plane (measured in metres).

ypos: The position of the Entity in the y plane (measured in metres).

zpos: The position of the Entity in the z plane (measured in metres).

4.4.2 Light

Light,EntityLink,type,#colour,xpos,ypos,zpos,range,intensity

The line above is used to create a light in the scene.

Light: This specifies the type of Entity being created. This value never changes for all lights.

EntityLink: As discussed above, this string is used to identify the entity being created.

type: The type of light being created. Possible types are

- spot
- area
- directional
- point

#colour: No, this is not a hashtag. This is the hexadecimal colour used for the light.

xpos: The source of the light in the x plane.

ypos: The source of the light in the y plane.

zpos: The source of the light in the z plane.

range: Floating point number indicating how far the light should travel.

intensity: This value between 0 and 1 indicates how strong the light is.

4.5 Model

Model,EntityLink,http://EntityFile.obj,posX,posY,posZ

5 Troubleshooting

Why is the headset is not displaying an image?

Firstly ensure that the headset is showing a blue light. If an orange light is being displayed, exit OcuViz. Restart Oculus Rift Runtime and relaunch OcuViz.

Why am I feeling motion sick?

Firstly with OcuViz you are not limited with what you can place in the scene. Thus if you try and add a billion objects, your computer will attempt to render it, albeit poorly.

With VR performance is vital to ensure not only a smooth performance but also one free from motion sickness. Specifically OcuViz is intended to run at a minimum of 75 fps (frames per second) for DK2 and 90 fps for CV1. Besides this, a maximum latency of 16.6 ms needs to be maintained to prevent motion sickness.

In order to see a scene's performance, go to settings in OcuViz and enable the performance option. In your scene HUD you will now see both the scene's fps and latency. If these numbers are green it means that motion sickness is not a result of hardware.

What else can cause motion sickness? Well how long have you been using OcuViz? Using it for an extended period of time can result in motion sickness but this is user and scene dependant.

Finally if someone else moves you this will cause motion sickness.