EPI-USE LABS
value through innovation

OcuViz

3D Infographic with OculusRift

Project Proposal

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1.OcuViz

It is sometimes difficult to imagine how far away the moon really is or how much money is spent every day. Humans can't always conceptualize large numbers if they are just digits on a piece of paper. The project is to create a platform for visualization of data in a virtual 3D space to enhance the sense of scale. This platform will allow us to actually see how much, how big or how far something is. We will be able to compare numbers visually without physically having to fly to space or collect all the money spent and put it in one big pile. For this project we going to utilize the power of the Oculus Rift to visualize these scenarios.

2.Project Objectives

Humans are visual beings and thus numbers are not a very good way of bringing across the sheer scale of some of these scenarios. People struggle to conceptualize data as numbers and visualizing these in a virtual world allows even the physically or logistically impossible to become possible. For example, can you imagine what a million dollar would look like as hundred dollar bills?

This is a $100:

This is $10 000:

And this is $1 000 000:

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A little less impressive than you'd think it would be.

This demonstrates why enabling people to visualize data they would otherwise not be able to conceptualize could add great insight into information. This project aims to allow people to design and create scenarios which can be visualized in a physically-correct virtual world with the Oculus Rift. The project will provide them with tools and the platform for creating and viewing these scenarios.

3.Project owner

This project will be completed for EPI-USE Labs in Pretoria.

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4.Project scope

4.1 Functional requirements

- Allow creating scenarios
  - Import raw/numeric data
  - Import or download 3D models or scenes
  - Describe physical properties of the scene and the viewer
  - Design layout of scene
  - Allow defining properties that must be changed over time such as the size of individual objects
- View scenarios using the Oculus Rift
  - Be able to move around the world
    - May be restricted by the scenario

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        - Allow various controls such as gamepads or other input methods
    - Allow users to change their size (become bigger or smaller)
        - This ratio to an average human must be displayed if an user or the scenario has changed the user's relative size
    - Allow changing the rate at which time passes
        - The speed at which time passes must be displayed if an user or the scenario has changed the speed at which time passes

4.2 Additional features

- Allow interfacing with data repositories to retrieve data
    - Wolfram Alpha
    - Google Public Data Explorer
- Advanced animation/physics
    - Object falling on piles
    - Growing animation
    - Flowing liquids

5. Architectural requirements

5.1 Non-functional Requirements

- Performance
    - Consistent and high frame-rate (13.33ms per frame or less)
        - 13.33ms per frame (75fps+)
    - Low latency (Input to display latency)
        - Ensure input is captured just before it is required and is not delayed by a frame
- Usability
    - Any person able to play basic computer games must be able to view scenarios without training
    - Designing basic scenarios should be very simple
- Extensibility – Code structure should be modular enough to allow for easy future development
- Stability – Application should not crash due to user input
- Portability
    - Even if it is not a requirement to run on Windows, Mac and Linux, it should be simple to port the application to either one of these operating systems.
    - Portability to Android, iOS or another mobile platform is a bonus

5.2 Recommended technology

The following are only recommendations and other technologies may be proposed if they adhere to all the requirements.

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A 3D/Game engine is recommended but you may use a 3D API, such as OpenGL, directly. The selected engine or API must be cross-platform (Windows, Mac, Linux minimum) and must have decent performance when working with lots of independent objects.

A physics engine might be required for some of the additional features. It is not recommended that you implement your own. Recommended open-source physics engines are Bullet and ODE.

It is highly recommend that you use version control such as Git. It is not recommend to use Dropbox for version control of code.

6.Skills requirements

It is highly recommended that at least one of the group members have experience in creating 3D graphics applications. The sheer amount of objects in some scenarios might require complex graphical or algorithmic solutions to achieve the required performance, especially when using virtual reality devices where users are very sensitive to low or inconsistent frame rates. Knowledge of 3D engines such as Unity or Unreal would be useful.

7.Project deliverables

- Source Code
- Build scripts or project files
- Documentation
    - Requirements (signed)
    - Architecture
    - User/Installation Manual
- Example scenarios (3 minimum)
    - One example must display at least 100 000 objects

8.EPI-USE commitments

8.1 Resources provided by EPI-USE

An Oculus Rift DK2 has already been procured specifically for the purpose of this project. EPI-USE will make the Oculus Rift and SDK available to the students for the duration of the project.

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8.2 Meetings and feedback

It is expected of the team to provide the project owners with a detailed time line and setup regular meetings. These meetings can be held on campus or at the EPI-USE offices which are close to the University of Pretoria.

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