Husker STEM VR – UNL CSE Falkinburg-Palmer

Project Overview

For this project we would like to have the team work with us to build a virtual reality Oculus Quest app for UNL's Computer Science and Engineering department to encourage STEM outreach for UNL and the department. The team will build a virtual world around Memorial Stadium allowing the students to do fun engineering type activities/research that are happening here at UNL in the CSE department. This project is somewhat open to the imagination of the students that join this team. I have a potential list of fun engineering activities/research that can be incorporated into the VR application in the scope of work. The team will be working closely with CSE Faculty and the CSE Advising department to develop the best app for STEM outreach.

Sponsor Background

Prof Jeff Falkinburg is a Lecturer in the Computer Science and Engineering Department at the University of Nebraska-Lincoln, a Computer Engineer, and recently retired U.S Air Force Major. My research interests include robotics, embedded systems, 3D modeling, and simulation design. My areas of specialization include VLSI Systems, Computer Architecture, Embedded Systems, Advanced Digital Design. He has been teaching in the CSCE department for three years and have taught courses like Computer Organization, Embedded Systems, Advanced Embedded Systems. During that time he has also been Tribe Lead for many CSE Senior Design projects and wanted to propose a VR project with a little more of a hardware/robotics feel to it.

Brittney Palmer joined the Computer Science and Engineering department as Recruiting Coordinator. She previously worked in the Admissions office right here on campus where she was a recruitment specialist traveling in the state of Iowa. She has enjoyed educating prospective students about the University of Nebraska-Lincoln and will continues to do so in the CSE department. Prior to her time here at the university, she was an elementary and special education teacher for six years. She has taught in both Sioux City, Iowa, and in Lincoln Public Schools as a special educator and third grade teacher.

Palmer is excited about growing the population of computer science, computer engineering, and software engineering students. She has a special interest in educating new generations about the many options that are available to them in this field of study. She wants to ensure that all students realize there is a place for them in the department.

Project Stakeholders

This application will be used by engineering outreach throughout UNL.
- *Jeffrey Falkinburg, Lecturer, Principle Investigator and Primary Contact*
- *Brittney Palmer, Recruitment Coordinator, CSE Advising and Recruiting Expert*
- *Other UNL Engineering Recruiting offices*

Current System Overview

This project will have the team build a virtual reality Oculus Quest app for UNL's Computer Science and Engineering department to encourage STEM outreach for UNL and the department. The team will build a virtual world around Memorial Stadium allowing the students to do fun engineering type activities/research that are happening here at UNL in the CSE department. The Huskers STEM VR app shown below in Figure 1 will be used for STEM Outreach and Recruitment.

Figure 1: Husker STEM VR App Overview

Proposed System/Scope

In the following four subsections, we will provide the project vision.

1. Business Justification

This will be an Oculus Quest app that will be used to help with recruitment in the Computer Science and Engineering department at UNL by providing a fun and engaging way to learn about STEM and about the Huskers in virtual reality environment.

2. Proposed System Overview and Strategy

The final solution we wish to attain is a STEM outreach focused game that implements various fun engineering type activities/research accomplished here at UNL in the CSE department. This app could include somewhat of a virtual tour of the area around Memorial Stadium or some challenging escape room activities that. Ultimately the app will be designed to encourage the user to pursue degrees in STEM at UNL.

3. Scope of Work

The team is tasked to create a virtual reality Oculus Quest app for UNL's Computer Science and Engineering department to encourage STEM outreach for UNL and the department. The app will build a virtual world around Memorial Stadium allowing the students to do fun engineering type activities/research that are happening here at UNL in the CSE department. Here is a list of potential activities/research that could be built into the VR app.

- *Tour through Memorial Stadium and portions of the UNL Campus with an engineering scavenger hunt to collect tokens of the different types of STEM degrees offered here at UNL (Maybe Golden Computers).*
- *Fly a quad copter around/in Memorial Stadium.*
- *Drive a remote controlled robot or RC car around/in Memorial Stadium.*
- *Launch Rockets/Fireworks from inside Memorial Stadium.*
- *Escape room challenges like building a simple circuit with resistors, buttons, LEDs, speaker, etc. Something like Snap Circuits except virtual. In other words we could also have them build a robot with motors and sensors to make them work*
- *Some sort of bridge/tower building activity.*
- *Scooter tour of Campus.*

4. High Level Architecture Requirements (Technical Specifications)

This app will be developed to be deployed on the Oculus Quest headset devices using Unity.

Expected Deliverables from Project Team (Senior Design Provides)

The expectation is a fully functional Oculus Quest mobile application that is deployed to the SideQuest Store and potentially the Oculus Quest store by the end of this effort. Additionally, we expect that you plan ahead to have a developmental version being deployed as an APK installation files that can be sideloaded on the Oculus Quest devices via SideQuest for starting no later than Release 3.

Supporting Materials (Sponsor Responsibilities and Provisions)

This project is motivated by some of the VR capabilities shown in the Oculus First Steps app. Specifically, the blocks, ping pong paddle/ball, paper airplanes, and the remote controlled zeppelin shown in Figure 2.

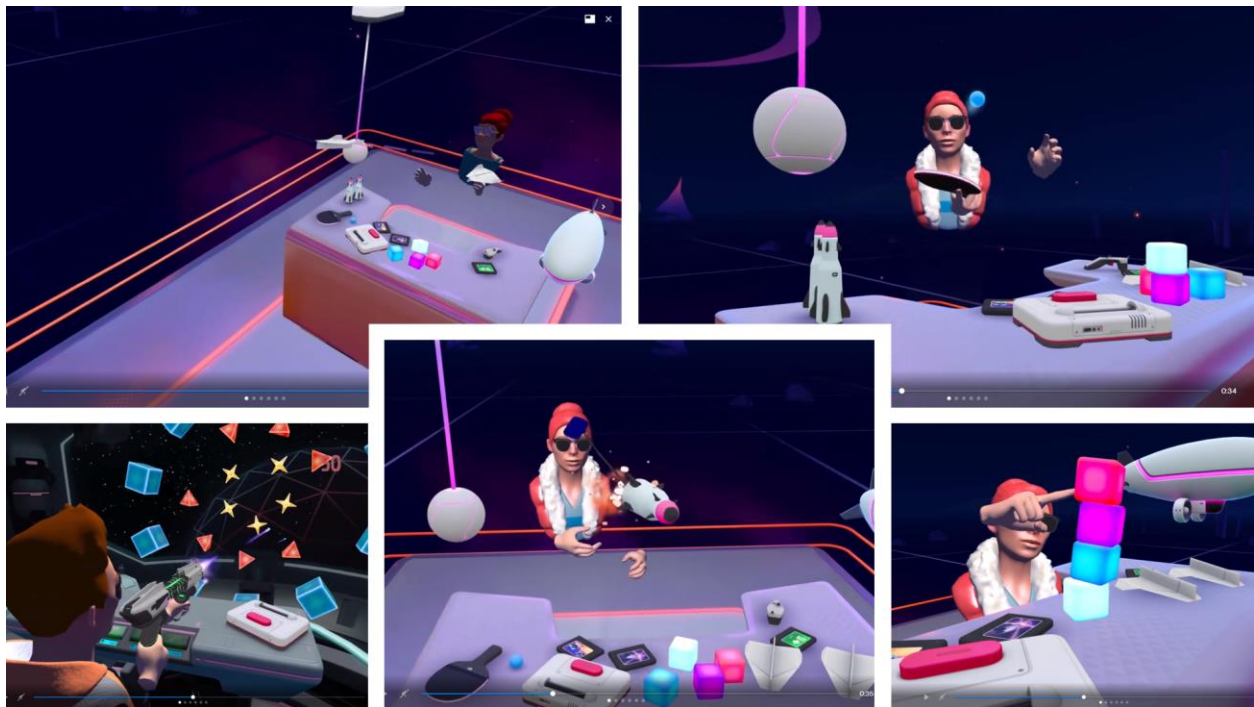- *https://www.oculus.com/experiences/quest/1863547050392688/?locale=en_US*

Figure 2: Images from the Oculus First Steps App

Here are a couple apps already available for STEM education to give you some ideas, but ultimately the team will have a lot of academic freedom to propose a plan of attack and final solution:

- *https://sidequestvr.com/app/974/futuclass-stem-education-in-vr*
  - *Futuclass is an educational game for learning natural sciences. The goal is to solve puzzles related to real life examples. Every module in Futuclass is designed like an escape game. Instructions and hints inside the rooms guide the player.*
- *https://sidequestvr.com/app/3813/rollover-ranch*
  - *UNMC Rollover Ranch developed last year by CSE Senior Design Students to teach about Tractor Safety.*
- *https://sidequestvr.com/app/3848/nurses-escape*
  - *UNMC Nursing Escape room developed last year by CSE Senior Design Students to teach Nurses about Sepsis.*
- *Example 3D Model of Memorial Stadium:*
  - *https://3dwarehouse.sketchup.com/model/7d732e205833546d984d58190460bdb5/Lincoln-Memorial-Stadium?hl=en*

Communication Plan

The communication will be mainly via Slack (text, audio, or Zoom calls). Meetings will be held via Zoom for weekly meetings and in-person for major milestone meetings if possible. The primary contact is available weekly to answer any questions during his office hours or at scheduled office/Zoom visits. Email for an appointment. Otherwise, send a message via Slack and I will get back to you asap.

Sponsor Contact Information

Below is a list of the stakeholders on this project.

Name	Primary Contact (Y/N)	Email Address	Title	Address	Phone Number
Jeffrey Falkinburg	Y	jfalkinburg2@unl.edu	Lecturer – Computer Engineering	368 Avery Hall	402-312-8078
Brittney Palmer	N	brittney.palmer@unl.edu	Recruiting Coordinator	250D Avery Hall	402-472-5027