Virtual Nuclear Micro Reactor User Facility

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INTRODUCTION
The demand for nuclear research reactors on university campuses is becoming more prevalent as the use of nuclear energy grows. Demand for more nuclear energy means more nuclear reactors. Ideally, as each new reactor is built, it will be the most advanced it can possibly be at that moment. To do this, nuclear engineers and physicists must be able to continuously advance knowledge, training, and the reactors themselves. In other words, there must be an environment to explore the reactor and learn how it can be improved.

Project Overview
While the Ultra Safe Nuclear Corporation (USNC©) Micro Modular Reactor (MMR™) can be used for a more portable reactor for nuclear energy, it also shows potential as an effective research reactor [1]. Treating the University of Illinois at Urbana-Champaign as an example site for this reactor to be built, this project creates a 3D virtual environment representing what the reactor and an attached educational/professional building would look like.

AIM
Problem
Nuclear energy and its environmentally friendly method of generation is the future of energy production. Unfortunately, the idea of nuclear reactors to generate this clean energy often receive a negative connotation due to nuclear accidents in the past and/or the connection to nuclear weapons. The only way to combat these misplaced concerns is educating the community about the improvements and constant research to improve these nuclear power plants.

Solution
In this project, an example nuclear micro reactor, the USNC© MMR™, was virtually recreated along with its facility building. By creating a virtual representation of the facility, the community can be better informed of the safety measures and benefits of such a place. Especially treated as a research reactor, the potential held in such an addition to a University is boundless. Overall, this virtual environment can be used to better inform not only the community, but future researchers who will use the facility.

METHOD

Programs Utilized
- Unity: to create the game and apply the C# scripts
- SketchUp and its 3D Warehouse to furnish the rooms
- Unity Connect for a web-based game platform
- GitHub for version control

Development Process
First steps included learning how to use each program and how to code in C#. Tutorials in the programs themselves proved most useful. In Unity, First Person Shooter (FPS) games/tutorials were most applicable. A YouTube channel entitled Brackeys held many useful video tutorials for this project [2]. To get used to Unity and learn more about C# language, a video playlist on how to make your first Unity game from Brackeys resulted in “CUBETASTIC”, a simple game with cubes, movement, and user interaction [3].

FPS Controller - The first real piece of this project was creating an FPS controller, through the help of Brackeys’ videos. This controller uses universal coding for moving forward/backward, side to side, and camera view/head rotation. This allows for the game to export as a web-based game, but also in formats like for a virtual reality headset.

RESULTS
A web-based virtual environment was created entitled “Virtual Nuclear Micro Reactor User Facility” representing the USNC© MMR™ and its surrounding facility [4]. In this 3D virtual representation, the user can walk around the outside of the building as well as inside. In the facility, the player can explore different rooms within the floors.

To change floors, the user can use the elevator which provides a menu to select which floor to travel to. On the first floor, doors to exit the building are functional and bring the user back outside. There are also doors to the control room connected through the first floor.

The control room includes a modern-style control panel with the option to learn more about three of the most important controls that would be present in an USNC© MMR™ control room. Out of the control room the user can enter the lower level which covers the underground USNC© MMR™, with an option to learn more about the reactor, safety measures, and benefits to having the research reactor on a university campus.

CONCLUSIONS

Spread Knowledge
With this virtual environment, anyone can be a player. The more people who interact with this virtual environment, the more knowledge about the necessity of nuclear reactors, especially research reactors, can be dispersed. With more knowledge comes more support and better understanding of what advances can be made. Providing a way for the community and possibly future reactor researchers/operators to explore the building and the reactor itself fosters awareness and preparation in this new age of clean energy.

Support
Supplying this virtual experience to the community through a possible construction of the USNC© MMR™ and an accompanying building would be essential in creating a supportive and understanding community. In addition, supplying this to facility users prior to their arrival on the scene would assist them in becoming familiar with the facility operations and even emergency procedures.

REFERENCES

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