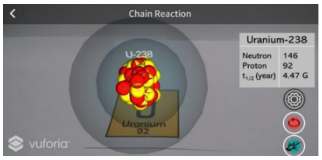
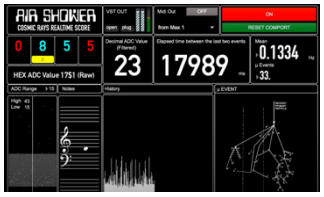
TOPIC: EXPLORING RADIATION VISUALIZATION IN AUGMENTED REALITY

PROJECT IGR 205



[1] AR visualization of decay model



[6] Cosmic rays music

References:

[1] Bakri, F., D. Sumardani, and D. Muliyati. "Radioactive decay model based on augmented reality." *Journal of Physics: Conference Series*. Vol. 1869. No. 1. IOP Publishing, 2021.

[2] Momin, Geoffrey, et al. "Case study: Enhancing human reliability with artificial intelligence and augmented reality tools for nuclear maintenance." ASME Power Conference. Vol. 51401. American Society of Mechanical Engineers, 2018.

[3] https://physicstoday.scitation.org/do/10.1063/PT.6.3.20181102a/full/

[4] http://www.forrestmims.org/sciencedata.html

[5] https://www.giorgiosancristoforo.net/research/

[6] https://www.youtube.com/watch?v=HwR-j_Uym7w

Description

Radioactivity, meaning disintegration of atoms, is a part of our Earth. Naturally occurring radioactive materials are present in Earth's crust and trace amounts in floors and walls of our homes, schools or offices and in the food that we consume. We also receive radiation from outer space called cosmic rays.

While normally invisible to human senses, augmented reality (AR) technology may help humans visualize radiation in our surroundings and to help critically think of sources/types of ionizing radiation around us. Researchers have previously created simulations of decay models [1] of various elements. Prior work has also shown computer-mediated reality applications to provide monitoring systems [2] in nuclear maintenance. On the other hand, physicists at CERN have demonstrated novel ways of visualizing cosmic data through physical installations [3] and created algorithms to turn such data [4] into music [5, 6].

Goal

The goal of this project is to create an interactive augmented reality application that can help create real-time visualization of ionizing radiation in our surrounding environments.

The instructor will first demonstrate particle detection physically using a DIY cloud chamber. Students will receive an electronic geiger counter that can detect such radiation. This device may be used to gather data in your surroundings to be sent to handheld phones (AR application) or Microsoft Hololens devices for real-time visualization. Students are encouraged to think out of the box about ways to visualize this information. How might invisible information be made visible (or audible e.g: through music)? What might such particles look like in a spatial augmented reality system? How can such an application be used in educational environments to explain radiation through natural materials? Students will implement an application that connects Geiger counter data to an augmented reality application on phones.

Teams will be closely supervised by Professor Sareen who will be involved throughout the project. Each group is expected to meet once a week with their supervisor and discuss their ideas and the direction of the project.

Prerequisites:

Object Oriented Programming (e.g. Java, C++, C#)
Basic understanding of Computer Graphics
(optional) First experiences working with 3D Game Engines (e.g. Unity3D, Unreal Engine)

Acquired Skills:

Being able to understand the principles of a Geiger Counter
Working knowledge of electronics to stream data over Bluetooth
Being able to develop AR applications in Unity3D
Understanding the spatial paradigm behind Augmented Reality

Contact: Harpreet Sareen, sareen@newschool.edu **Web: harpreetsareen.com**