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# Using Virtual Reality (VR) for Education in Nanoscience

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The idea behind Virtual Reality (VR) for education in Nanoscience came about by trying to find interesting ways to teach students about the world of Nanoscience. The target audience we aimed for were students in elementary to high school. The goal was to develop VR applications that could teach students about the scale of items and the beauty of Nano Art.

Based on our choice of Unity3D and the C# programming language, we identified the GearVR as a suitable VR platform for education and mobility. Unity3D was chosen as the rendering engine, because of its multi-platform compiling capabilities. Another aspect that made it easier to work with Unity3D for the GearVR was Unity's built in support for the Oculus SDK. The Oculus SDK is what powers the VR capabilities of the Samsung devices for the GearVR.

Originally, the Oculus DK2, which required an Xbox controller to navigate in 3D space, was utilized for our initial development and testing. The GearVR has a built in touchpad for movement and other operations. So, it was rather easy to move towards the GearVR as the desired platform; with just a few adjustments being made to the underlying code. However, the original code for the movement and interactions using the Xbox controller will not go to waste, as a gamepad controller will be required for our upcoming application versions for the iPhone. The iPhone versions will be powered by Google's Cardboard SDK for VR, which will be used with the Zeiss VR One Plus headset.

The first application we created is Nano Navigator (figure 1). Nano Navigator features you starting off looking at an Iron Man replica at 6 ft. tall. The touchpad on the GearVR is then used to move forward or backward. The forward motion zooms you further into the world of smaller and smaller objects. The objects range from an apple seed all the way down to a carbon atom. Being limited to just one button, the user can press the back button while looking at an object to enable manual rotation for that object. The trackpad is then used to rotate the object. The user can then go back to normal movement by pressing the back button again.

The second application we developed is Nano Art Gallery (figures 2-3). Nano Art Gallery drops the users into an art gallery featuring various Nano Art and Microscopic images. The user can freely navigate in full 3D space with the touchpad forward and backward gestures. Where the user looks is where they will move forward or backwards from. This technique is called *Steering* and is just one of the ways to navigate in 3D space for VR. The users can also press the back button while looking at certain artworks to read more about it. The artworks with extra info are denoted by our custom Nano character's face by the nameplate. The Nano gallery is broken down into different sections ranging from Carbon based items to recreations of Masterpieces at the Nano scale.

We believe that using VR in the classroom can not only enhance the learning aspect of Nanoscience but

also make it easier to understand. We have only touched the tip of the iceberg with what we have so far. There are even more possibilities when it comes to using VR for education in Nanoscience. Further exploration includes Nano based structures, atomic arrangements, and so forth [1].

References:

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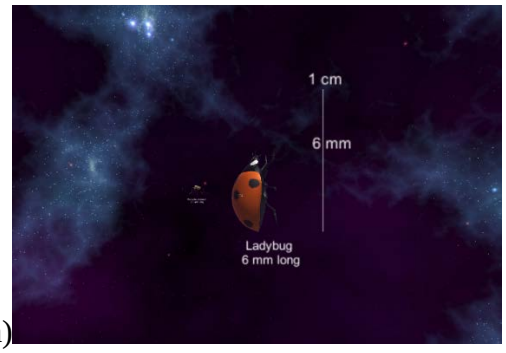
(a) 

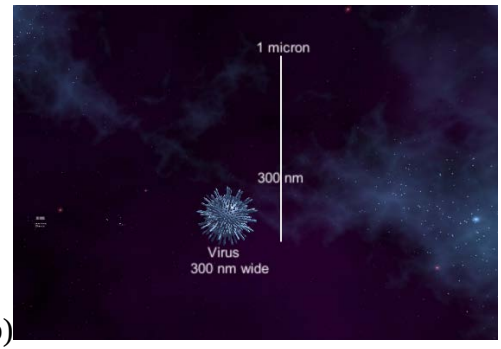
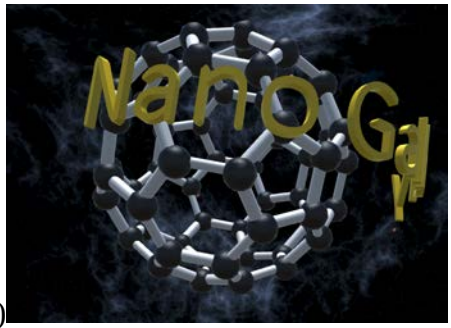
(b) 


**Figure 1.** (a) Transition from the previous Centimeter object to the Ladybug at 6 millimeters. (b) Transition from previous Microns object to a Nanometers object. A ruler helps identify the differences in measurements between major transitions.

(a) 

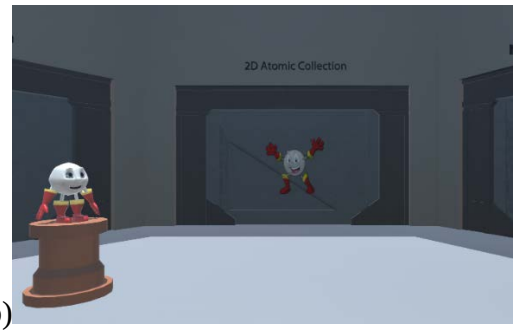
(b) 


**Figure 2.** (a) Starting point of the VR experience. (b) Main entrance area where each door leads into the specified section. Each door has the title above it along with direction markers in other hallways.

(a) 

(b) 


**Figure 3.** (a) Part of the 2D Atomic Collection. (b) Part of the Nano Sculpture Collection. There are about 10 pieces per room. With a total of 6 rooms laid out in a hexagon pattern.

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