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Holodeck Testbed Project

The main objective of the Holodeck Testbed is to create a cost effective, realistic, and highly immersive environment that can be used to train astronauts, carry out engineering analysis, develop procedures, and support various operations tasks. Currently, the holodeck testbed allows to step into a simulated ISS and interact with objects; as well as, perform Extra Vehicular Activities (EVA) on the surface of the Moon or Mars. The Holodeck Testbed is using the products being developed in the Hybrid Reality Lab (HRL). The HRL is combining technologies related to merging physical models with photo-realistic visuals to create a realistic and highly immersive environment. The lab also investigates technologies and concepts that are needed to allow it to be integrated with other testbeds; such as, the gravity offload capability provided by the Active Response Gravity Offload System (ARGOS).

My main two duties were to develop and animate models for use in the HRL environments and work on a new way to interface with computers using Brain Computer Interface (BCI) technology. On my first task, I was able to create precise computer virtual tool models (accurate down to the thousandths or hundredths of an inch). To make these tools even more realistic, I produced animations for these tools so they would have the same mechanical features as the tools in real life. The computer models were also used to create 3D printed replicas that will be outfitted with tracking sensors. The sensor will allow the 3D printed models to align precisely with the computer models in the physical world and provide people with haptic/tactile feedback while wearing a VR headset and interacting with the tools. Getting close to the end of my internship the lab bought a professional grade 3D Scanner. With this, I was able to replicate more intricate tools in a much more time-effective rate.

The second task was to investigate the use of BCI to control objects inside the hybrid reality ISS environment. This task looked as using an Electro Encephalogram (EEG) headset to collect brain state data that could be mapped to commands that a computer could execute. On this Task, I had a setbacks with the hardware, which stopped working and was returned to the vendor for repair. However, I was still able to collect some data, was able to process it, and started to create correlation algorism between the electrical patterns in the brain and the commands we wanted the computer to carry out. I also carried out a test to investigate the comfort of the headset if it is worn for a long time.

The knowledge gained on will benefit me in the future career. I learned how to use various modelling and programming tools that included Blender, Maya, Substance Painter, Artec Studio, Github, and Unreal Engine 4. I learned how to use a professional grade 3D scanner and 3D printer. On the BCI Project I learned about data mining and how to create correlation algorithms. I also supported various demo's including a live demo of the hybrid reality lab capabilities at ComicPalooza.

This internship has given me a good look into engineering at NASA. I developed a more thorough understanding on engineering and my overall confidence has grown. I have also realized that any problem can be fixed, if you try hard enough, and as an engineer it is your job to not only fix problems but to embrace coming up with solutions to those problems.