

University of North Texas Augmented Reality Interface System

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Purpose

ARIS was created to address the increasing need for technologies that assist astronauts with the rigorous demand of lunar and mars surface exploration.

Our goal is to provide astronauts with a non-obstructive interface that allows them to monitor suit vitals, telemetry, mission information, record and document field notes, and navigate through lunar terrain.

Solution

The System combines a Head Mounted Display (HMD) in Augmented Reality with a custom External Hardware System (EHS). These two systems working together provide an easy-to-use, unobtrusive tool enabling astronauts to take on a more autonomous workflow.

HID Features

- Navigation
- Suit telemetry
- 3D model loader
- Mission instructions
- Camera viewer
- Error system
- Audio log recording and playback
- System debug

EHS Glove System

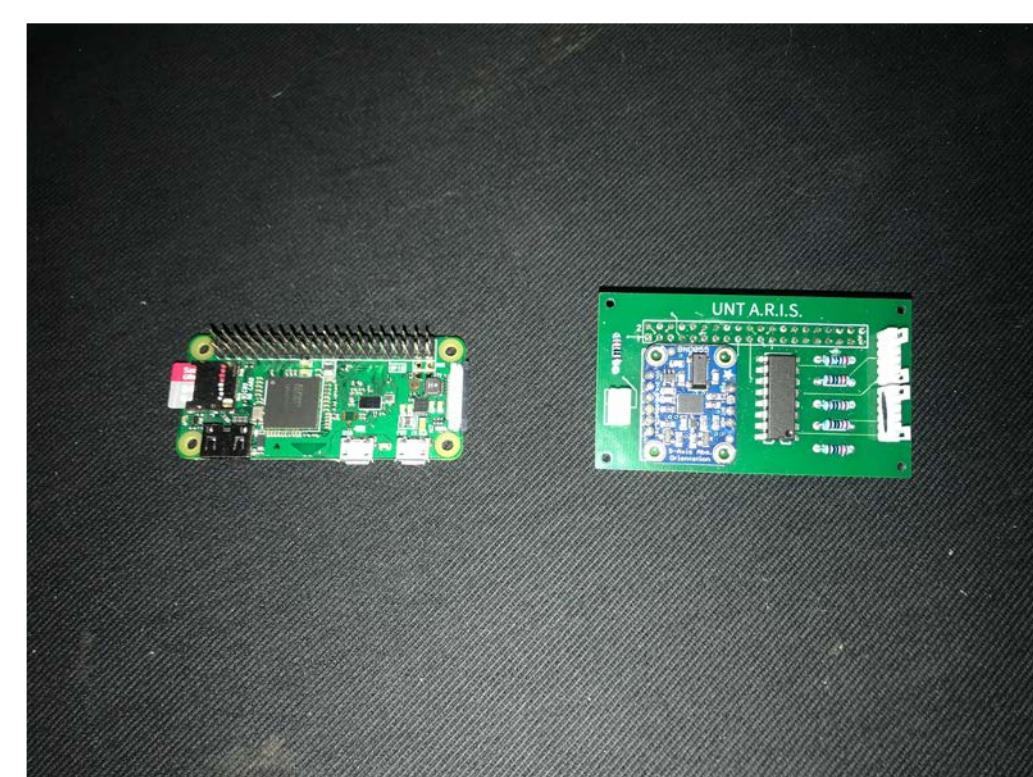
- IMU
- Toggle switch
- Force sensors
- Hand camera

EHS Chest System

- IMU
- Toggle switch
- Rearview camera



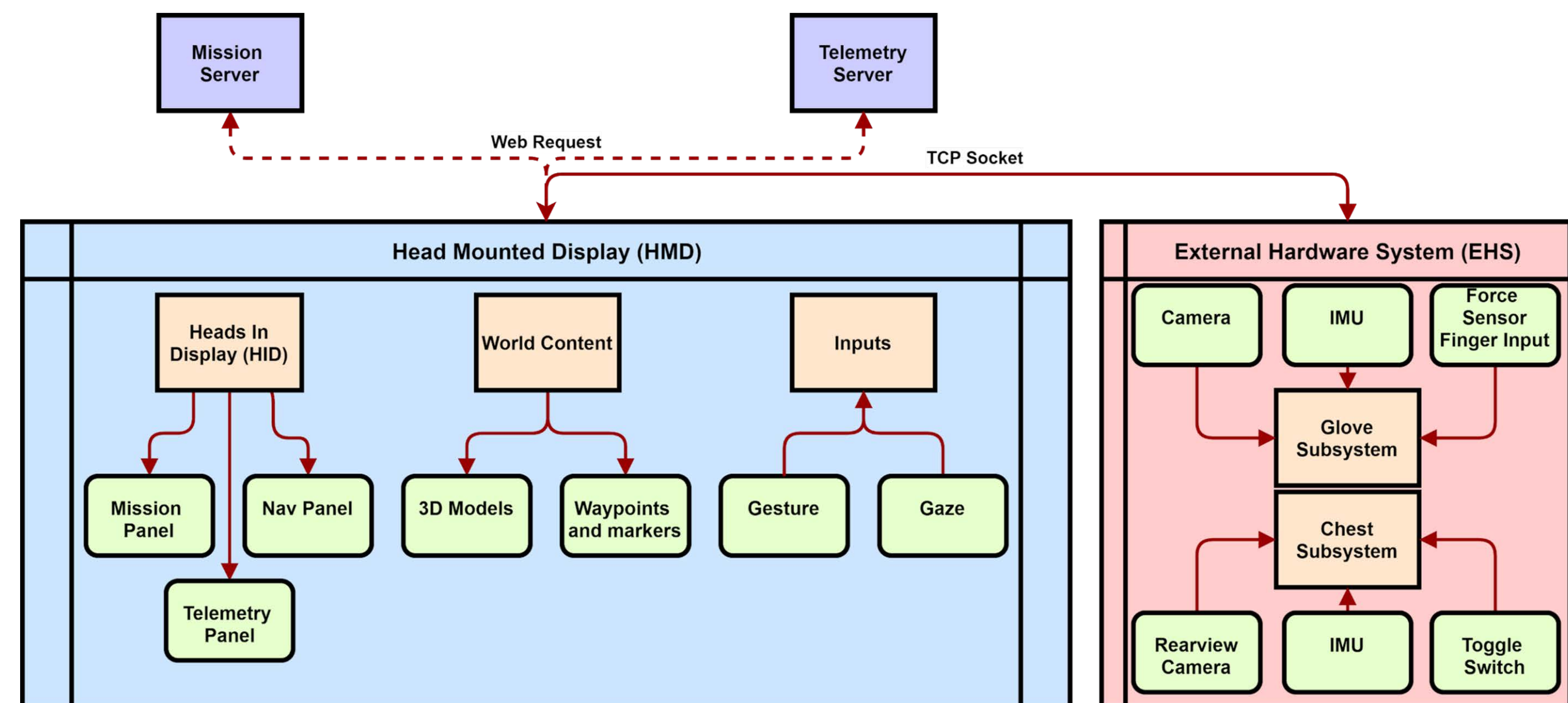
Head Mounted Display (HMD)



External Hardware System (EHS)

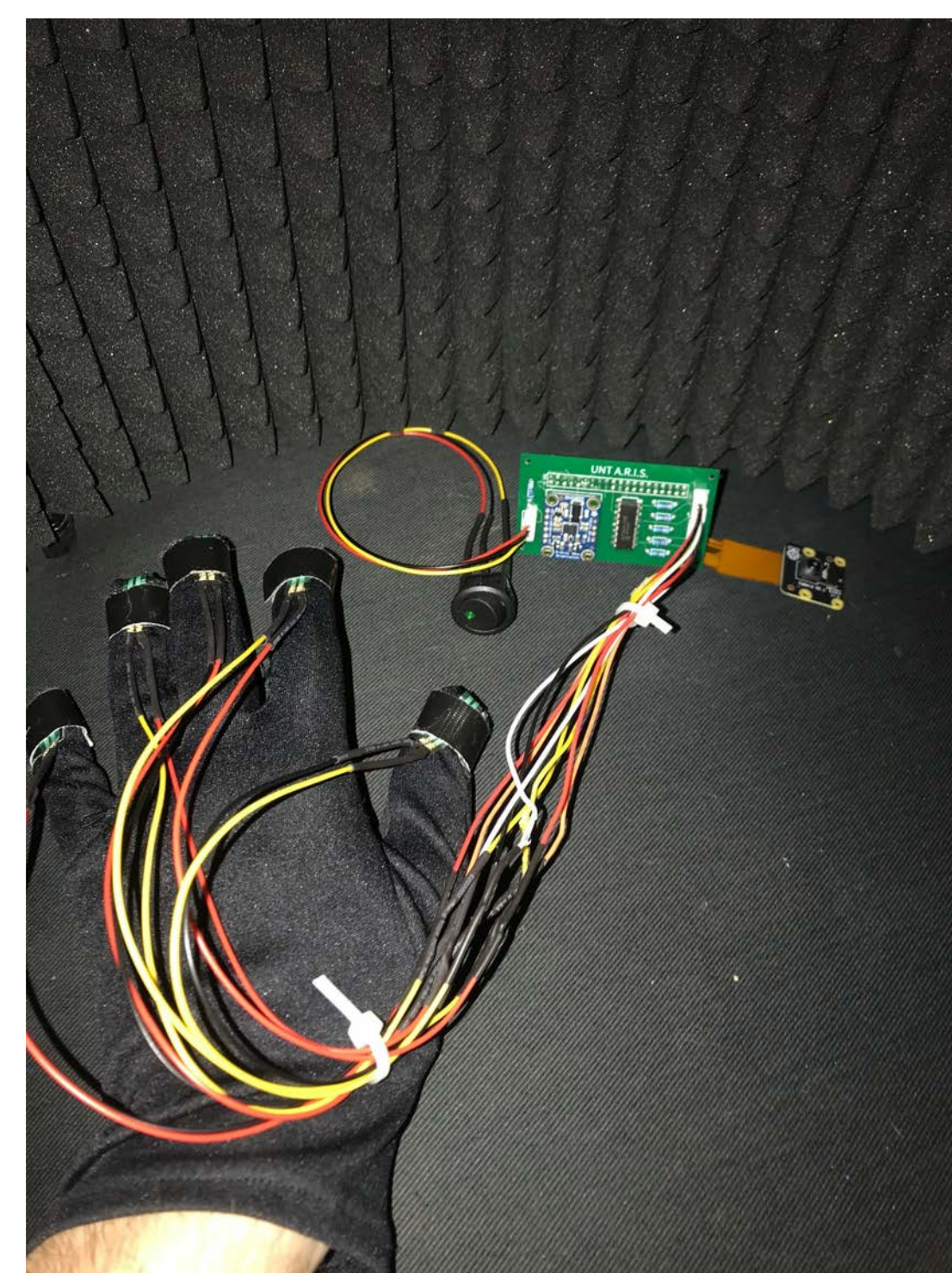
System Diagrams/Illustrations

The Head Mounted Display consists of multiple panels with additional tabs displaying the mission objectives, audio logs, real time telemetry data, and navigation tools. Additionally the force sensors and head tracking provide multiple input methods for any situation. Lastly, world content contains waypoints that help astronauts return to home in an emergency and 3D models that enable astronauts to see objects in 3D in the palm of their hand.

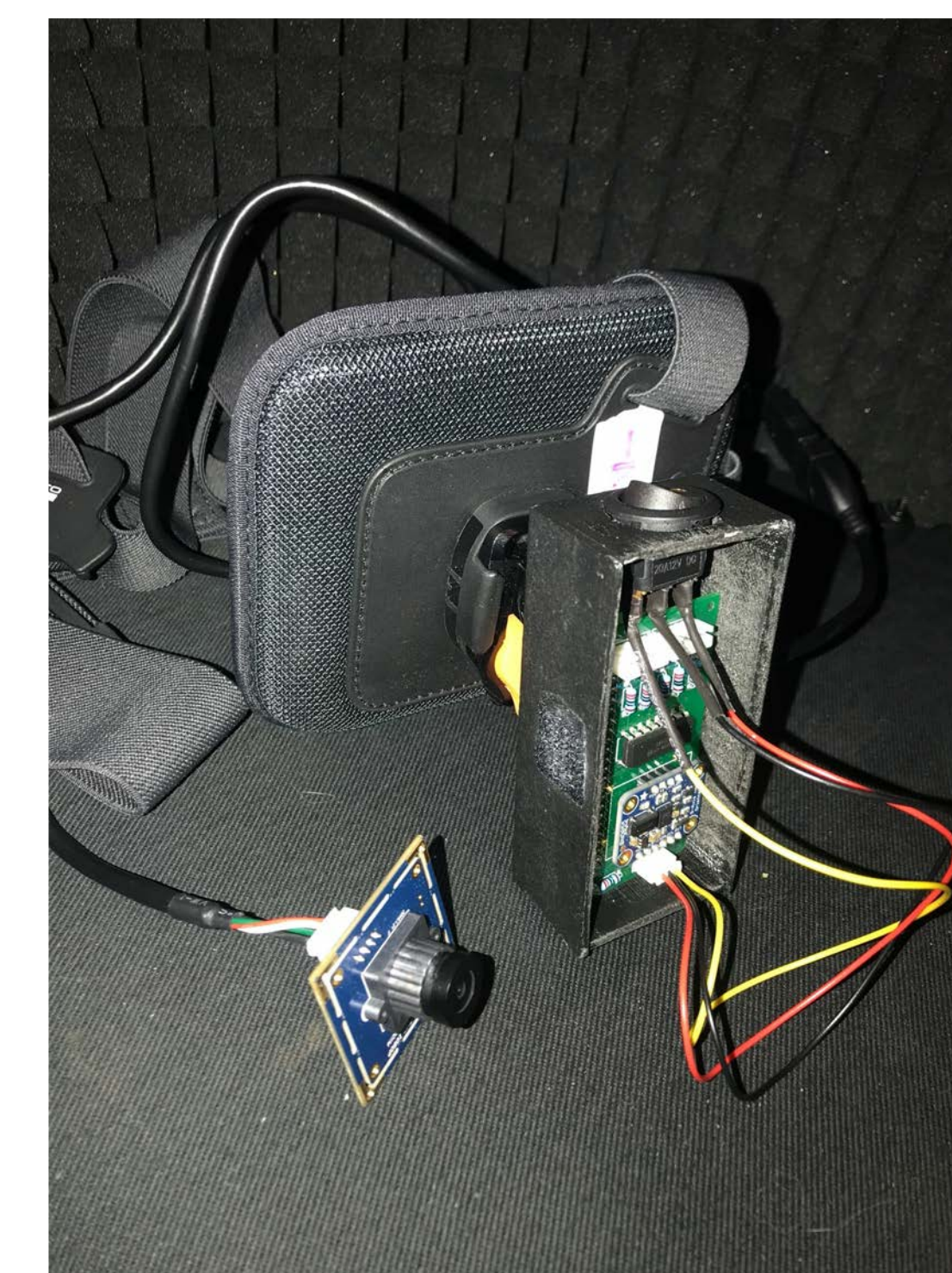


Full System Flow Chart

The External Hardware System includes an external glove and chest system that will provide inertial measurement (IMU) data, force sensors attached to the fingers, toggle switches, and live camera feeds to the HMD. The IMUs track the astronauts' position and rotation, the force sensors allow the astronaut to provide input to the HMD, and the camera feeds give the astronaut extended visibility around their suit.



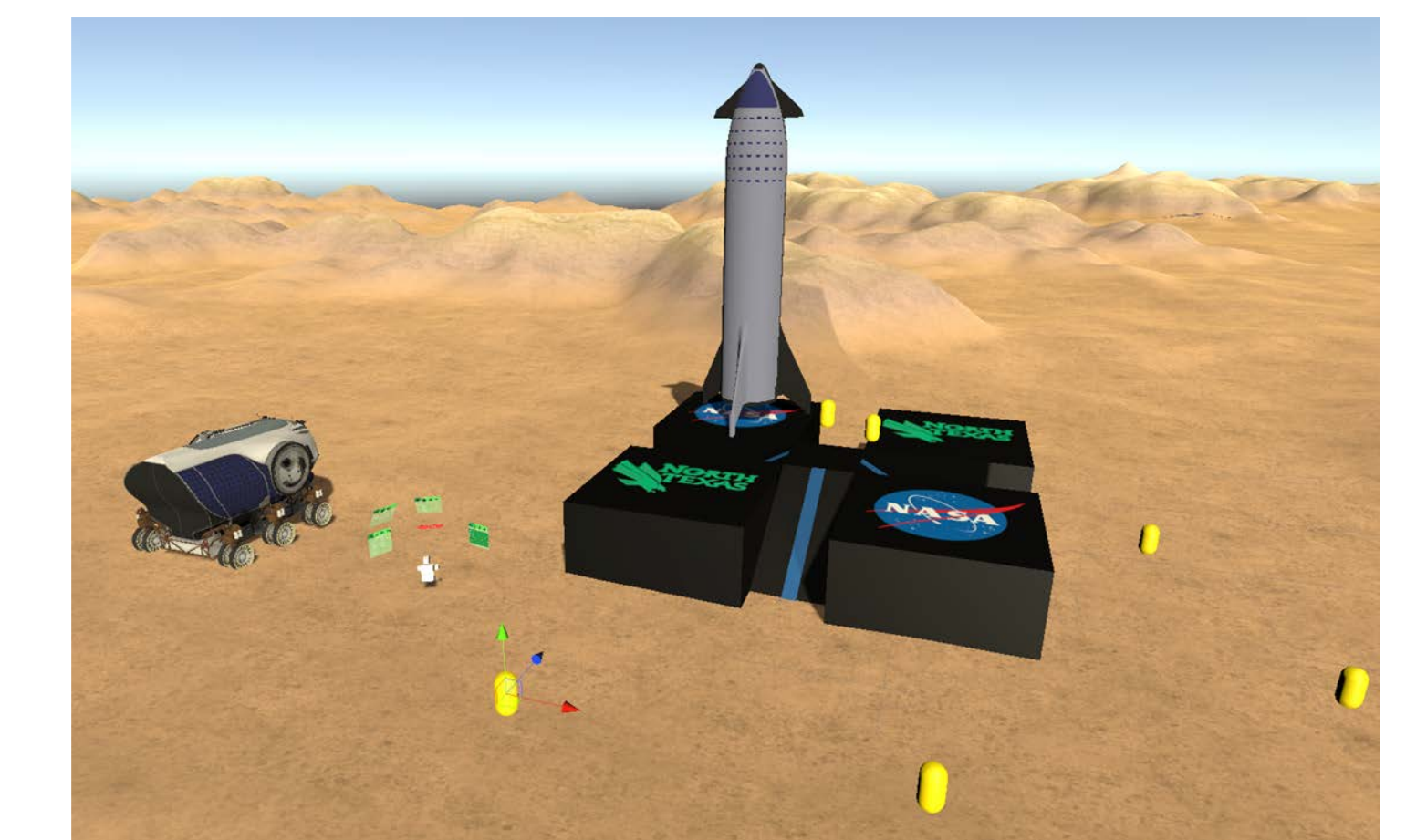
Glove Subsystem



Chest Subsystem

Results

The EHS and HID systems together create an expansive and dynamic augmented reality system that will assist astronauts in a wide variety of environments and challenges for fully autonomous lunar and mars missions.



mARs Simulator

Summary

All in all, the team was successful in designing and developing the ARIS system. Although user testing was limited due to COVID-19, the system is fully functional and simulator testing proved successful.



Heads in Display (HID)

Acknowledgement

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