Department of
ATMOSPHERIC SCIENCES
COLLEGE OF GEOSCIENCES

Mixed Reality Visualization of Rocket Launch Weather Criteria

Armani Cassel, Eduardo Garza, Adam Brainard, Eric Munoz, and Neil McHenry

Introduction

The Microsoft Hololens, revealed in early 2015 and released in 2016, brings mixed reality and spatial computing into one head-mounted display. The Hololens display projects light through flat, transparent optical waveguides that are matched to an environment pre-scanned by a system of cameras. Using the Hololens to display information can allow datasets to be present in a three-dimensional space alongside real-world, on-screen datasets for decision making.

Launch Criterion

"Do not launch…"

Clouds

- "within 10 nautical miles of an attached or detached thunderstorm anvil cloud"
- "within 3 nautical miles of a thunderstorm debris cloud"
- "within 5 nautical miles of disturbed weather clouds that extend into freezing temperatures and contain moderate or greater precipitation"
- "through a cloud layer greater than 4,500 feet thick that extends into freezing temperatures"
- "within 10 nautical miles of cumulus clouds with tops that extend into freezing temperatures"
- "through cumulus clouds formed as the result of or directly attached to a smoke plume"

Wind

- "if the sustained wind at the 162-foot level of the launch pad exceeds 30 knots"
- "through upper-level conditions containing wind shear"

Lightning

- "30 minutes after lightning is observed within 10 nautical miles of the launch pad"
- "within 10 nautical miles of the edge of a thunderstorm that is producing lightning within 30 minutes"

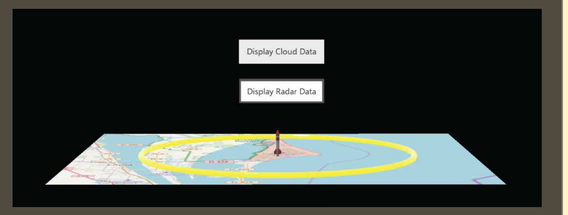
Launch Data

The datasets on display are timed with the December 15th launch of SpaceX CRS-13 on the Falcon 9 rocket from Cape Canaveral AFB and the December 23rd launch of Iridium-NEXT Mission 4 on the Falcon 9 rocket from Vandenburg AFB. Each Falcon 9 took about 75 seconds to surpass 12 km in altitude.

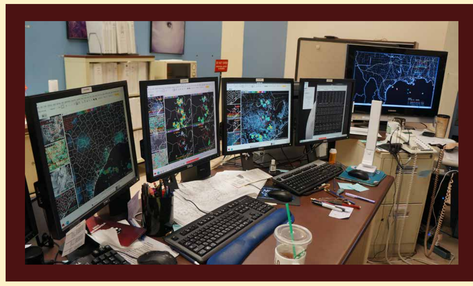
The "Holographic" Environment

Interface

This environment is contained in a draggable and adjustable virtual space of 1.2x1.2 meters. The interface allows the user to place the dataset wherever convenient before starting to load one or multiple datasets at once.



Program Layout



Conclusion

The Microsoft Hololens, and future mixed reality head-mounted displays like it, can allow users to focus on more or less data in a direct fashion by eliminating the need for some tethered displays and building visualization further into the working environment instead of being limited by it.

Dataset Processing

The dataset holograms are built from of a grid of cubes, with levels loaded individually and limited in space and negative values by code. The cubes can represent different variables and interpolations of values at different levels. Non-cuboid shapes rotated in different directions can allow for variables like wind. Variables available in this demonstration include cloud fraction, wind or radar data.

Data Path

Contact Me:

Armani Cassel: armaniwx@gmail.com

Acknowledgements

Sources/Thanks to:

serl.io

unity

Microsoft HoloLens