

1.1 PROBLEM STATEMENT

What problem is your project trying to solve? Use non-technical jargon as much as possible.

- ❖ Geographical data is often difficult to interpret and visualize. It can be challenging to portray data in a manner that conveys a sense of global scale to users.

1.2 REQUIREMENTS & CONSTRAINTS

List all requirements for your project . This includes functional requirements (specification), resource requirements, qualitative aesthetics requirements, economic/market requirements, environmental requirements, UI requirements, and any others relevant to your project. When a requirement is also a quantitative constraint, either separate it into a list of constraints, or annotate at the end of requirement as “(constraint)”. Other requirements can be a single list or can be broken out into multiple lists based on the category.

- ❖ The application will be able to track physical objects to map the globe's location
- ❖ The application will be able to scale the three dimensional globe to the user's liking
- ❖ The application will be able to rotate the globe to give users a full 360 degree view of all geographical based data
- ❖ The globe will be able to remain stationary in the “world” independent from user's location
- ❖ This application will require a 6' x 6' unobstructed space (empty 6 x 6 space) (Constraint)
- ❖ This development and use of the application will remain under a \$1000 dollar budget (Constraint)
- ❖ This application will require the use of a Microsoft HoloLens (Constraint)
- ❖ This application will have its own API layer that standardizes incoming data streams (Compatibility layer)
- ❖ This application will use the implementation of real time data as well as historical data
- ❖ This application will be able to take 3 different types of geographical data streams as input
- ❖ This application will be able to layer different types of data on the globe visualization for a multi type data visualization
- ❖ This application will be built using the Unity engine
- ❖ This application will maintain a stable 60 fps through the HoloLens visualization (Constraint)
- ❖ This application will be able to run for an hour on one HoloLens battery charge
- ❖ This application will have a “pick up and go” ease of use where no technical developer is needed for a user to understand how to run the application
- ❖ This application will create a 720p resolution image as specified in HoloLens standards
- ❖ The project implementation needs to be completed within 14 weeks. (time constraint)
- ❖ This application will need to run smoothly utilising the limited HoloLens hardware performance (Constraint)
- ❖ This application will need to run using the unity engine under the constraint of the system requirements needed for unity (Constraint)

What Engineering standards are likely to apply to your project? Some standards might be built into your requirements (Use 802.11 ac wifi standard) and many others might fall out of design. For each standard listed, also provide a brief justification.

- ❖ Microsoft Hololens Development Standards
 - To meet a threshold of usability and performance for the user
- ❖ Unity Engine Development standards
 - To meet a threshold of usability and performance for the user
 - To ensure ease of development
- ❖ IEEE 802.11 Standard for Information Technology - Telecommunications and Information Exchange between systems
 - To maintain reliable and stable connection between hardware devices and software application

1.3 INTENDED USERS AND USES

Who benefits from the results of your project? Who cares that it exists? How will they use it? Enumerating as many “use cases” as possible also helps you make sure that your requirements are complete (each use case may give rise to its own set of requirements).

- ❖ Benefits and Stakeholders
 - General Users, will be able to see visualization of geographical data and experience a practical application of augmented reality
 - Client, will be able to check weather patterns, import custom streams of historical and real time data and showcase the ability of senior engineering students to faculty
 - Developers, will be able to showcase their abilities and develop a fully usable and finished product
- ❖ Use Case
 - User will be able to see weather data visualized on a three dimensional globe
 - Users will be able to scale the size of the three dimensional globe
 - Users will be able to rotate the globe to see all geographical based data
 - Users will be able to move around the space while the globe remains stationary in relation to the space
 - Users will be able to select from available data streams they want to visualize on the globe
 - Users will be able to select and see historical data visualization
 - Users will be able to pick up the Hololens, put it on and begin to see the application without further technical knowledge needed

Demonstrates the skills of Seniors at Iowa State University

- ❖ Benefits visitors and prospective students of Iowa State to see the potential abilities they may learn
- ❖ Benefits any user wishing to visualize a data stream using AR
- ❖ Client
 - Check weather patterns
 - Import custom streams of historical and real time data
 - Experience practical applications of augmented reality

- ❖ Zoom and rotate
 - Expand the globe
 - Manipulate scale and vision
- ❖ Mobility of the Globe
 - Tracking object
 - Stability of image in a local space
 - Mapping visualization data to physical objects
- ❖ 6' x 6' flat surface/space without obstructions (not a table environment)
- ❖ Budget remains under \$1000 dollars
 - Primary costs: API/data
 - Focus on finding free data streams
- ❖ Requires a Microlens Hololens
- ❖ Modular API which supports various data types, starting with weather
 - Compatibility layer?
 - Data updates in real time, potentially historical data (short term or long term)
 - Proof of concept: 3 types of data streams
- ❖ Support overlaying of different types of data
 - Toggles for users to request data
- ❖ Unity visualization
- ❖ Refresh rate:
- ❖ Maintain Microsoft Hololens requirements of 60 FPS
- ❖ Ease of use (pick up and go) - untrained user can easily access the visualizer without difficulties
 - Clear/clean UI
- ❖ Runs for an hour on one battery charge
- ❖ 720p resolution (set by the Microsoft Hololens)
 - Check pixels per degree
- ❖ Potential for transition to Microsoft Hololens