Site Select

Kacper Porebski; Abid Al Labib; Brian Kramer; Jinseo Lee
Schulich School of Engineering, University of Calgary

Contact: Kacper Porebski
Email: Kacper.Porebski@ucalgary.ca
Phone: 403-889-6525

INTRODUCTION

- Certain technologies such as communication links, sonar and radar have line-of-sight limitations.
- These limitations can cause unwanted behavior or the inability to accomplish a desired task depending on the location.
- Our Sponsor performs BVLOS flights with the aid of a radar to “see” the airspace they are operating in.
- The problem is, there is not a good solution for being able to tell where to setup the radar to have good coverage over an area of interest.
- Typically, a site visit would be required to assess the conditions of the location and find appropriate location(s) that seem suitable for a radar (such as on top of a hill) to avoid interference.
- This is **costly** both time and monetarily, and the cost increases based on how far the operators would need to travel etc.

METHODS AND MATERIALS

- Using Unreal Engine 5 and the Cesium Plugin, we can simulate the coverage of a given radar location.
- First, we define a grid around the location of interest, and the radar locations we would like to test.
- Then for each square, or 'point' of the grid we determine the minimum height required to see something in that square from the radar location.
- This allows us to generate a visual map for the coverage in the area for each radar location.

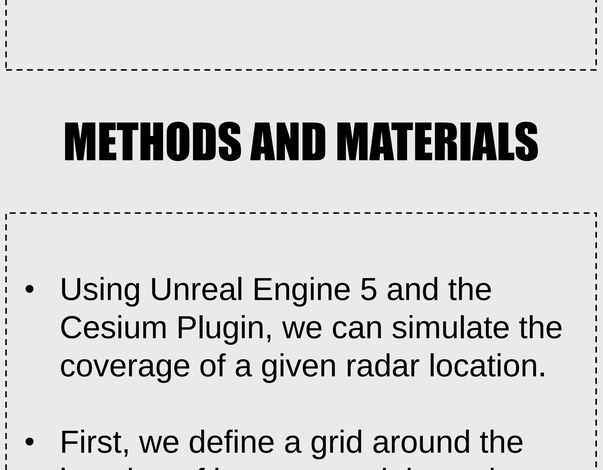

Figure 1. Single Radar Heatmap.

INPUT

- At present, our system exposes three main categories of input to the user.
- Grid parameters:
  - Location of where to spawn the grid
  - The total length of a side
  - Number of points to a side
- Radar Locations can be added to a list with the following parameters
  - Latitude
  - Longitude
  - Height AGL
- Raycast Config:
  - Number of Vertical increments
  - Number of solutions

OUTPUT

- Location encoded image compatible with GoogleEarth.
- Color coded Unreal Engine blocks overlayed on the terrain for a more comprehensive assessment of each radar's coverage in the area.

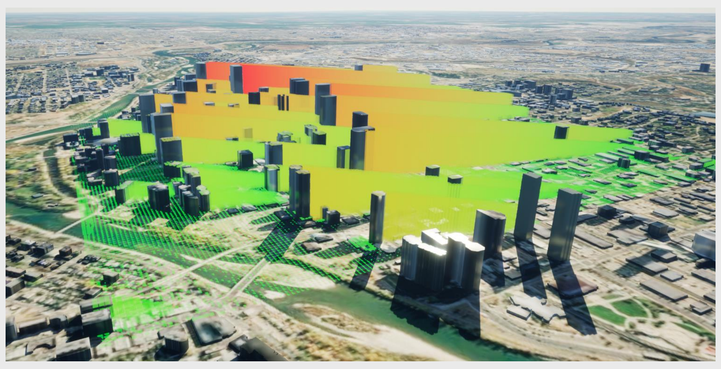

Figure 2. Visualization of Heatmap.

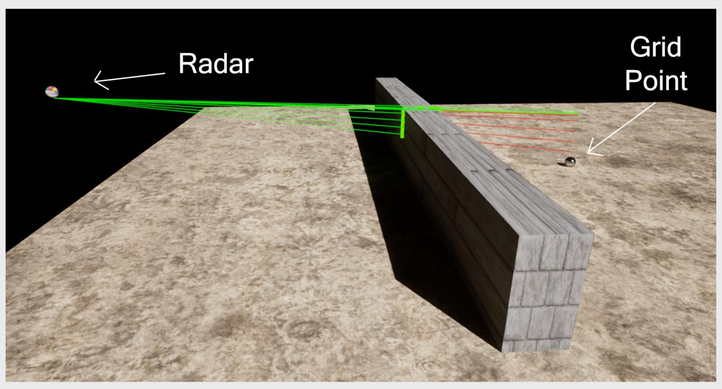

Figure 3. Visualization of Solution Algorithm.

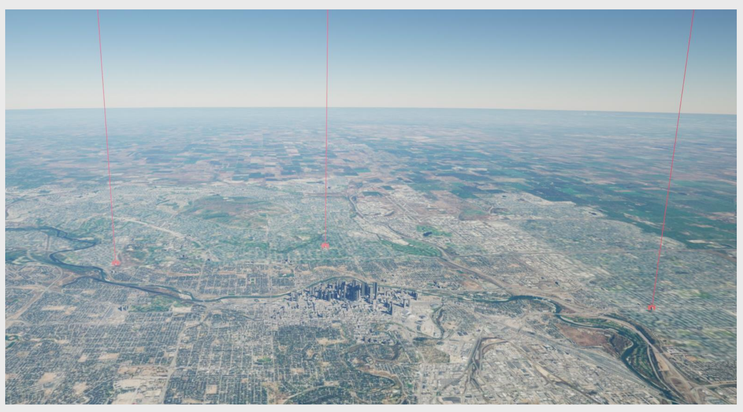

Figure 4. Radar Locations.

LIMITATIONS

- There is a computational limitation of our program. In its current iteration a 4K output, while possible, takes a long time to generate which makes the resolution not feasible under typical user operation.
- The color-coded cubes is intensive computationally making it not feasible for high resolutions
- Cesium terrain data does not come with foliage. Adding it makes the whole system very sluggish.

CONCLUSIONS

- Our system is a convenient tool to determine coverage of a line-of-sight tool.
- It can save a lot of cost by being able to evaluate a location remotely and can be easily integrated into a pre-op procedure
- Being able to support multiple locations simultaneously differentiates our product from other viewshed tools.

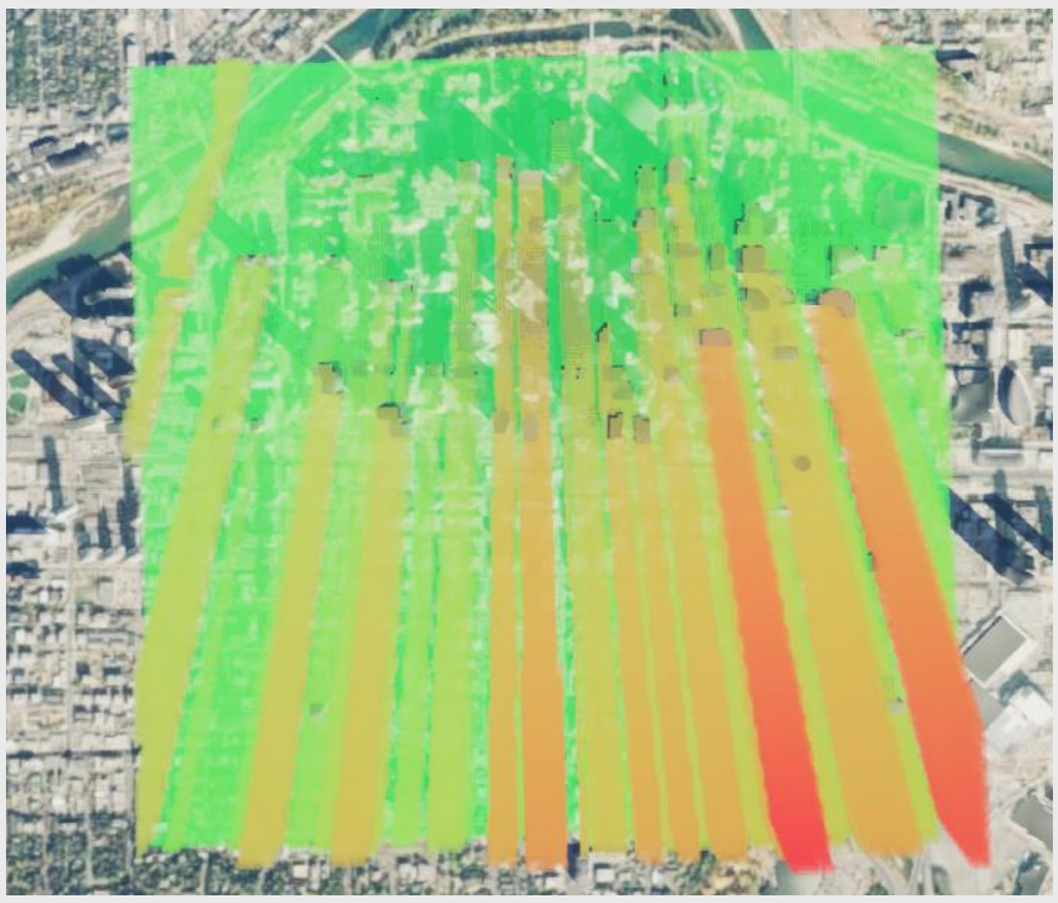

Figure 5. Top-down view of visualization.

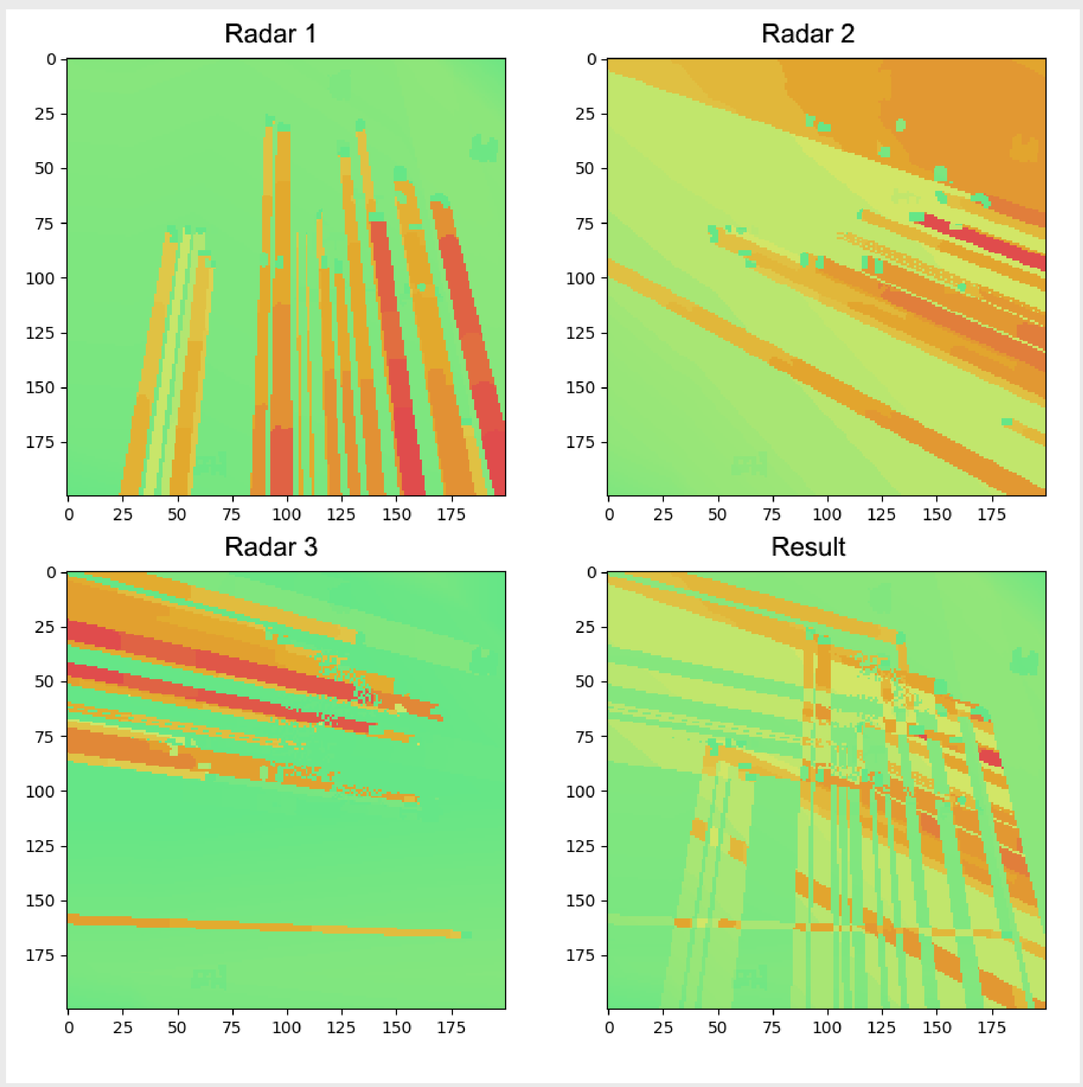

Figure 6. Example Output with 3 radars.