Prince George's County Mixed Reality Visualization

Ian Way
Mentor: Guangyang Fang

Objectives

- Build a detailed 3D visualization of Prince George's County, Maryland
- Develop a standalone MR application for interactive visualization of the county.
- Establish a framework that can later incorporate environmental, weather, and climate information.

Data

- PG County LiDAR terrain elevation data
- PG County building/GIS data
- PG County National Agriculture Imagery Program (NAIP) Satellite Imagery data

Figure(s)



Figure 1: PG County Satellite Image



Figure 2: MR App Example

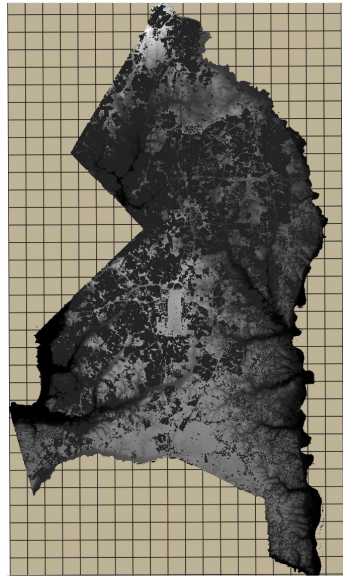


Figure 3: Visualization Data In QGIS

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Challenges

- PG County contains a large amount of high-resolution 3D geographic data.
- Rendering the entire county at full resolution exceeds the practical capabilities of standalone MR devices.

Solutions

- Divide the county model into smaller manageable 3D tiles.
- Load and render one tile or region at a time.
- Apply multiple Levels of Detail (LODs) to reduce computational and memory requirements
- Preserve sufficient geographic detail while maintaining MR performance.

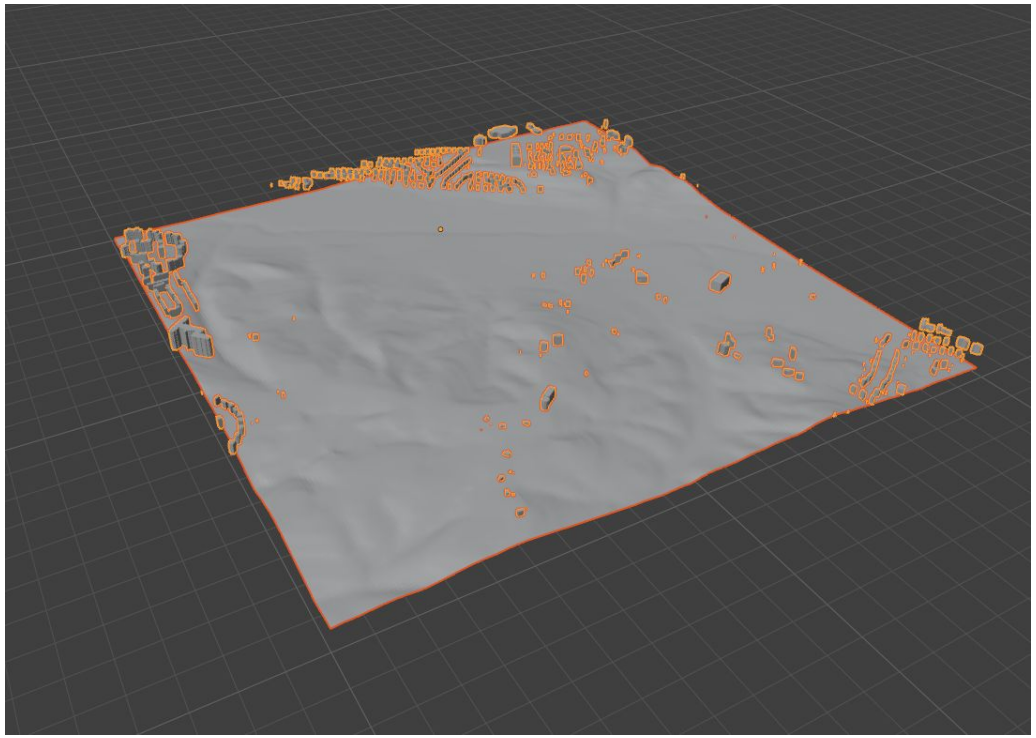


Figure 4: 3D Modeled PG County Tile

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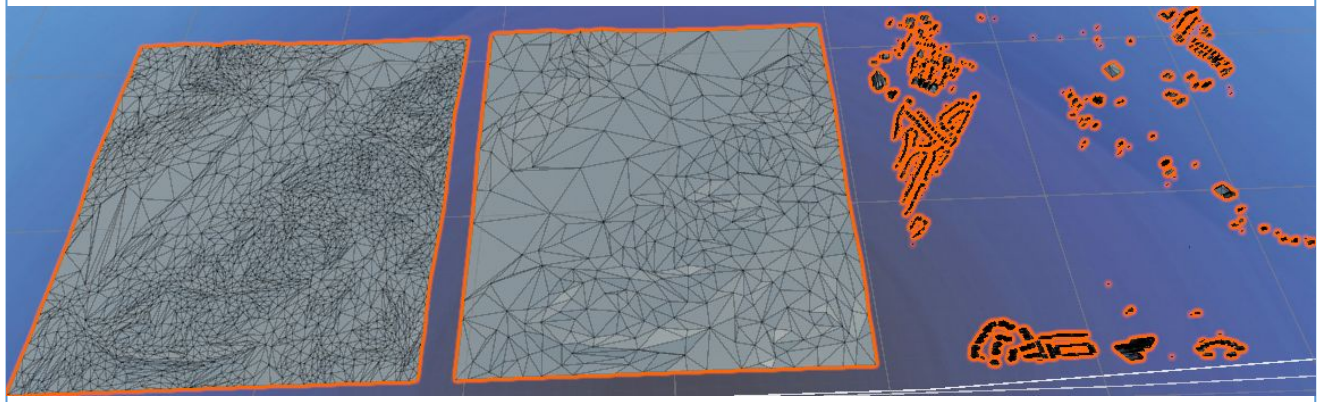


Figure 5: Tile LOD Triangle Density

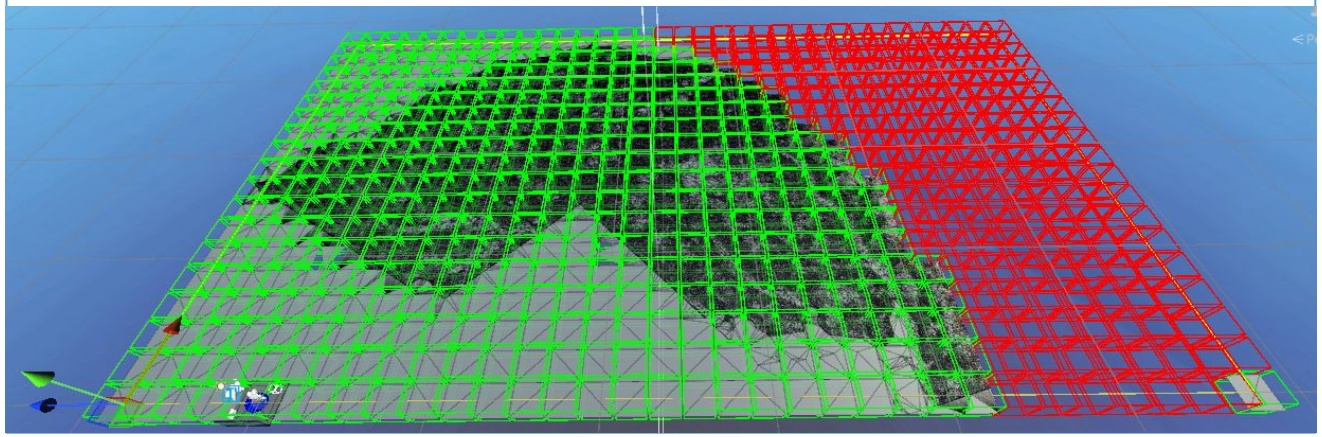


Figure 6: Tile Chunk Loader Rendering

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Results

- Developed a standalone MR application for spatial exploration.
- Implemented tiled rendering and LOD optimization for MR devices.
- Demonstrated interactive visualization of county-scale geographic information.

Future Works

- Highlight major landmarks and infrastructure for easier spatial orientation and navigation.
- Integrate environmental and atmospheric information, such as its climatology, urban heat island patterns, and lightning strike hotspots.
- Enhance user interaction and spatial exploration tools within the MR environment.

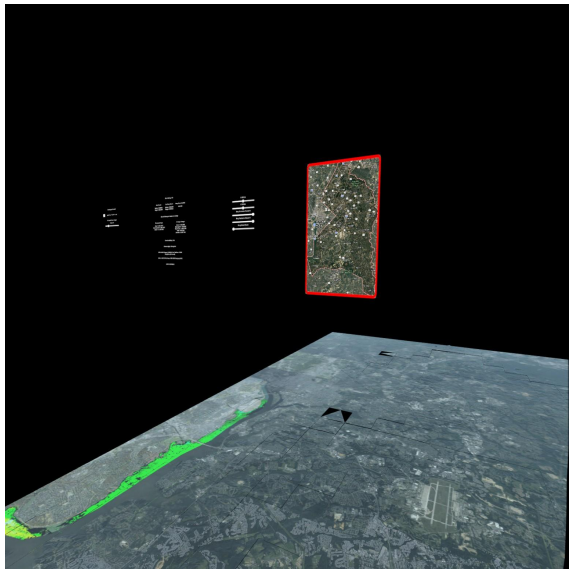


Figure 7: PC High Quality



Figure 8: Quest 3 Optimized Quality

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Demo Video

