

Immersed 3D Visualization of the University of Chicago Campus



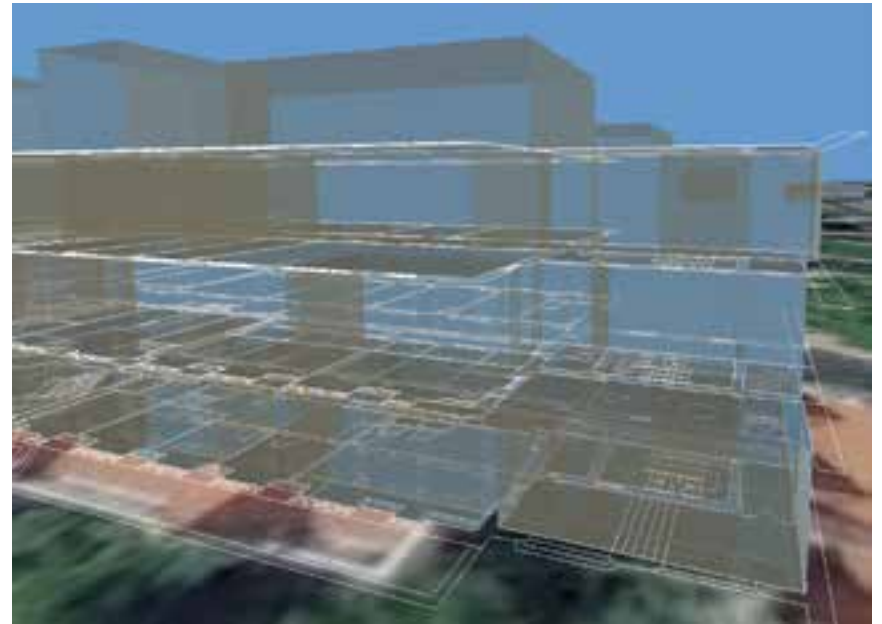
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Immersed 3D Visualization of University of Chicago Campus

- **Discussion Outline**
 - **Objectives of the Project**
 - **Data Utilized**
 - **Methods Used to build the Model**
 - **CAVE2 Visualization Environment**
 - **Tricks/Lessons Learned**
 - **Next Steps**

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- **Objectives of the Project**
 - **Create a 3D Composite of our existing data**
 - **Establish a common Data Model Framework**
 - **Identify Tools/Methods to Edit/Build the Model**



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- **Objectives of the Project**
 - **Why do this?**
 - ü **Push to the most challenging 3D visualization environment available**
 - ü **Impact this environment has on Tools/Models**
 - ü **Issues presented will need to be addressed in the final data model - CityGML**
 - ü **Important since Visualization will be a key function Central Repository Model**

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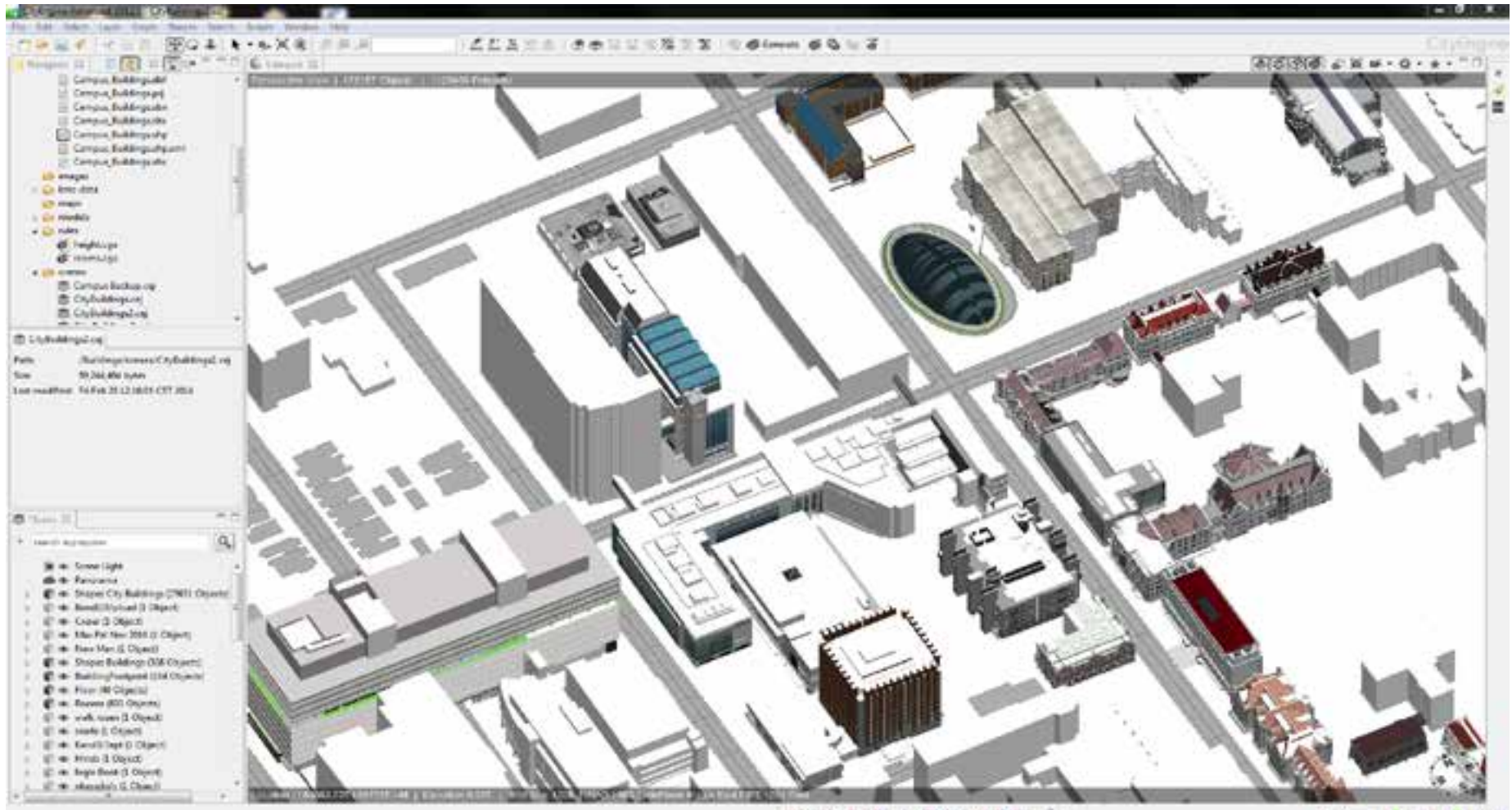
- **Data Utilized:**
 - **GIS: Building polygons, roads**
 - **CAD: Building floor plans**
 - **BIM: Detailed Buildings – Exterior/Interior**
 - **SketchUp: building exterior textures/photos**

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- **Methods**
 - **GIS: CityEngine data for the ‘Base’ of the model roads and buildings - FBX**
 - **CAD: building footprints/ 3D CAD Model - FBX**
 - **BIM: Revit with FBX export into 3ds MAX**
 - **SketchUp: migrated to CityEngine via Collada**
 - **Used Unity Gaming software for final Model**

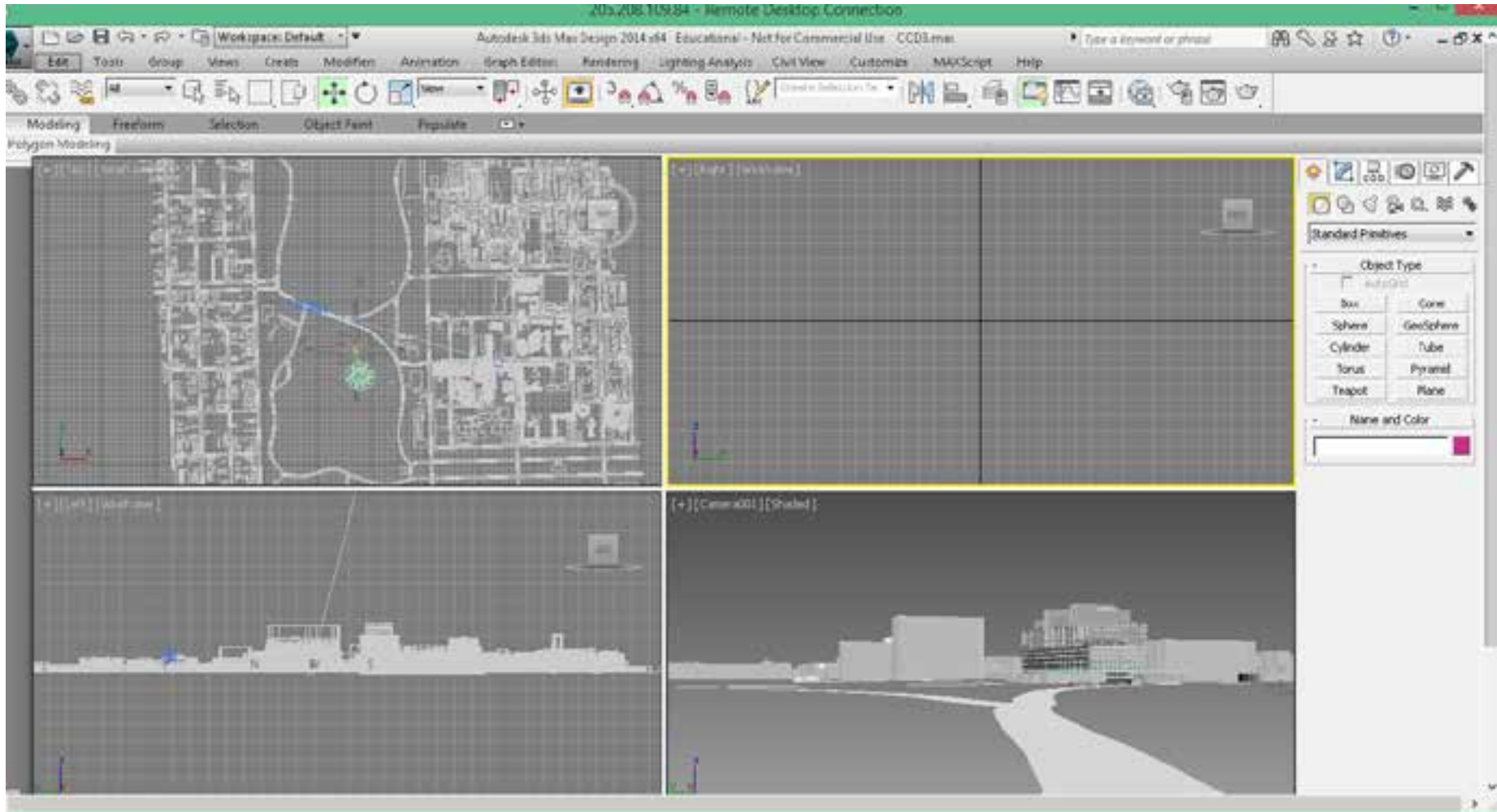
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- **Methods: GIS CityEngine**



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- **Methods: BIM – 3ds MAX**



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- **Methods: GOOD, BAD and UGLY**

- **The GOOD:**

- ü 3ds MAX was a staging environment for FBX exports of BIM models

- ü Unity is 'easy' to use, advanced visualization tools

- **The BAD:**

- ü 3ds MAX tough to use with very large models

- ü Software support for imports/export & results???

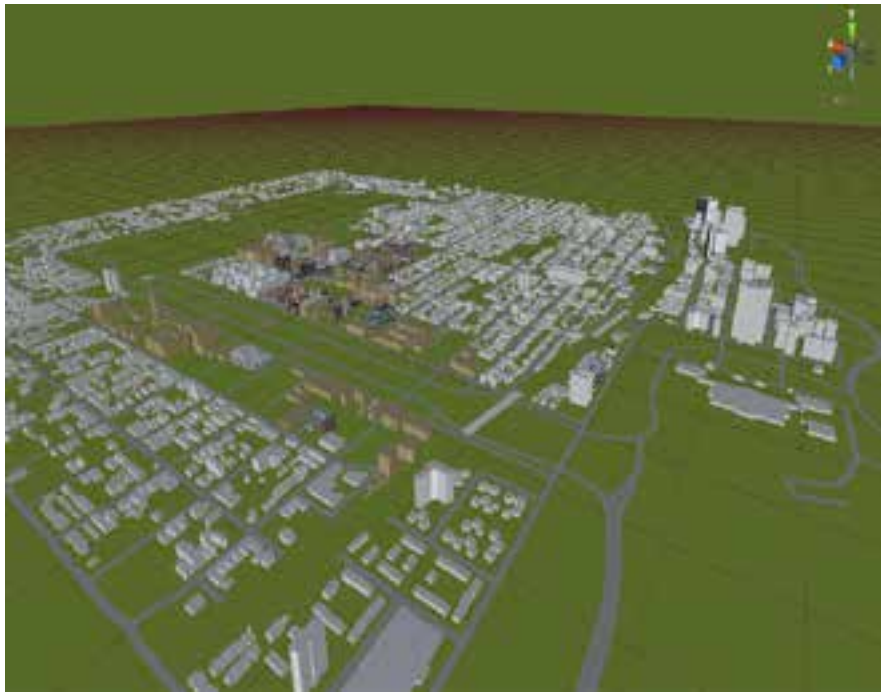
- **The UGLY:**

- ü Texture mapping is an Art!

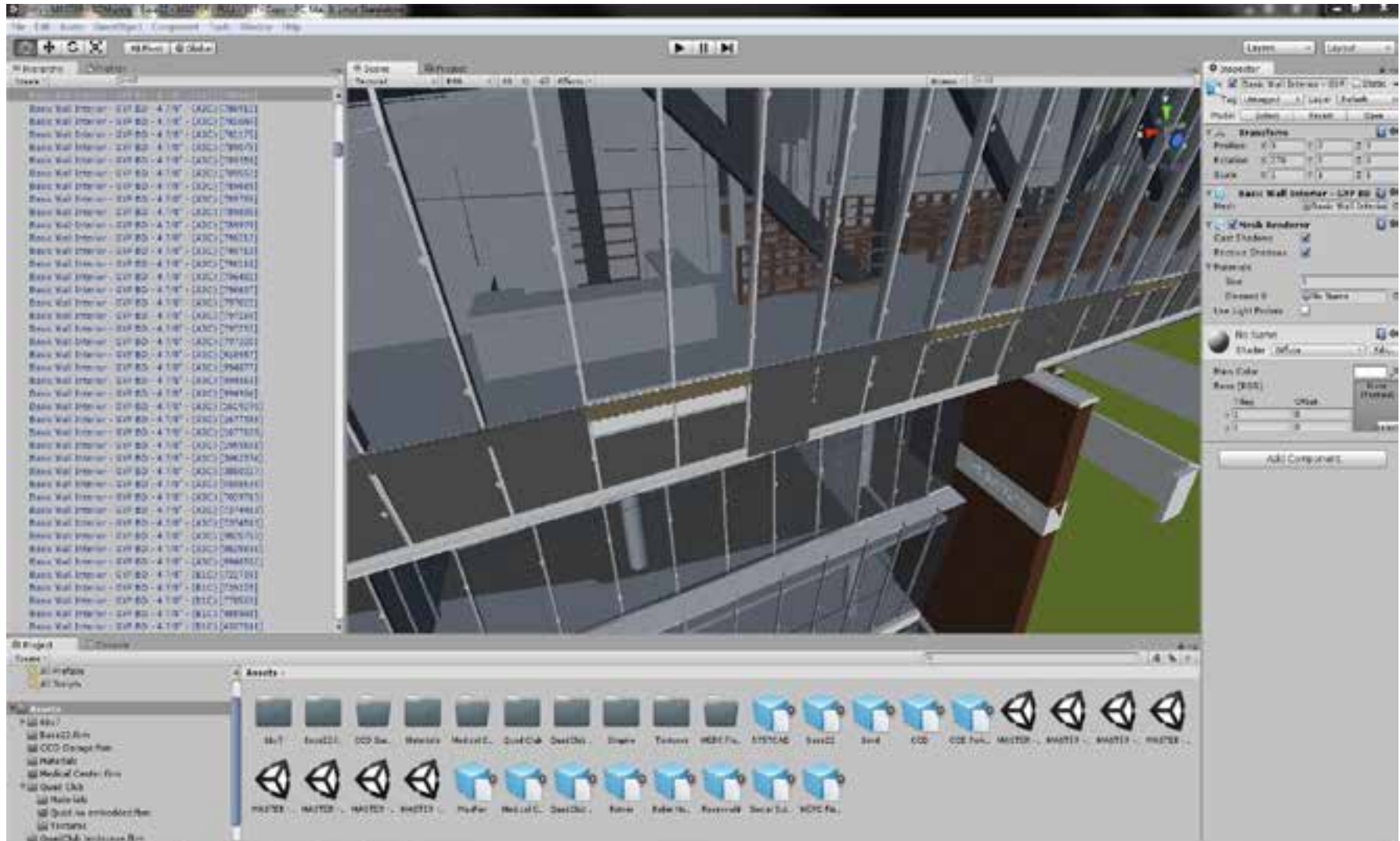
- ü Spatial placement of models is a manual process

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- **Methods: Unity – 3D editing environment**
 - **Can handle large imported models in FBX**
 - **Strong editing tools for 3D data**
 - **Used within advanced Visualization Environments**

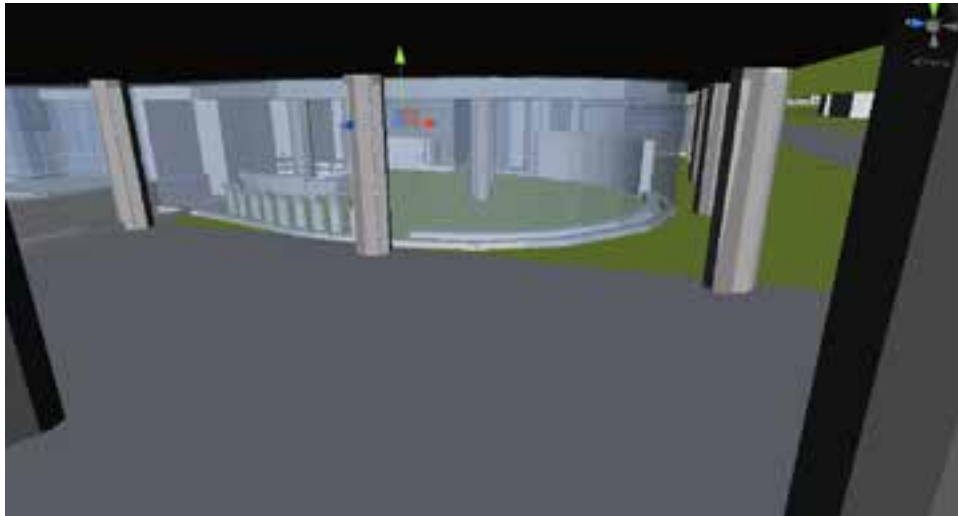


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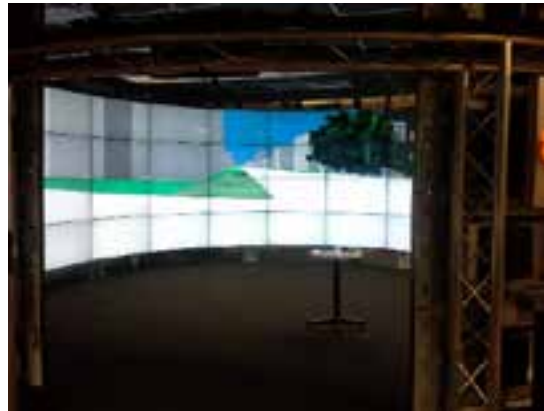
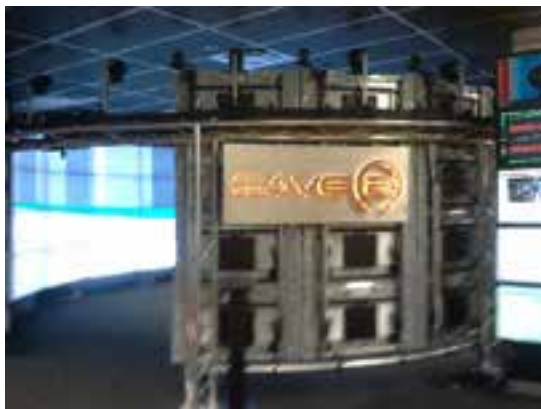
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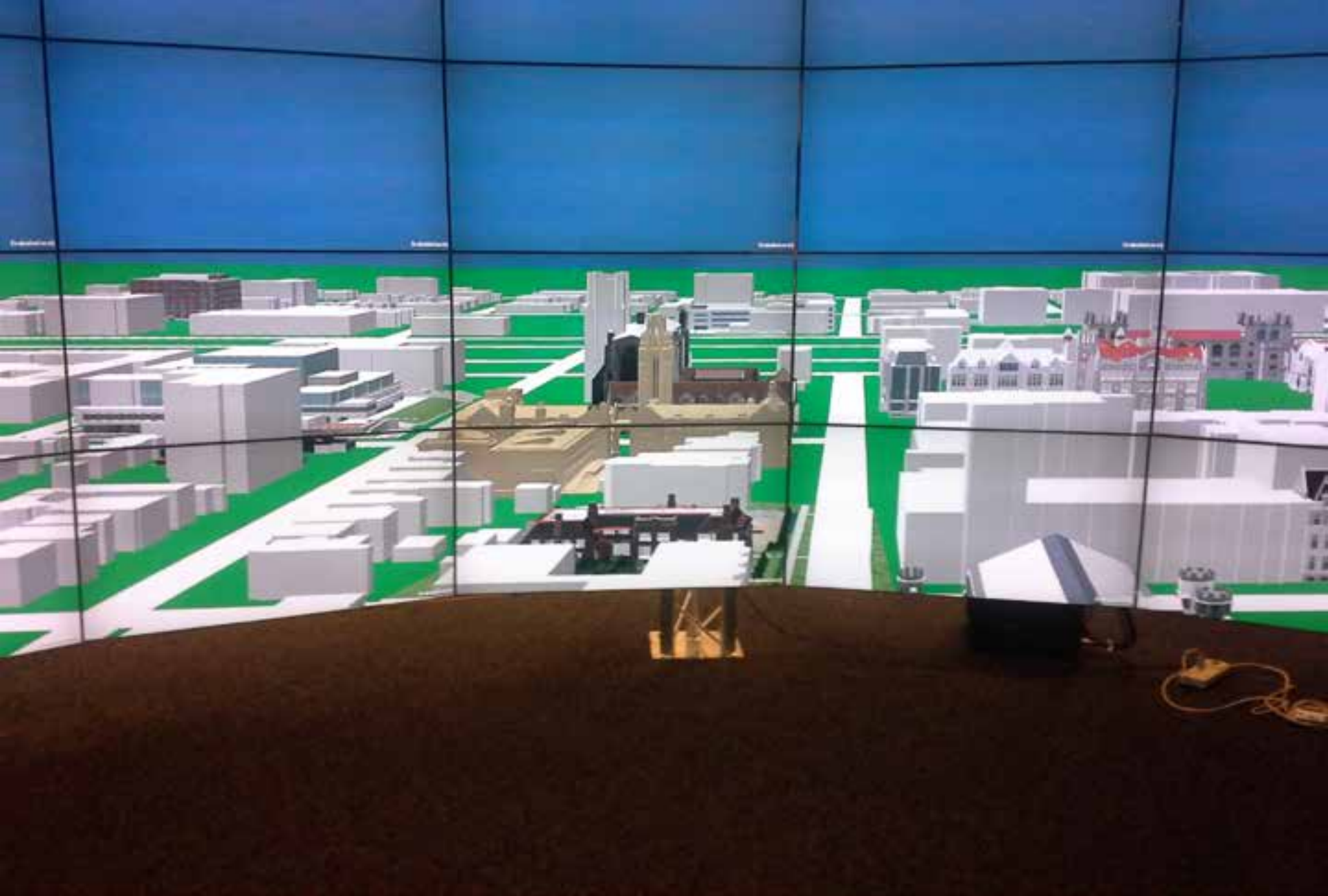
- **Virtual Campus Specifications:**
 - **Over 2 million objects**
 - **2,000 texture files: images and graphics**
 - **Total Model size: 2.5 GB**
 - **This is a small model – only 4 buildings are BIM models with interior spaces**

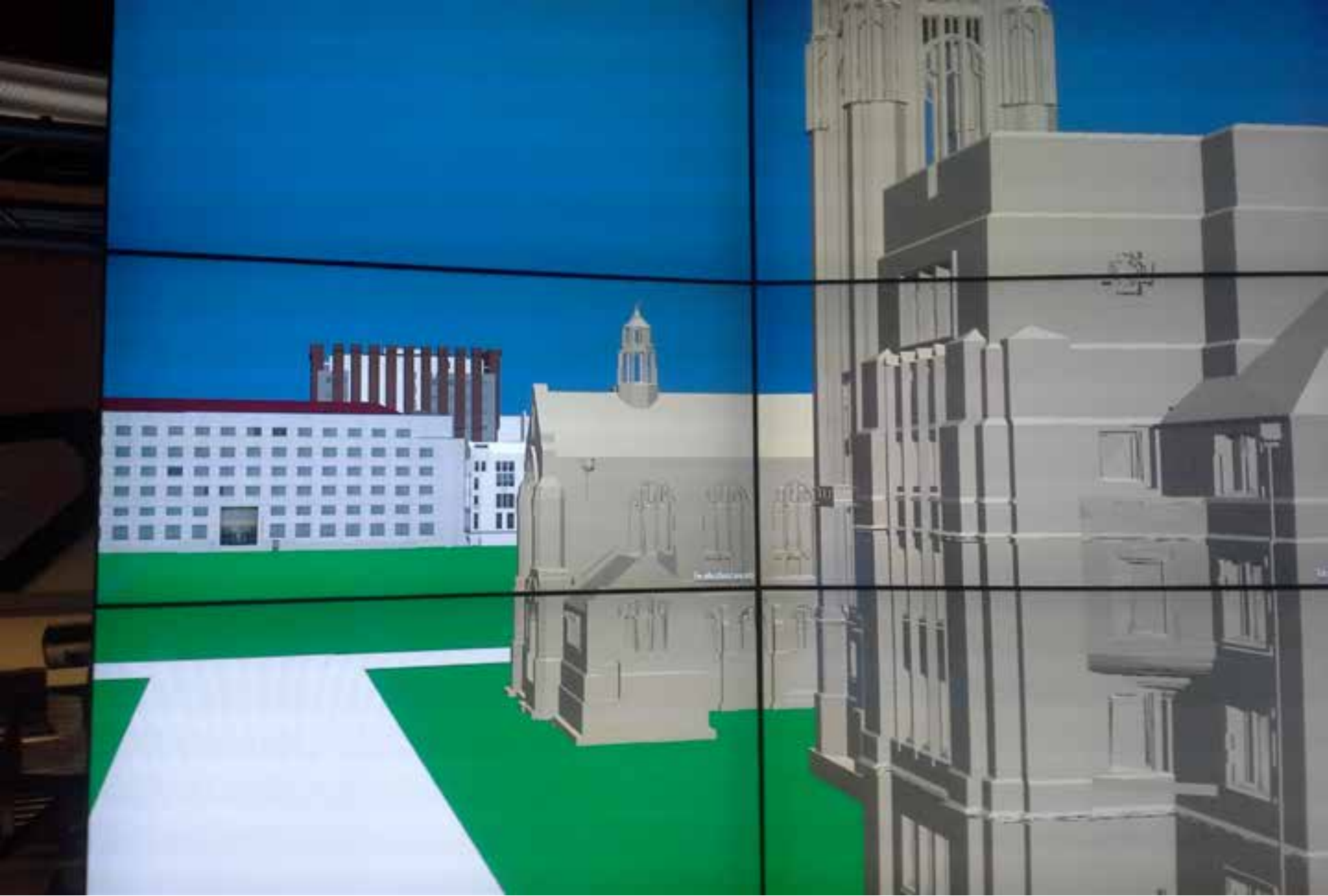


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- **CAVE2 – Virtual Reality System**
 - **320 degree panoramic 3D that matches human visual acuity**
 - **480 SqFt of viewing surface**
 - **.029 inch per pixel resolution – 100 million pixels**
 - **10 camera optical tracking system – uses glasses or ‘drive stick’ for navigation**









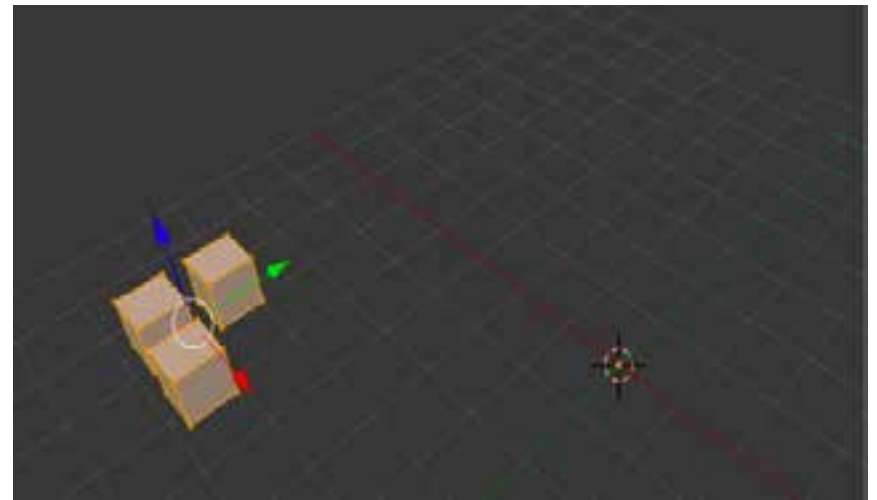
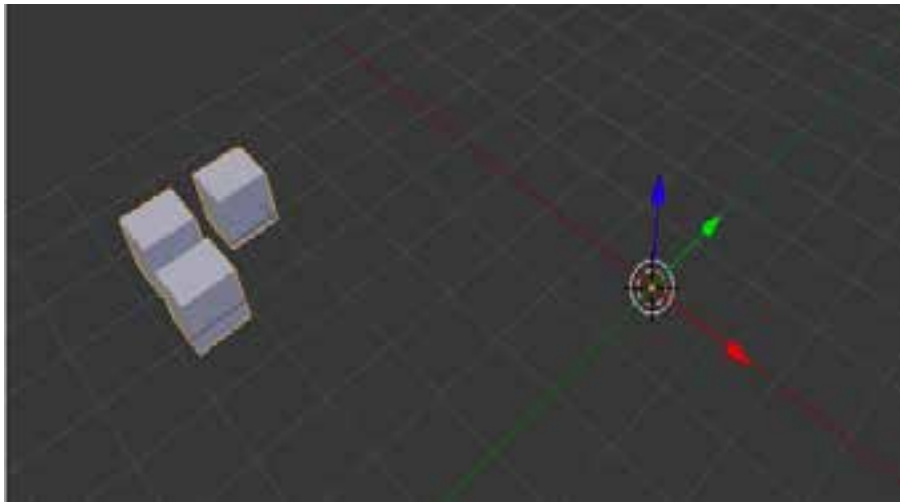






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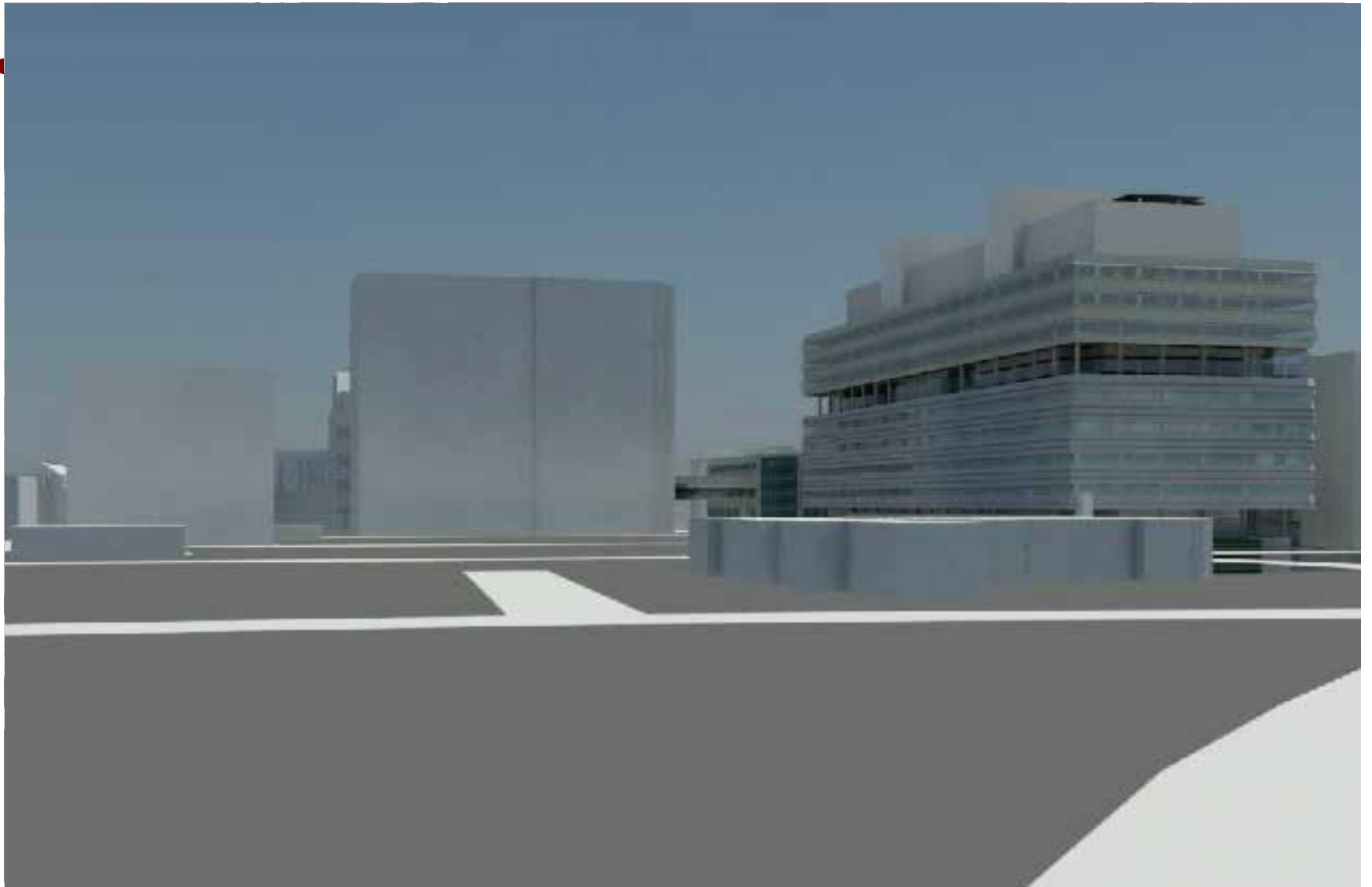
- **Tricks:**
 - **LOD for textures – turn off at large scales**
 - **Interior polygons/textures loaded at run time as we approach the building.**
 - **Center of the model (Origin) very important – must complete resolution of model as you migrate**



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- **Lessons Learned**
 - **Data Models:**
 - ü **LOD & Map Scale**
 - ü **Textures do not map constantly from BIM or SketchUp.**
 - ü **Geometric conversions are tough – FBX most common supported format**
 - ü **How much attribution do we carry forward – semantics will be huge**
 - ü **We want the visualization environment to work for Catalog and Smart Cities/OWS down the road.**

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- **Lessons Learned**

- **Hardware:**

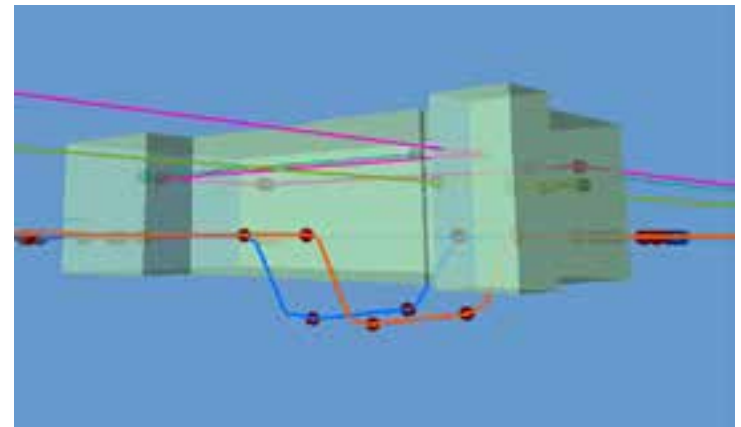
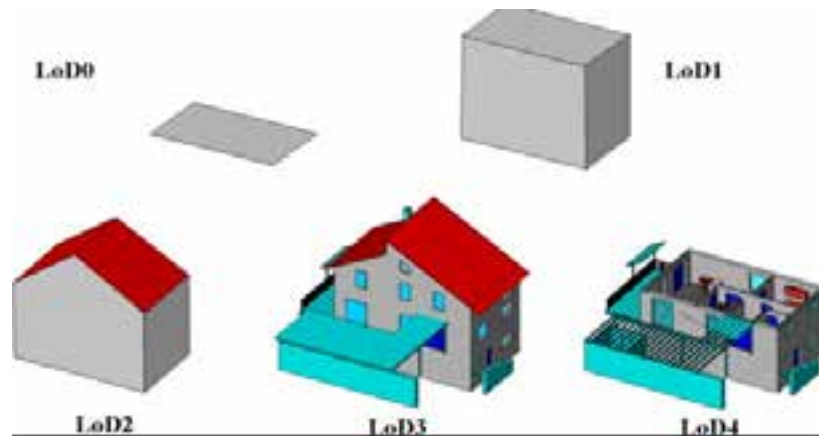
- ü **It's good and getting better all the time**

- ü **Standard 64bit environments might not cut it for very large models (Campus or Citywide)**

- ü **CAVE2 technology can handle the throughput on the images – no flicker to resolution issues**

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- **Next Steps:**
 - **Determine the Visualization Software**
 - **Build the Virtual Campus in CityGML**
 - **Include other campus assets to the Model: Utilities**
 - **Establish best practices in Texture Management**
 - **‘Plug and play’ Model components for buildings & utilities – State Plane, Data Formats etc....**



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