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
Objectives of the Project

- Why do this?
  - Push to the most challenging 3D visualization environment available
  - Impact this environment has on Tools/Models
  - Issues presented will need to be addressed in the final data model - CityGML
  - 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
  – 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:**
    - 3ds MAX was a staging environment for FBX exports of BIM models
    - Unity is ‘easy’ to use, advanced visualization tools
  
  – **The BAD:**
    - 3ds MAX tough to use with very large models
    - Software support for imports/export & results???
  
  – **The UGLY:**
    - Texture mapping is an Art!
    - 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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- 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:
    • LOD & Map Scale
    • Textures do not map constantly from BIM or SketchUp.
    • Geometric conversions are tough – FBX most common supported format
    • How much attribution do we carry forward – semantics will be huge
    • We want the visualization environment to work for Catalog and Smart Cities/OWS down the road.
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- Lessons Learned
  - Software: Not really ready to prime time – video gaming software cannot scale to detail or complexity of the virtual environments we want to present
  - Navigation and Management Tools are complex and hard to use.
  - Building vs. Campus level visualization
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• Lessons Learned
  – Hardware:
    • It’s good and getting better all the time
    • Standard 64bit environments might not cut it for very large models (Campus or Citywide)
    • 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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