Efficient Large Scale Acquisition of Building Interiors

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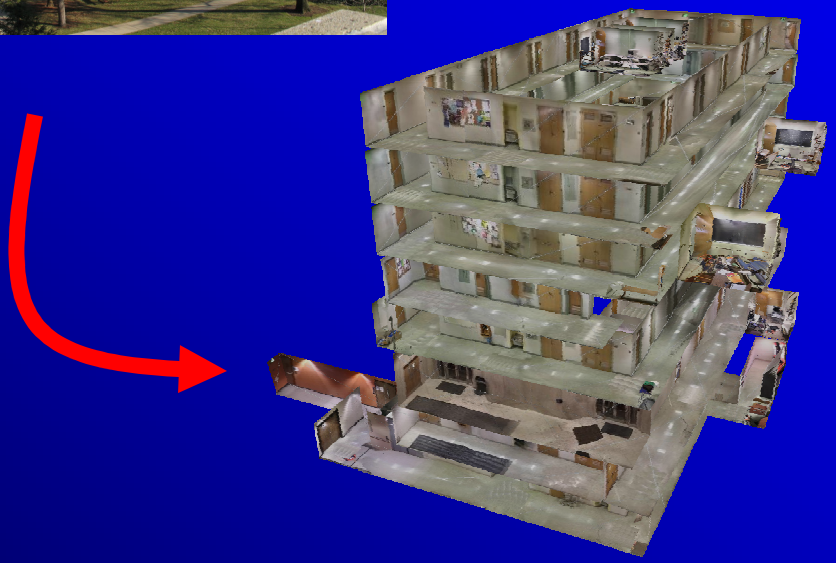
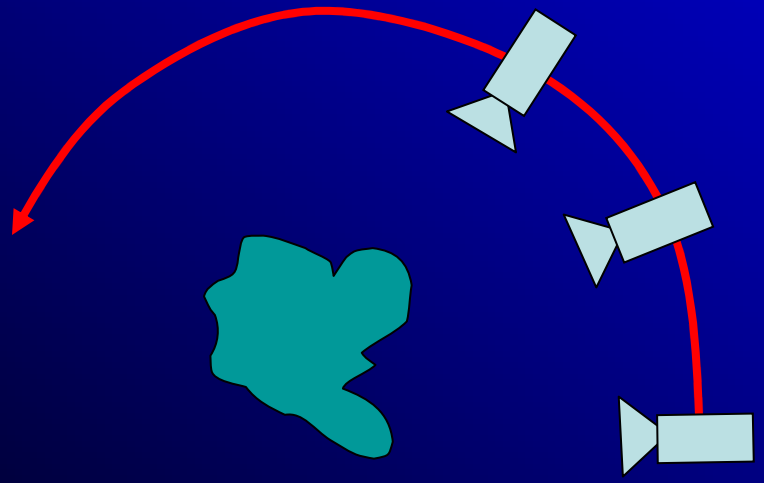


Acquisition

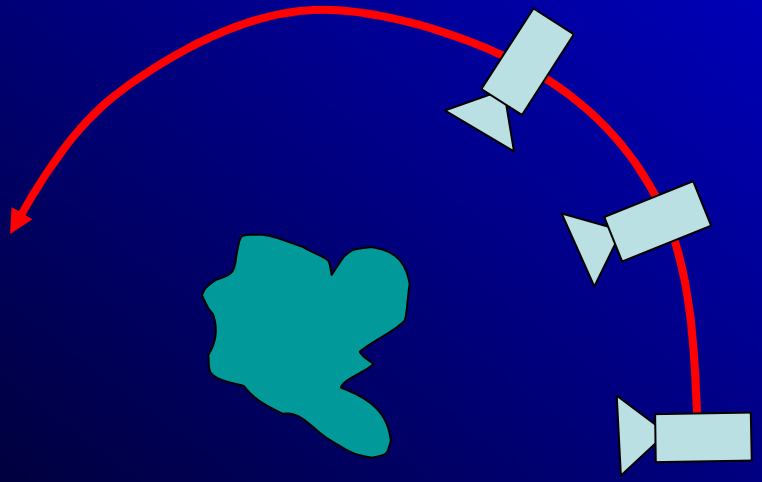
- *Outside-looking-in*

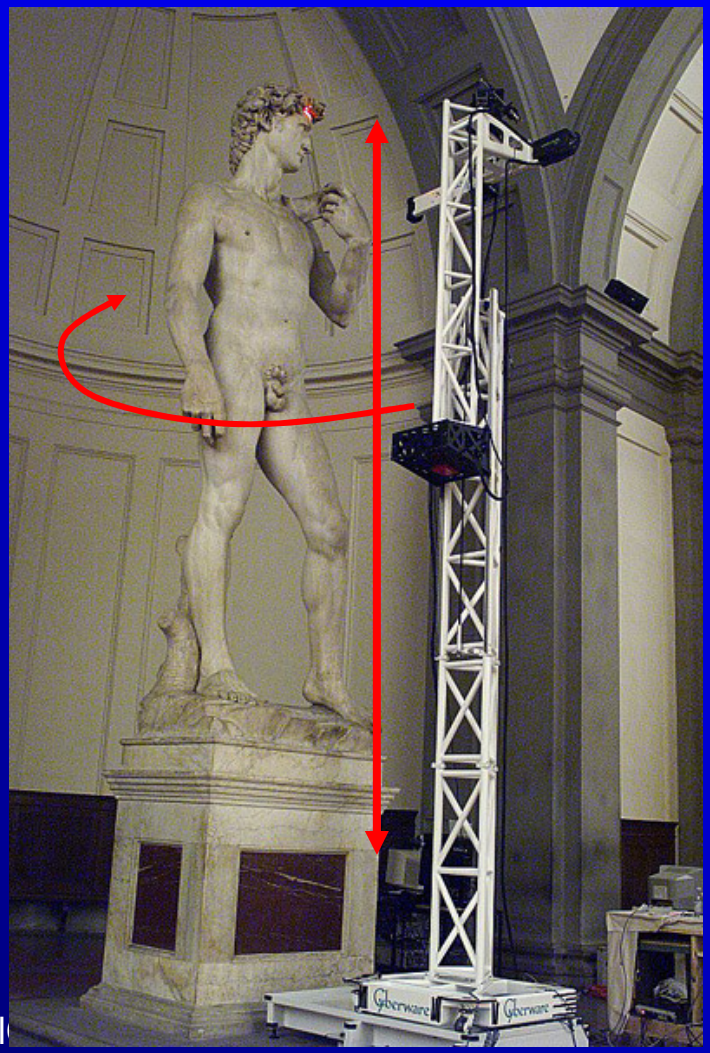


http://www.cs.purdue.edu/cgvlab/modelCamera/modelCamera.html

Acquisition

- *Outside-looking-in*





http://graphics.stanford.edu/projects/mich/

http://www.cs.purdue.edu/cgvlab/model

Acquisition

- *Outside-looking-in*
  - *Camera is outside the scene*
  - *Controlled environment (e.g. camera's position tracked)*
  - *Small depth range*
- *Hard to compete with photographs!*

http://graphics.stanford.edu/projects/mich/

http://www.cs.purdue.edu/cgvlab/modelCamera/modelCamera.html

Acquisition

- *Inside-looking-out:*
  camera is surrounded by the scene
  - *HARD!*
  - *Cannot be substituted by photographs*
  - *Camera's position?*
  - *Large depth range*
  - *Complex objects*

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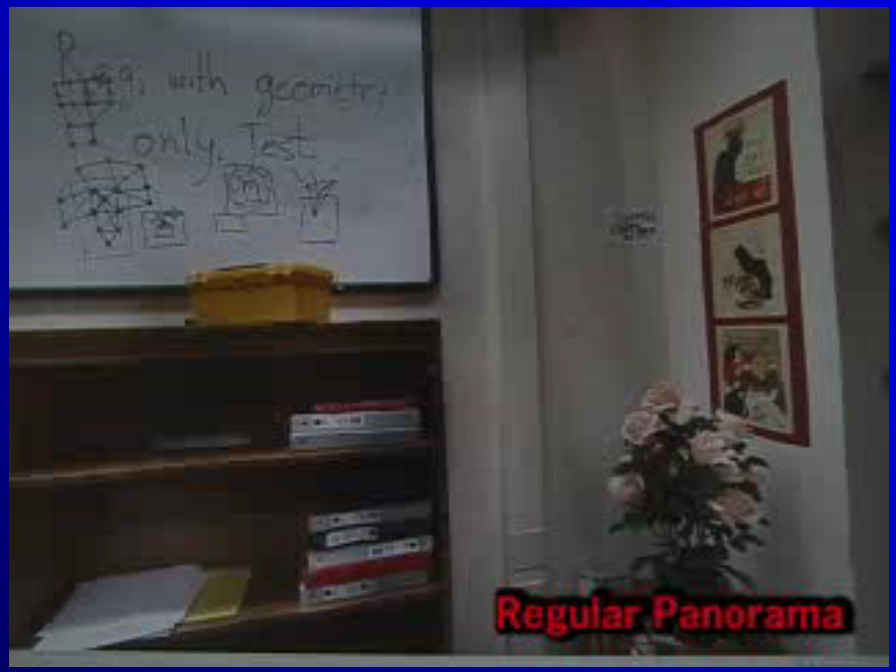
Scene Geometry (Depth)

- Hard to capture
- Necessary to allow translation



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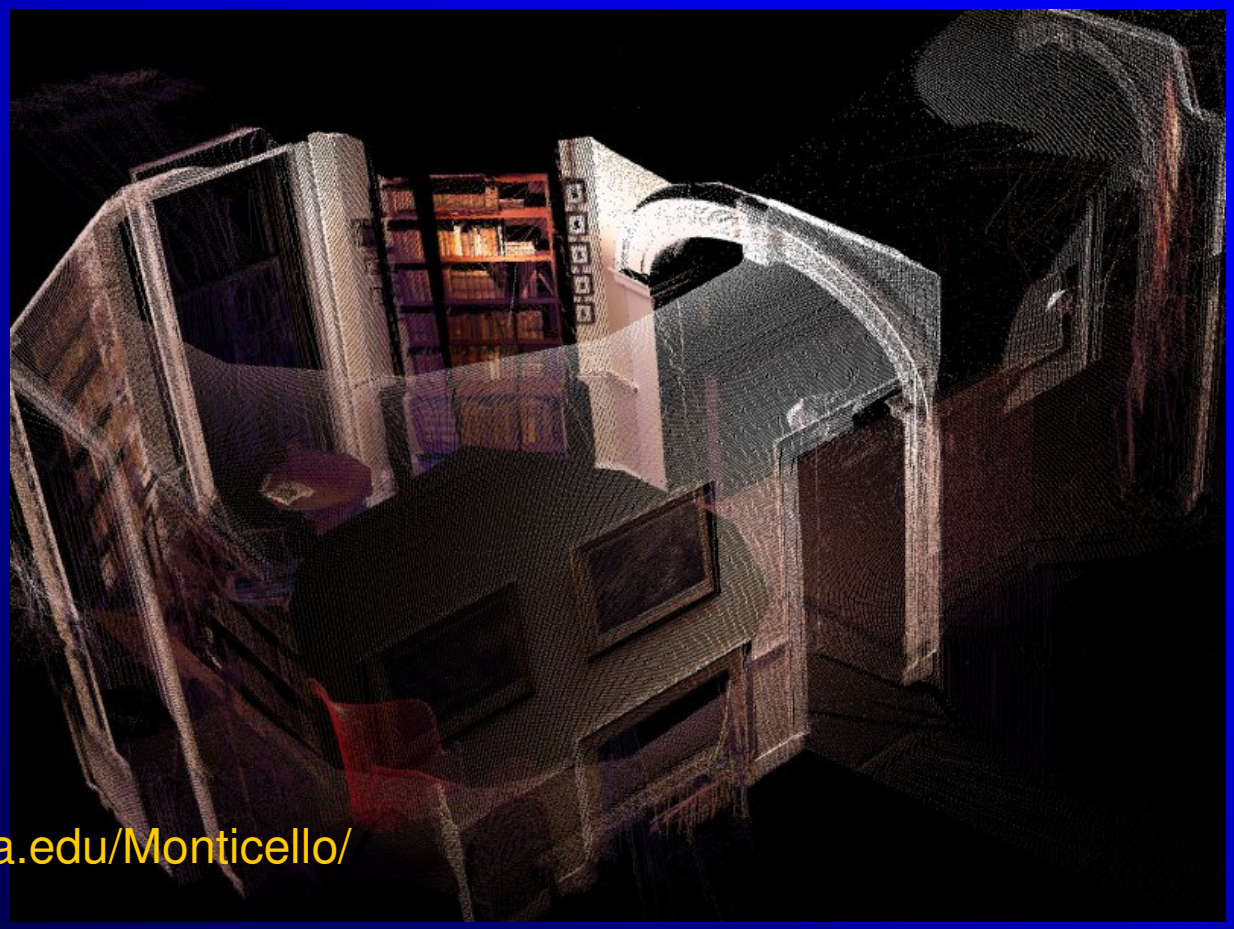
Depth Acquisition Methods

- Dense



David Luebke

Scanning Monticello

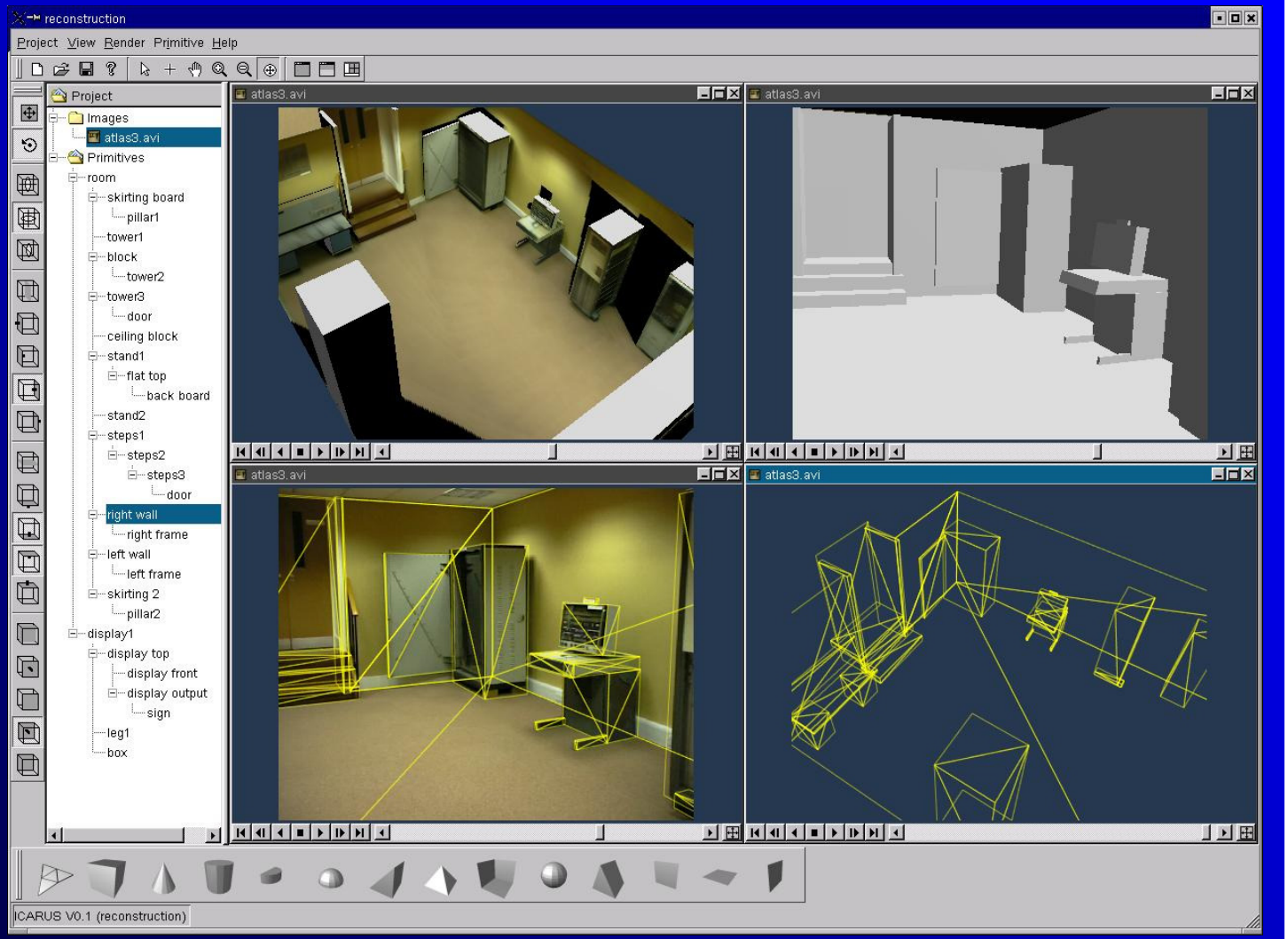
http://www.cs.virginia.edu/Monticello/

http://www.cs.purdue.edu/cgvlab/modelCamera/modelCamera.html

Depth Acquisition Methods

http://aig.cs.man.ac.uk/research/reveal/icarus/index.html

- Dense
- Manual



http://www.cs.purdue.edu/cgvlab/modelCamera/modelCamera.html

Depth Acquisition Methods

- Dense
- Manual
- Zero

Quicktime VR

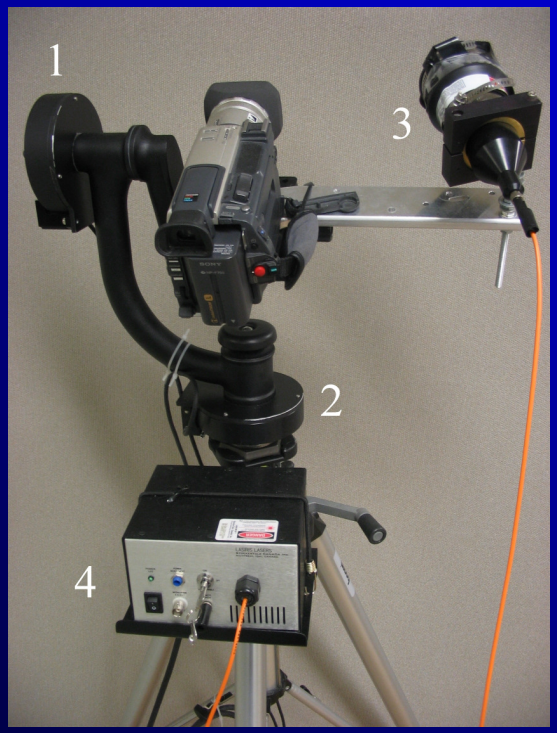
http://www.cs.purdue.edu/cgvlab/modelCamera/modelCamera.html

Panorama by Jook Leung, http://360vr.com/jook/

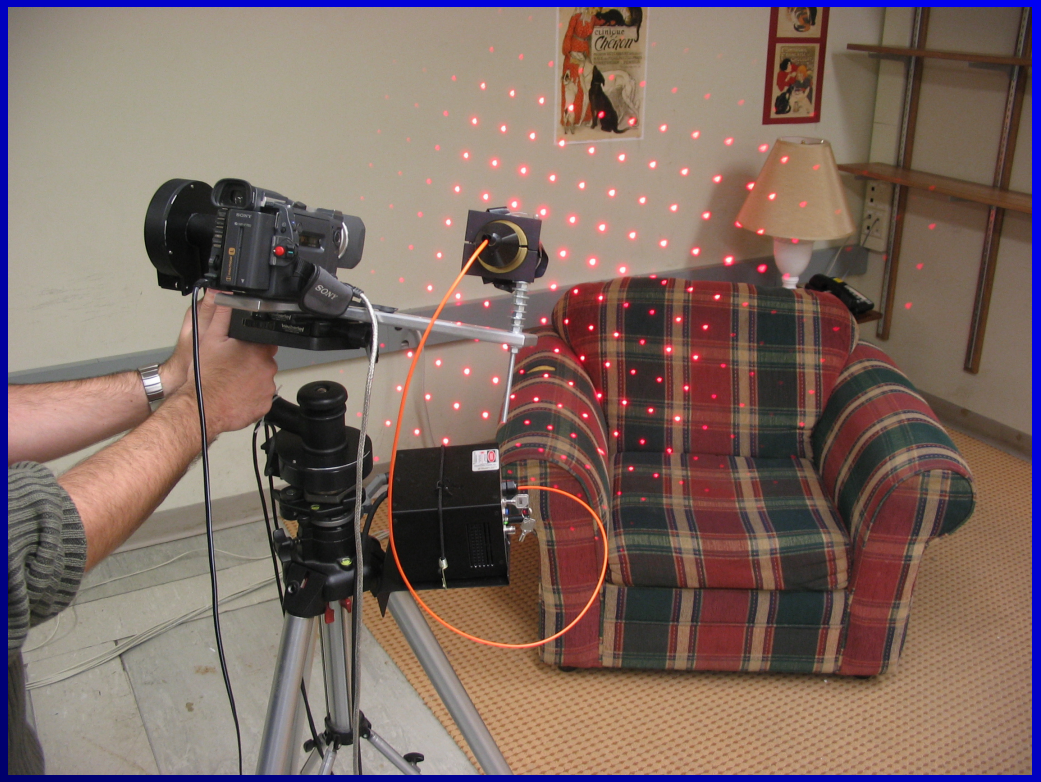
Dense Color / Sparse Depth (our approach)

- Improved panoramas (single acquisition point) = Depth Enhanced Panoramas (DEP)
- Let the user aim the acquisition device!
  - Present results immediately
- Fit proxy geometry to individual point clouds
- Combine proxies from different viewpoints

Acquisition Device



Sparse Depth



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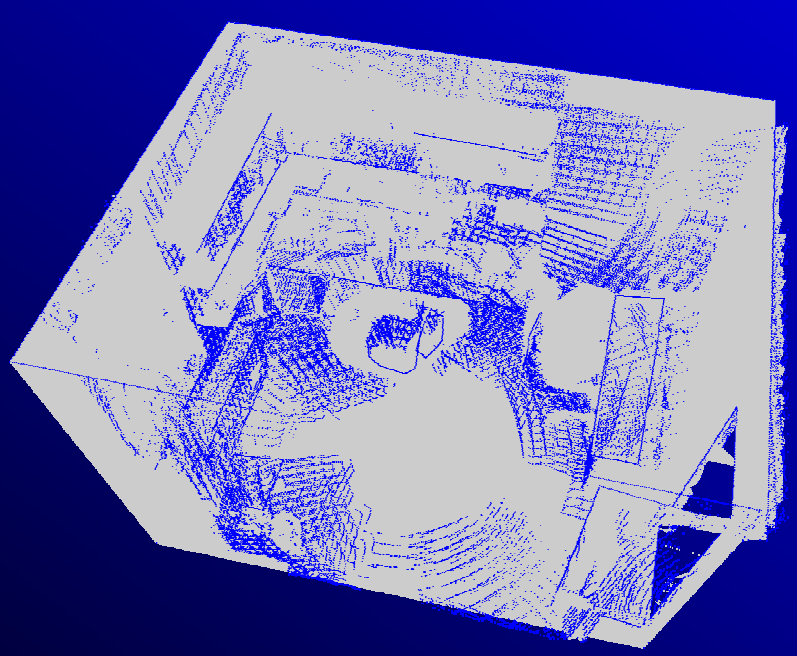
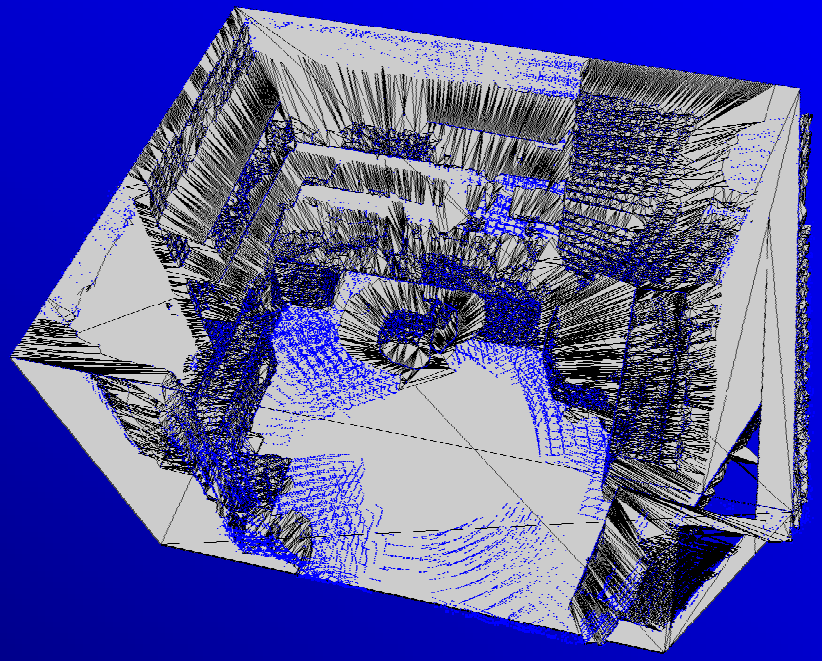
Individual DEPs





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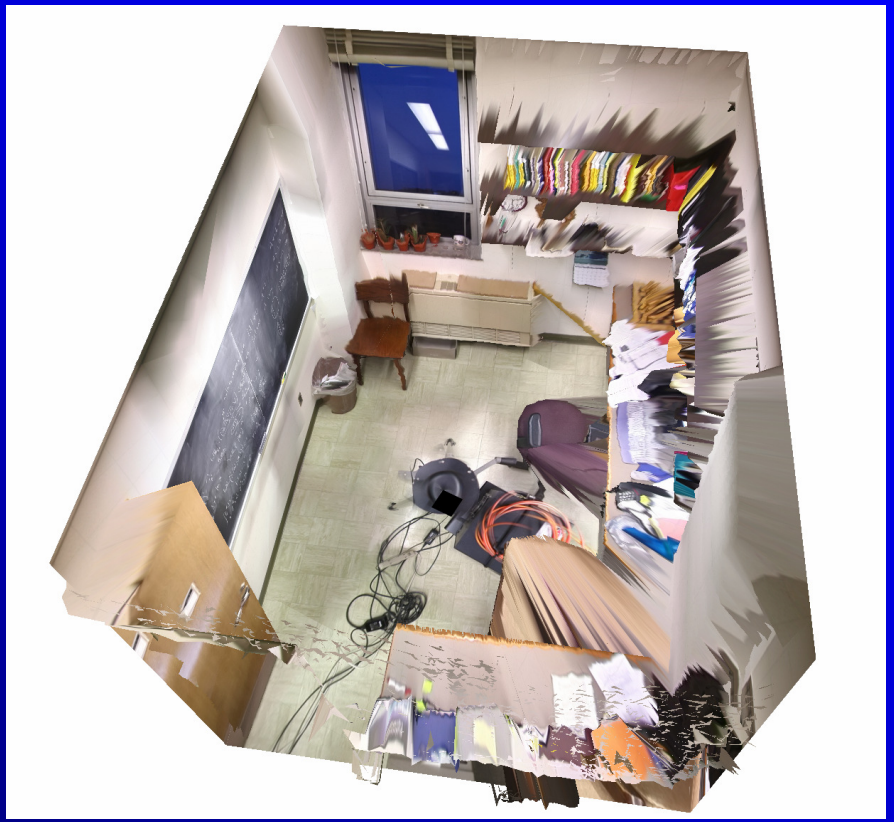
Rooms



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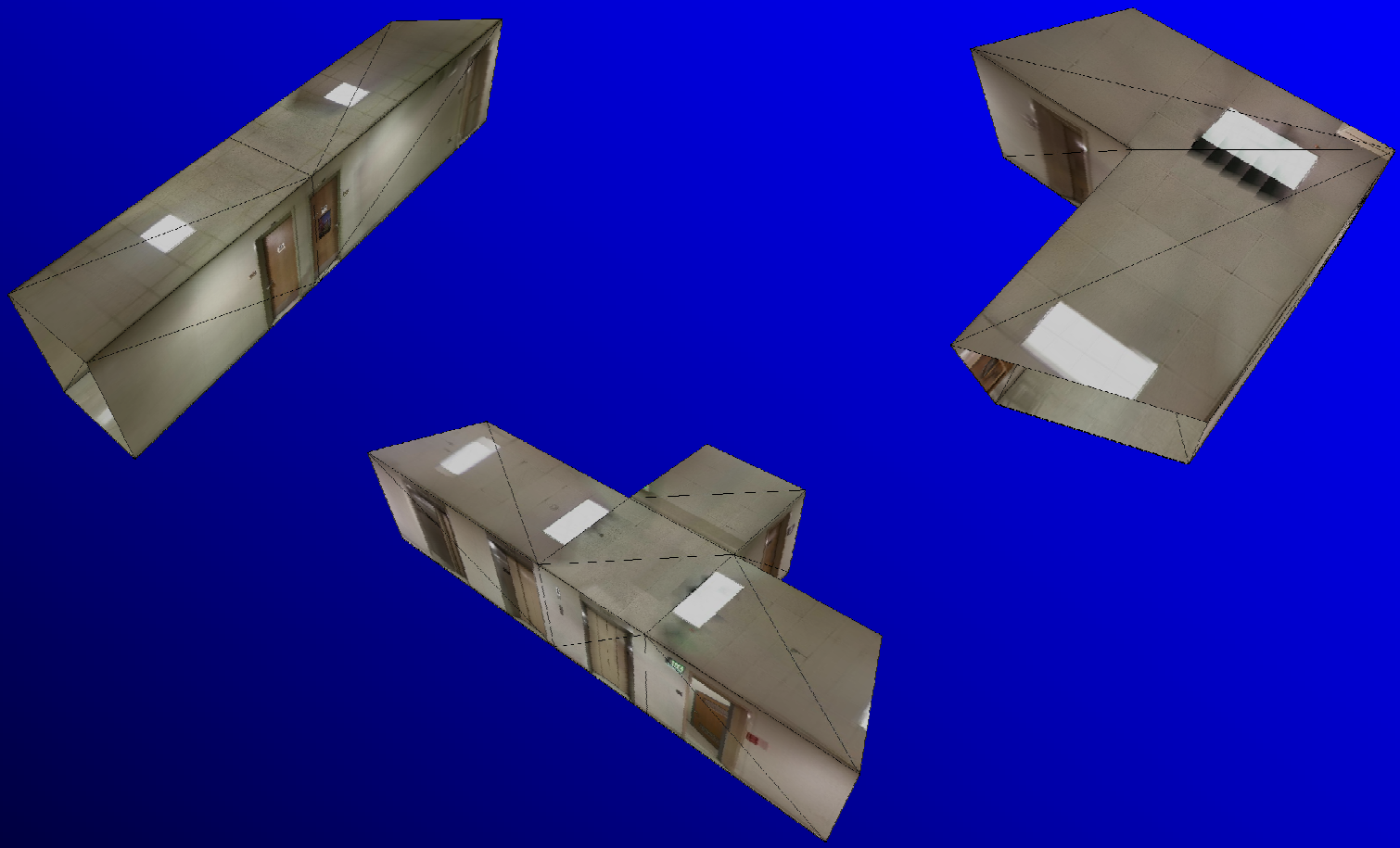
Corridor Sections



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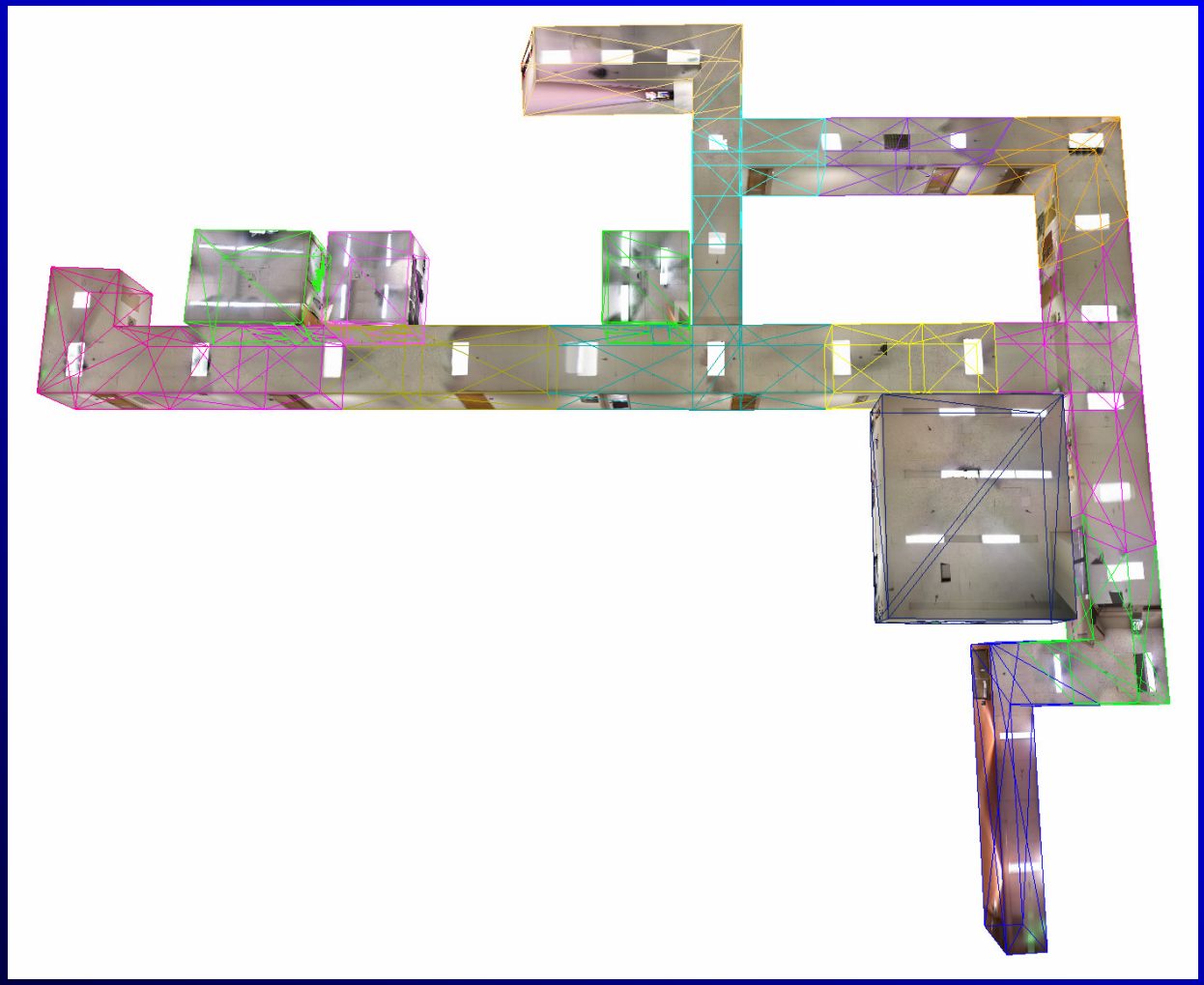
Floors



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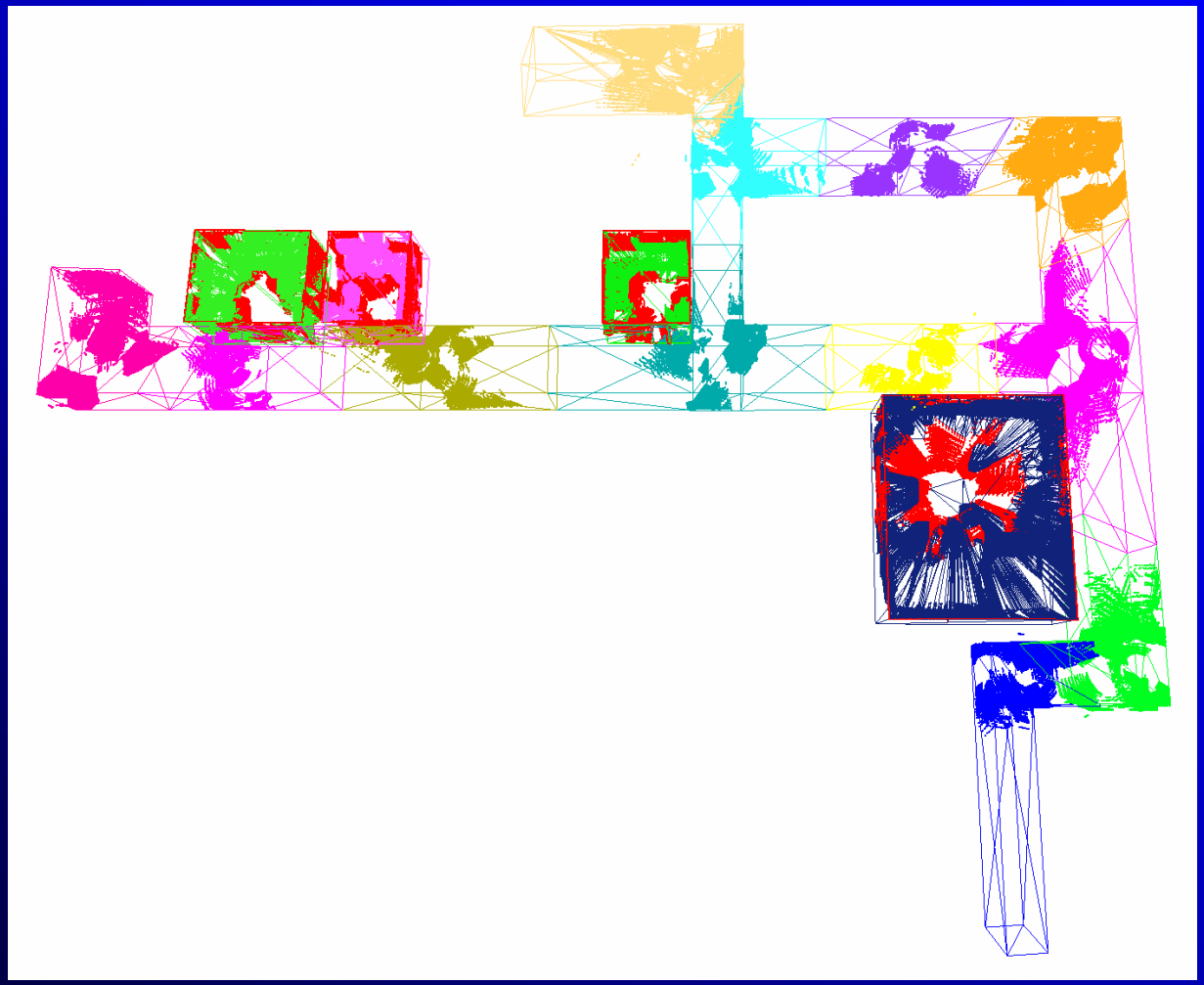

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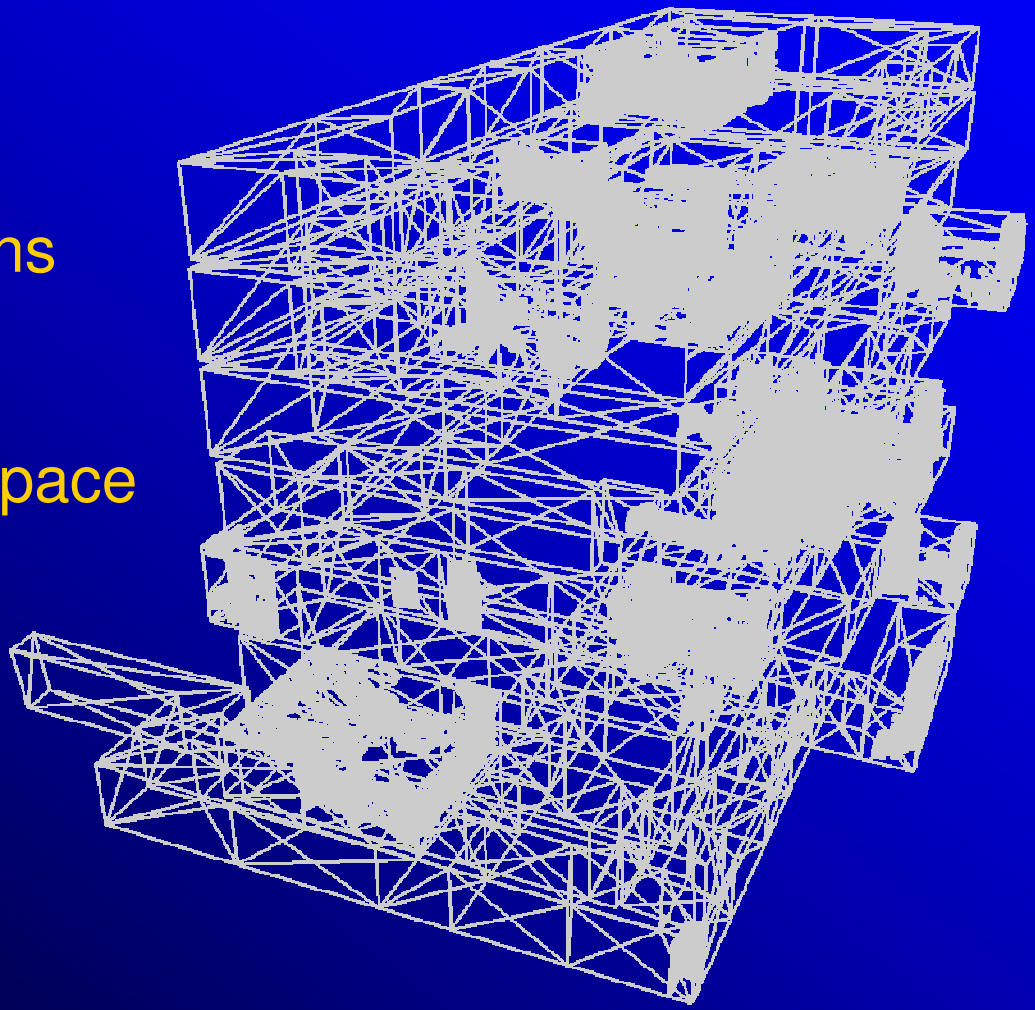
Math Building

- 6 floors
- 20 rooms
- 56 corridor sections
- 40 hours
- 1400 m^2 of floor space
- 2M triangles



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Summarize (the movie)

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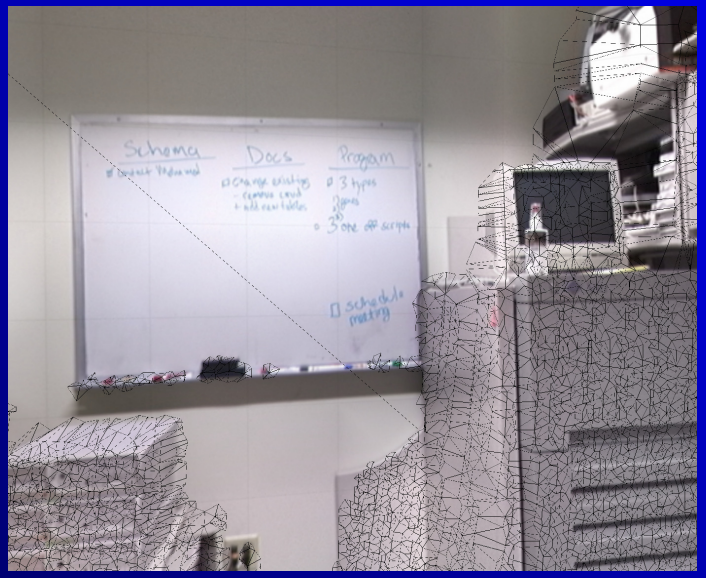
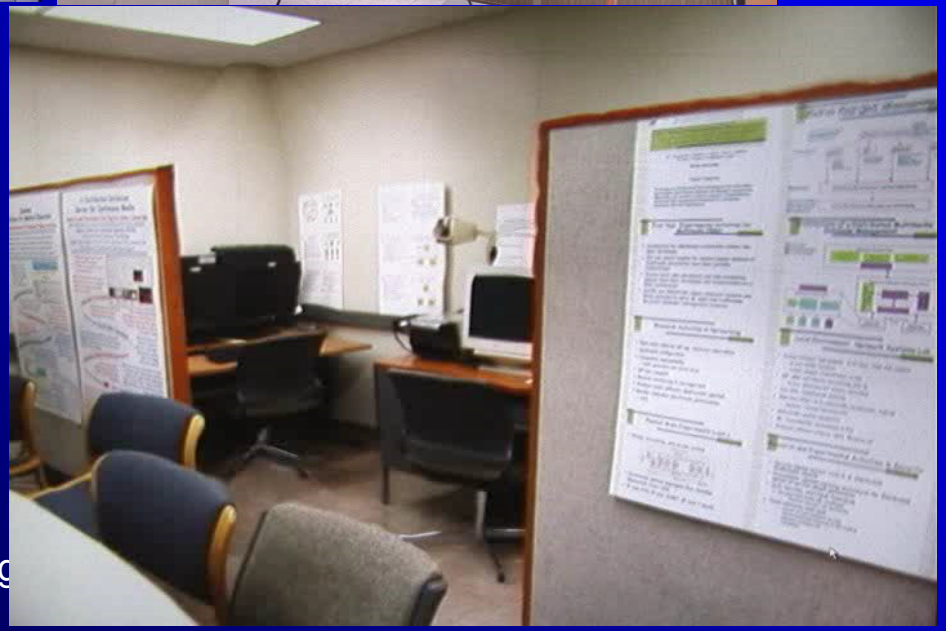
Model Show-off



Model Show-off 2

Model Show-off 3



Future Research

- Specular highlights
- Missing surfaces
- Scanning in parallel

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Conclusions

- Sparse depth
  - efficient, user controlled acquisition
- Proxy geometry
  - saves space, allows registration of floors
- Embedded geometry
  - Captures complex geometry inside rooms and corridors
- Captured large inside-looking-out model