MIT9904-20: High Resolution Mapping and Modeling of Multi-Floor Architectural Interiors

Seth Teller

ntt mit

Bi-Annual Report January 2001

Seth Teller

Goal: Rapid Capture of Interior Architectural Spaces

- Maintain accurate 6-DOF egomotion for camera moving in extended interiors
- Extract high-quality geometry and photo-texture from image sequence
- Our goal: image, model complexity far greater than that which is attainable with interactive tools

Seth Teller

Recent Advances

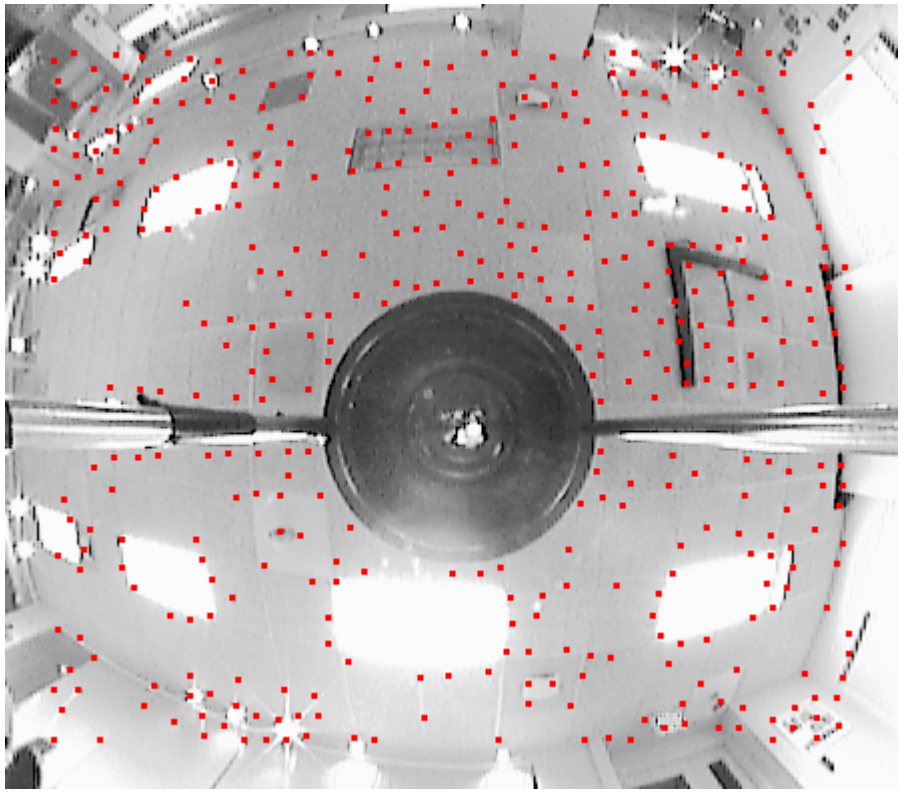
- This year, we demonstrated automated camera registration algorithms accurate to about *five centimeters, and 1/10th of a degree*, over baselines of hundreds of meters, outdoors with a high-resolution frame camera.

- We are now mapping these algorithms onto a new operating regime: low-resolution omni-directional, 30 Hz video, small baselines, indoors.

Seth Teller

Example Image Sequence

- Here is an example image sequence with pure translation and pure rotation, taken in the second floor Graphics Laboratory.



Seth Teller

Research and Engineering Aspects

Research:

- Optical Flow algorithms on the sphere
- Robust estimation of Vanishing Points, Focus of Expansion
- Coupled Egomotion, Structure, Texture Recovery
- Super-resolution estimation from hundreds of observations

Engineering:

- Camera and mirror mounts: minimizing self-occlusion
- Image stabilization: mounting, software issues
- Digital video storage and formats
- Real-time aspects: possible feedback to operator

Seth Teller

- Through December 2000:
  - Continued deployment of prototype sensor
  - Several test datasets from 2nd Floor of LCS
  - Initial software/processing architecture
- Next six months:
  - Develop strategies for ego-motion estimation
  - Sparse and dense reconstruction algorithms
  - Collaboration: Prof. Michael Black at Brown U.