Improvements on Automated Registration

CSc83020 Project Presentation

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References

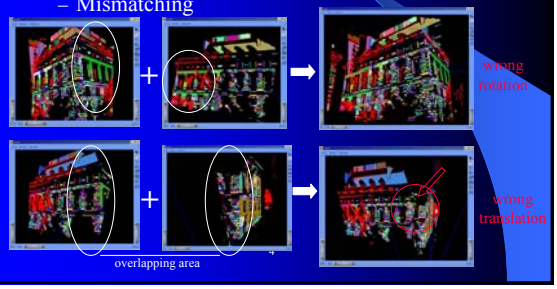
- [1] Automated Feature-based Range Registration of Urban Scenes of Large Scale, Ioannis Stamos and Marius Leordeanu
- [2] Geometry and Texture Recovery of Scenes of Large Scale: Integration of Range and Intensity Sensing, Ioannis Stamos, Department of Computer Science, Columbia University

Motivations

- Three phases of 3D rendering large scale scenes:
  - Segmentation, Registration, Texture Mapping
- Registration – an automated procedure in [1]
  - Pair-wise match two lines
  - Compute R, T and evaluate them
  - Keep the best R and T
  - Refine best R, T

Motivations

- Problems of automated registration
  - Mismatching

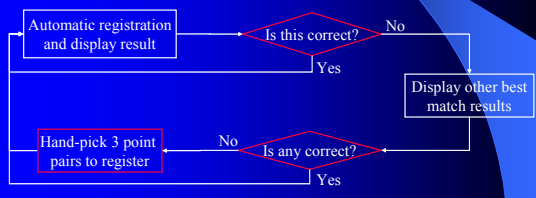


Motivations

- Other problems
  - Slow for images with many parallel lines
    - lines in same direction => many possible R, T => long time to check
  - Error accumulation
    - I_1-I_2, I_2-I_3, I_3-I_4, I_4-I_5 pair-wise image registration
    - Err1, err2, err3, err4 from each registration above
    - I_5-I_1 == err?

Implementations

- Improving the correctness
  - User interaction



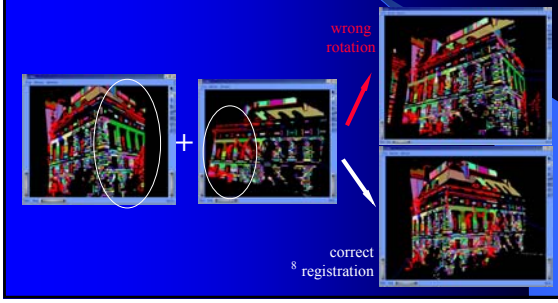
Results

- Hard to auto-register poorly overlapping images

Different viewpoints → different details → no matching lines in overlapping area

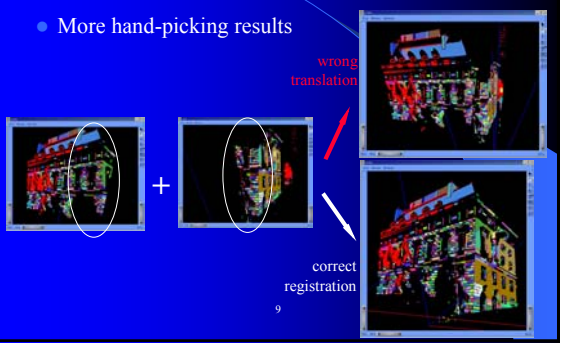
Results

- Hand-picking results in good registrations



Results

- More hand-picking results



Future Implementations

- Improving speed
  - Cluster lines and find major directions
  - Estimate R
  - Compute T similarly to the original method
  - Expected to be much faster: O(m+n) vs. O(mn)
- Improving global performance
  - Combine information after each registration
  - Global optimization by minimizing error function
- Build user interface