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

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

- Overlapping area

- Wrong rotation

- Wrong translation
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

Automatic registration and display result → Is this correct? (Yes/No)

Hand-pick 3 point pairs to register → Is any correct? (Yes/No)

Display other best match results
Results

- Hard to auto-register poorly overlapping images

Different viewpoints $\rightarrow$ different details $\rightarrow$ no matching lines in overlapping area
Results

- Hand-picking results in good registrations
Results

- More hand-picking results

wrong translation

correct registration

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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