

Improvements on Automated Registration

CSc83020 Project Presentation
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References

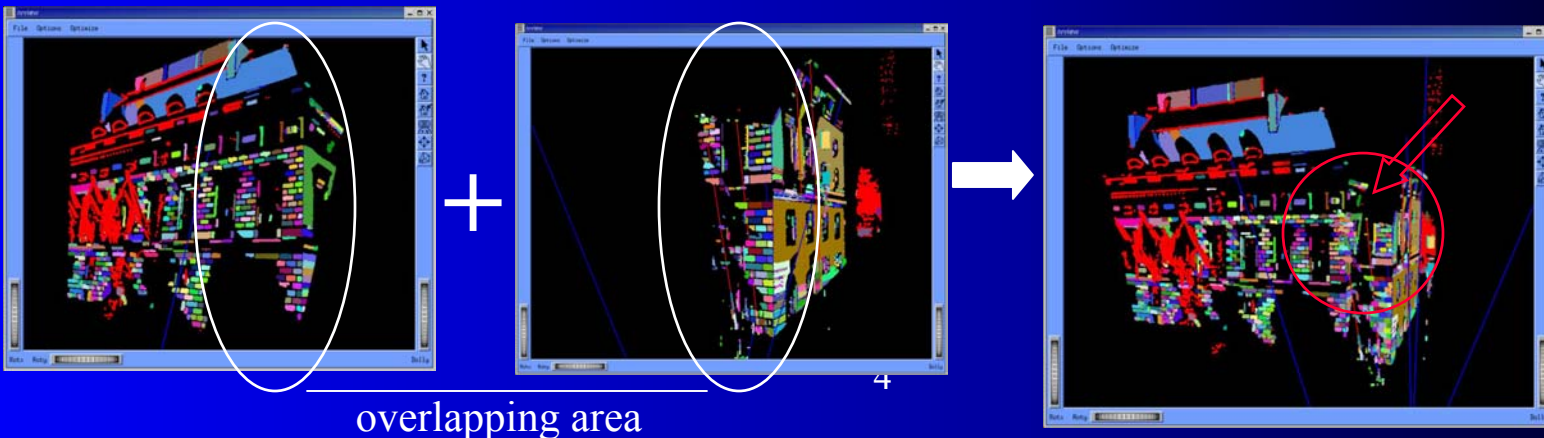
- [1] Automated Feature-based Range Registration of Urban Scenes of Large Scale, Ioannis Stamos and Marius Leordeanu
- [2] Geometry and Texture Recovery of Scenes of Large Scale: Integration of Range and Intensity Sensing, Ioannis Stamos, Department of Computer Science, Columbia University

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

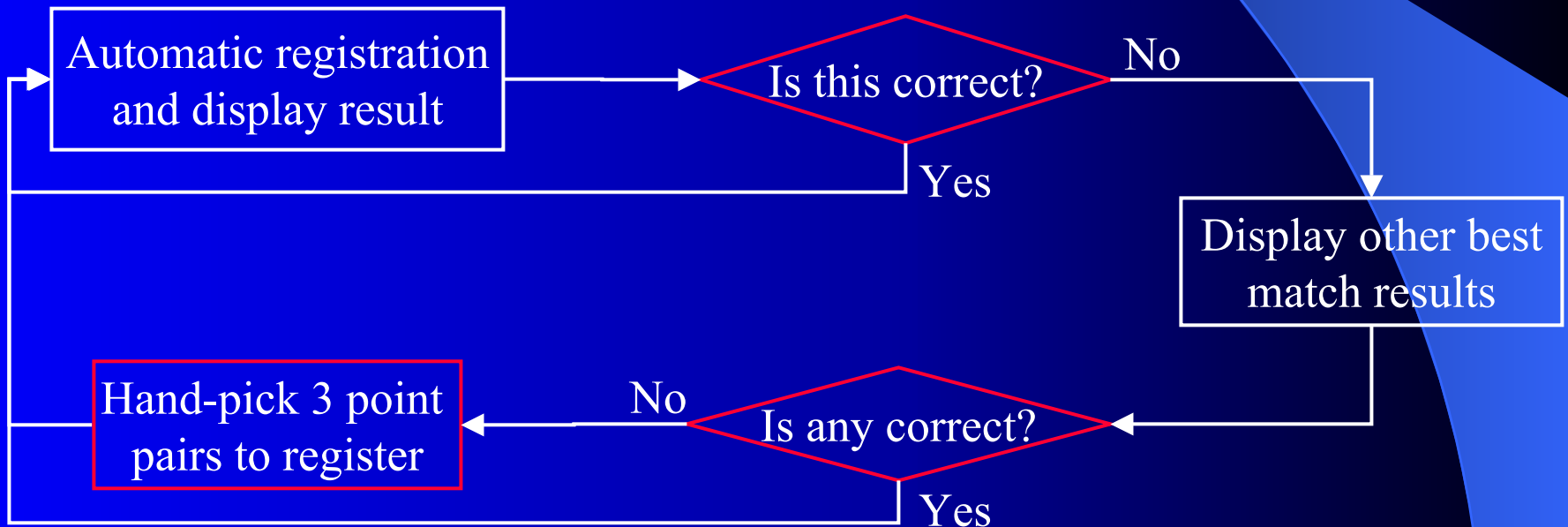


Motivations

- 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
 - $I_5-I_1 == \text{err?}$

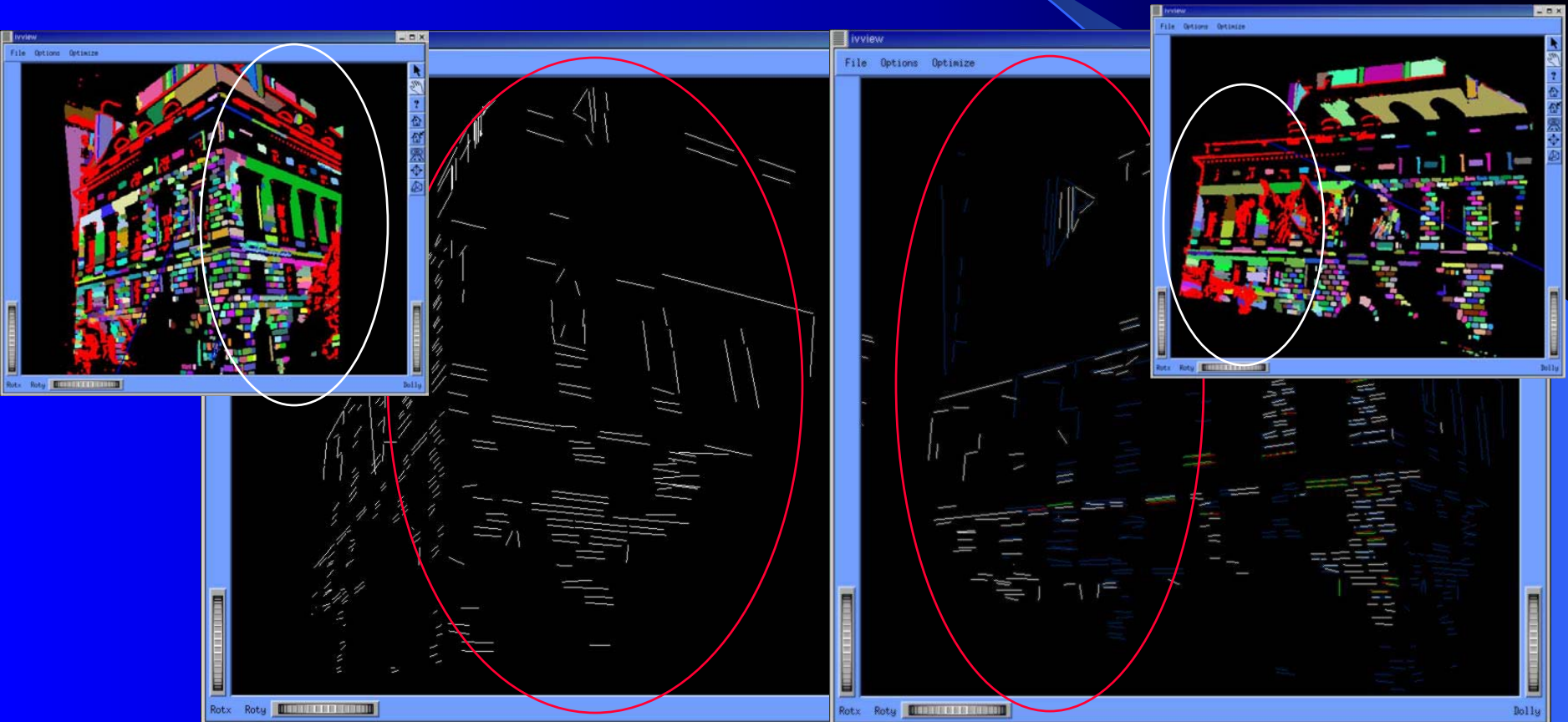
Implementations

- Improving the correctness
 - User interaction



Results

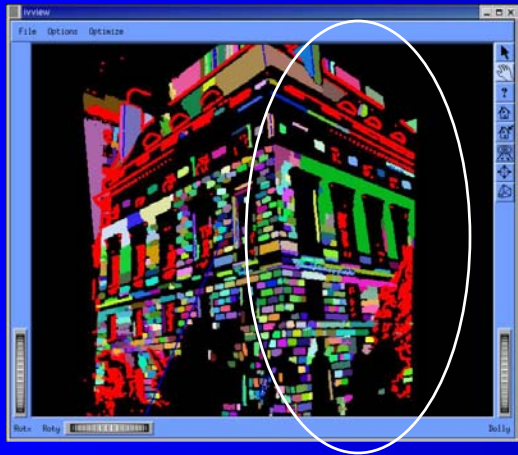
- Hard to auto-register poorly overlapping images



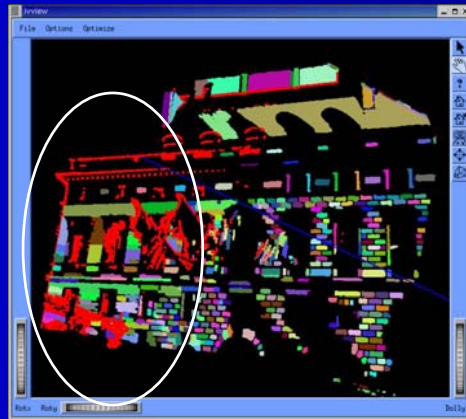
Different viewpoints \rightarrow different details \rightarrow no matching lines in overlapping area

Results

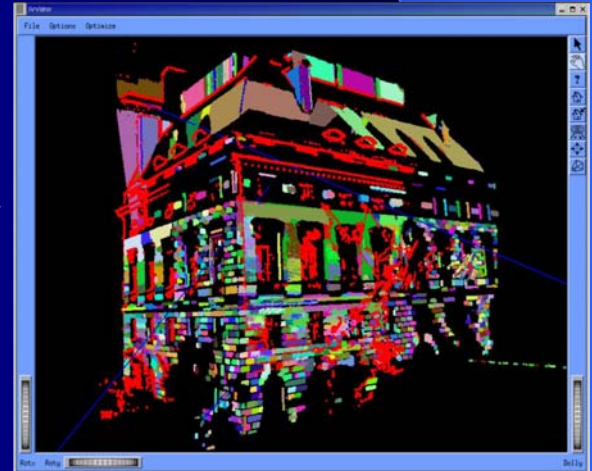
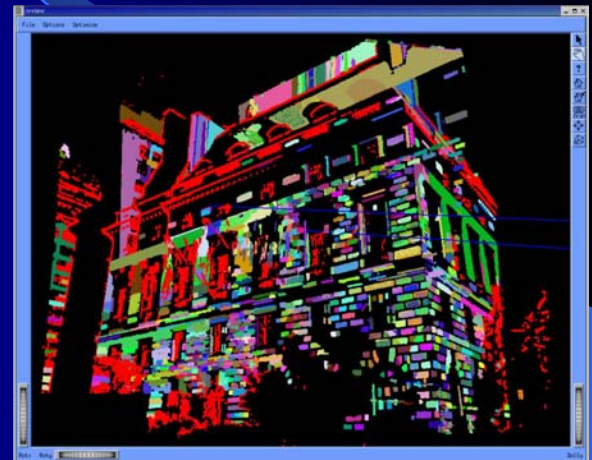
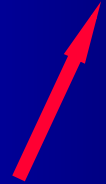
- Hand-picking results in good registrations



+



wrong
rotation



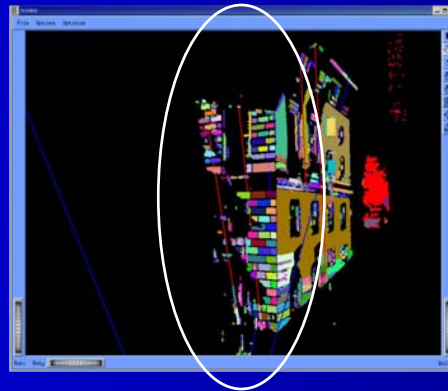
correct
8
registration

Results

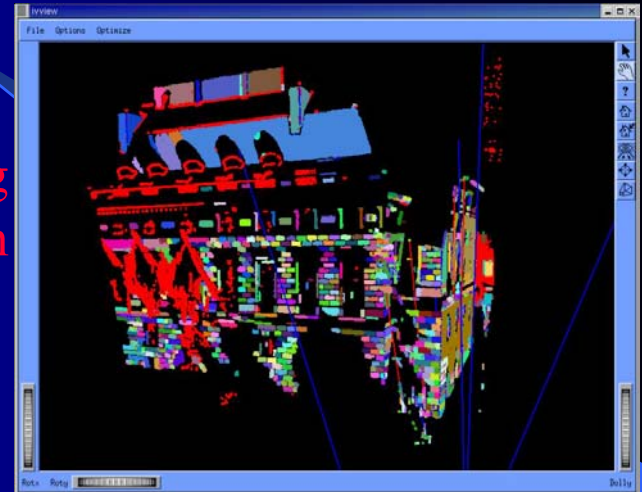
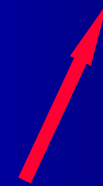
- More hand-picking results



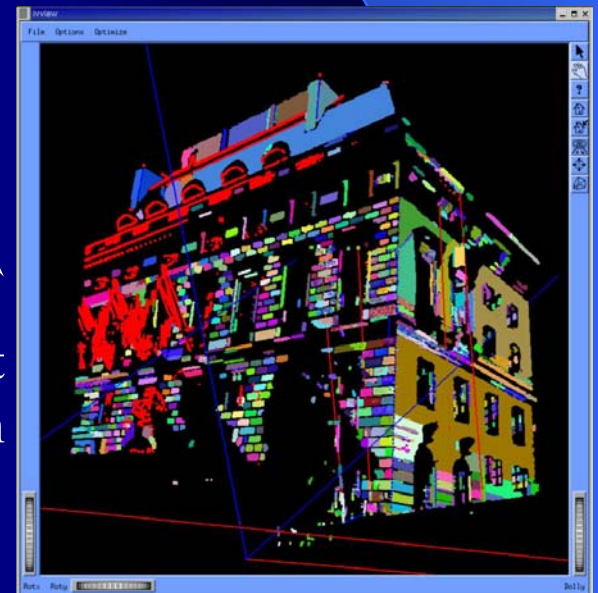
+



wrong
translation



correct
registration



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