Application of multi-sensor fusion to develop a personal location and 3D mapping system

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Outline

- Overall structure
- System implementation
- Experimental results
- Conclusion
Overall structure (1/2)

- Human-portable 3D mapping system
Flow chart of RGBD SLAM
System implementation (1/4)

- Feature Extracting and Matching
System implementation (2/4)

➢ GPU-SURF
System implementation (3/4)

- RANSAC
  - to remove incorrect matches

Results for feature matching
System implementation (4/4)

Calculate the translation and rotation matrix

\[ C_A = \frac{1}{N} \sum_{i=1}^{N} P_A^i \]

\[ C_B = \frac{1}{N} \sum_{i=1}^{N} P_B^i \]

\[ H = \sum_{i=1}^{N} \begin{pmatrix} P_{Ax}^i \\ P_{Ay}^i \\ P_{Az}^i \end{pmatrix} \begin{bmatrix} P_{Bx}^i & P_{By}^i & P_{Bz}^i \end{bmatrix} \]

\[ [U, S, V] = SVD(H) \]

\[ R = VU^T \]

\[ t = -R \times C_A + C_B \]
Experimental results

- Experimental result of scissor stair.
The colored point cloud extracted from Kinect is integrated to build exact 3D maps.

The proposed system has the capability for exploring a complex indoor environment such as terrain with height difference.
Thanks for your attention!