SAD – A Novel Multisensor Scene Acquisition Device

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Geometry

- PMD Vision 19k
  - time-of-flight camera
  - active modulated NIR
  - intensity and depth per pixel
  - real-time (up to 20fps)

Color

- Matrix Vision BlueFox 124C
  - high-quality color images
  - 2 Megapixels

Orientation

- Xsens MTi
  - miniature inertia sensor
  - 3D acceleration, rate of turn
  - magnetic field (not used)

Outlier Removal

- use depth-map structure
- remove isolated points, where isolation depends on scene
- assign score to each point depending on scale/details in the scene:
  - aggressive in homogeneous areas
  - conservative in high-frequency areas
- probable outliers do not stabilize their neighborhood

Smoothing

- optimize low-resolution, noisy geometry data using high-quality image data
- employ dependencies: discontinuities tend to co-align
- extended MRF model encodes dependencies [2], [3]; smoothness prior weighted by local image gradients

Scene Acquisition with SAD

Applications:
- 3DTV, entertainment, cultural heritage, ...
- Register multiple SAD-frames to obtain large scene models
- inertia data serves as initial estimate
- color & geometry enable accurate registration of point clouds

Previous setup [1]:
- SLAM-problem solved in 2D
- high-accuracy Laserscans
- relatively large and heavy setup