Increasing the Precision of Junction Shaped Features

Kai Cordes • Jörn Ostermann

**SFOP Feature Localization**

- The Scale-invariant Feature OPerator [1] detects junctions
- Detection: select fullpixel positions with locally maximal precision in each scale
- Localization: estimate subpixel/subscale using 3D quadratic approximation
  - **REF SFOP**
  - **DOG SFOP**

**Approach**

- Exchange suboptimal subpixel/subscale localization
- Estimate subpixel/subscale using signal adapted approximation [3]:
  \[
  D_{x_0, \sigma, l}(x) = l \cdot \left( e^{\exp\left(-\frac{(x-x_0)^2}{2\sigma^2}\right)} - e^{\exp\left(-\frac{(x-x_0)^2}{2\sigma^2 k}\right)} \right)
  \]
- Increases precision in most cases
- Choose localization method (DoG, Quadr.) with larger precision

**Evaluation: Repeatability**

- Repeatability protocol [4]
- Data sets [4,5] provide:
  - Ground truth homography
  - Planar scenes
- **DOG SFOP JUNC:**
  - More features, incr. repeatability
  - Similar results for SFOP CIRC

**Conclusions**

- Proposed approach improves subpixel/subscale localization of SFOP feature detector
  - The DoG approximation function increases the precision for 72.5 % of the features (cf. Tab. 1)
  - The number of extracted feature pairs increases by up to 30 % and in every case (cf. Fig. 3)
  - Results are valid on circular symmetric features (SFOP CIRC) as well (cf. Fig. 3)

---