A Robust Real-time Object Tracking using SIFT Features

Research Contents

- **Background**
  - Automated surveillance
  - Video indexing
  - Vehicle Monitoring
  - Human-computer interaction

- **Introduction of SIFT**
  - Difference of Gaussian Pyramid (Scaling)
  - Extrema Detection
  - Orientation Assignment (Rotation)
  - Descriptor Computation (Viewpoint / Illumination)

- **Proposals for Reducing Time in Tracking**
  - Use Homograph Matrix to locate ROI
  - Use 20 keypoints to describe an object
  - No descriptor part for other keypoints

- **Targets**
  - **Object trackers using SIFT features**
    | Rigid object | Non-rigid object |
    | Traditional Tracker | Target 1 | Target 2 | Future work |
  - **Target2: Robust Non-rigid Object Tracking**
    - **Performance**
      - Complex object motion
      - Non-rigid or articulated nature of objects
      - Partial and full object occlusions

- **Overall tracking procedure in each frame**
  - Feature points detection and matching
  - Object locating
  - Homography matrix
  - SIFT algorithm
  - to next frame

- **Experimental Results**
  - **Experimental Results**
  - **Test sequences**
    - # of frames
    - Size
    - Frame rate (fps)
    - Average error (pixels)
  - **Complex motion**
    - Mean shift: 434 frames, 320*240 size, Mean shift 40.8 frames, 8.2
    - Proposed: 4.2 frames, 7.6
  - **Occlusion by branches**
    - Mean shift: 488 frames, 320*240 size, Mean shift 43.2 frames, 36.0
    - Proposed: 13.8 frames, 8.0
  - **Occlusion by pillar**
    - Mean shift: 298 frames, 320*240 size, Mean shift 37.2 frames, 18.7
    - Proposed: 11.4 frames, 8.3

- **Tracking result examples of “Occlusion by pillar”**
  - Mean shift
  - SIFT
  - Proposed