Final Project Proposal

Systematic Evaluation of Binary Descriptors

Global Maximum

Approach

- Input:
  - Rotation invariance?
  - Memory consumption
  - Performance related parameters
- Automatic optimization
- Output:
  - Best binary descriptor for the given settings, training data and search space

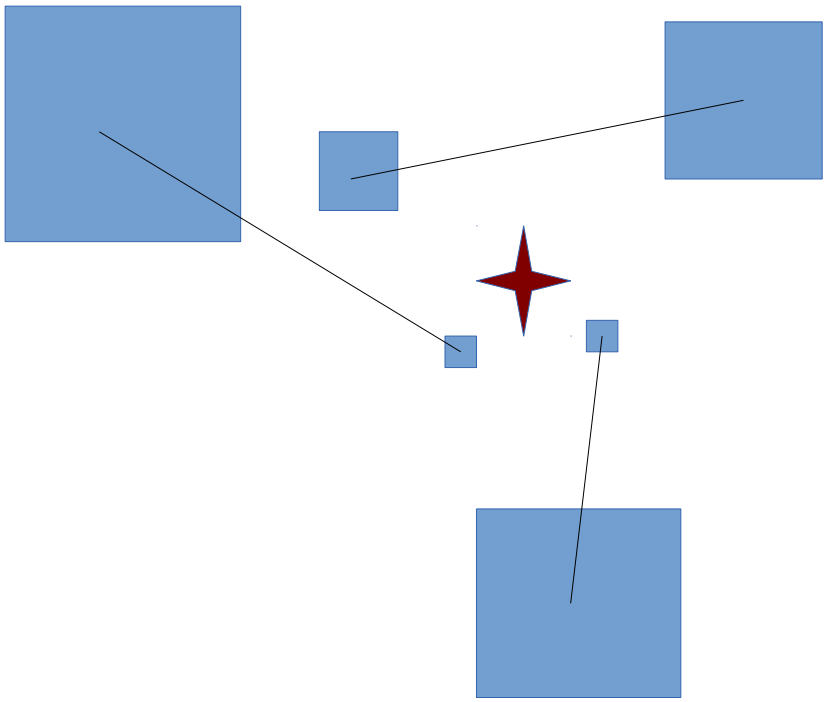
Training data

- Given data, e.g.
  Multi-view Stereo Correspondence Dataset
  from the University of British Columbia
- **Any set of images**
  Apply transformations for known perspective distortions and do lighting changes / add noise

- **Renderings**
  Render 3D objects from multiple views and calculate non-occluded correspondences

Parameters to optimize

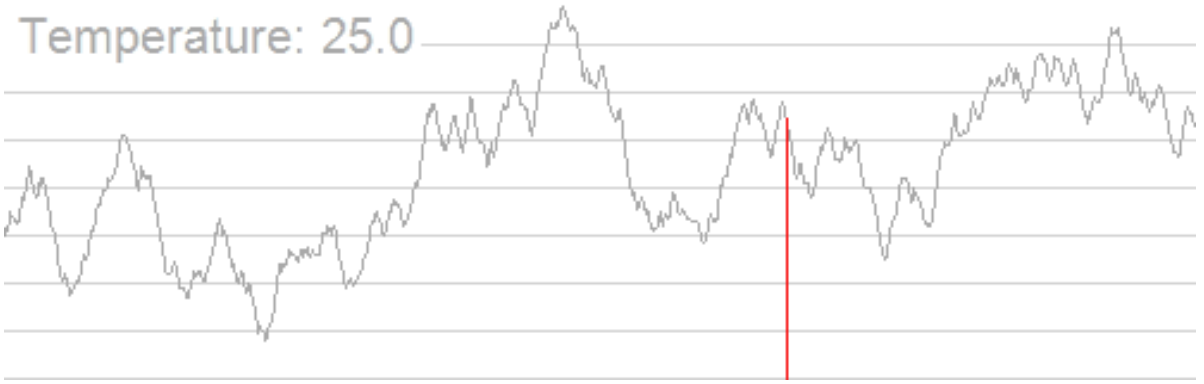
- Sample positions and combinations
- Sample averaging sizes
- Sample source:
  - Color image
  - Intensity image
  - Gradient image
  - …
- …



Global Maximum

Optimization

- Start with a set of parameters
- In a loop:
  - Slightly perturb parameters and evaluate quality
  - If quality improved, take over new parameters
- Global optimization method:
  Simulated annealing



Comparison with existing descriptors

- **BRIEF**
  Binary Robust Independent Elementary Features
- **ORB**
  Oriented FAST and
  Rotated BRIEF
- **FREAK**
  Fast Retina Keypoint
- **BRISK**
  Binary Robust Invariant Scalable Keypoints

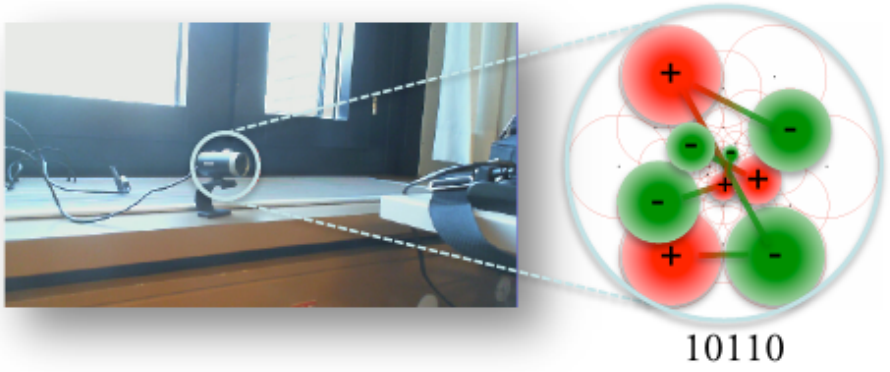
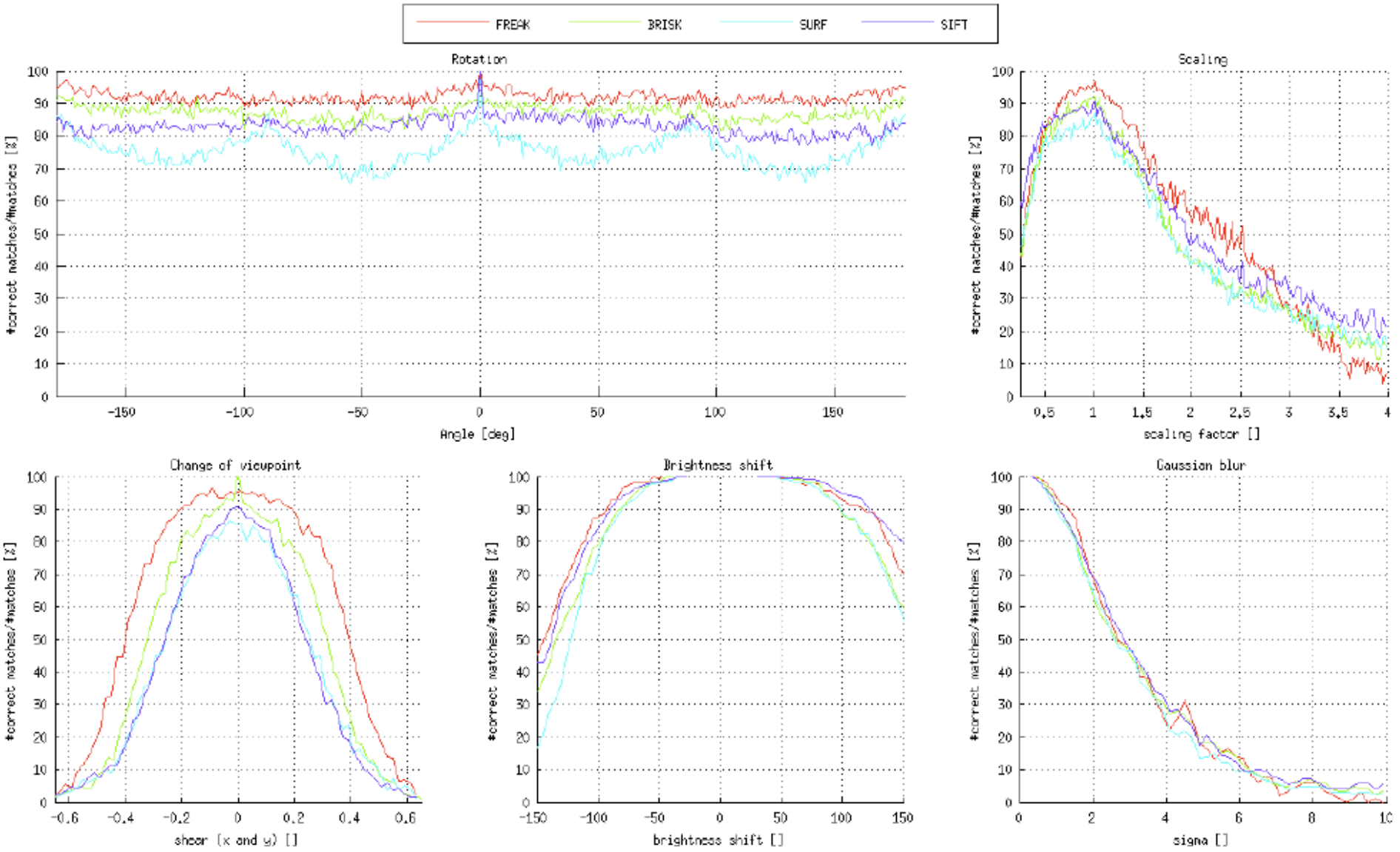


Figure 1: llustration of our FREAK descriptor. A series of Difference of Gaussians (DoG) over a retinal pattern are 1 bit quantized.

Evaluation



Global Maximum

Roadmap

1. Find / build / select training data
2. Implement evaluation of existing descriptors (graphs)
3. Implement optimization process
4. Add and play around with parameters to optimize :)

Global Maximum