Final Project Proposal
Systematic Evaluation of Binary Descriptors
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*: Illustration 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 :)