

BRIEF: Computing a Local Binary Descriptor Very Fast

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Motivation: A 256-Byte Descriptor?

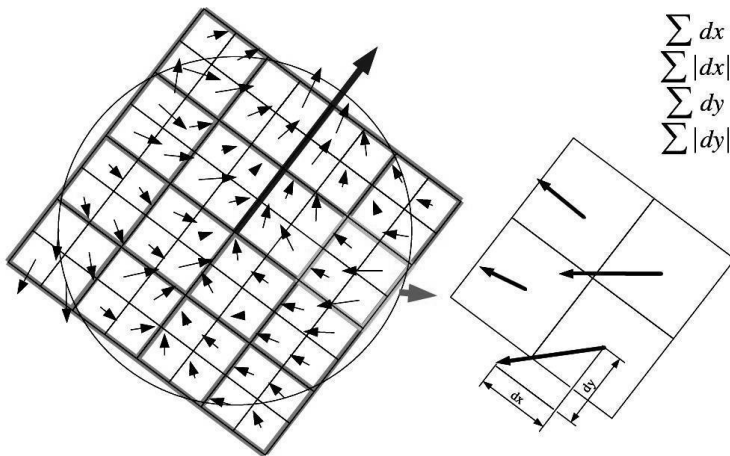


Figure: A SURF descriptor stores 64 orientation values as 4-byte integers.

Problem Definition: Make It Smaller, Compute It Faster

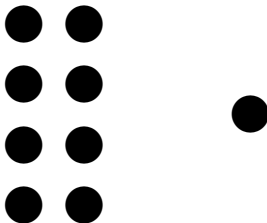


Figure: Reduce the size by a factor of 8.

Previous Work: Principal Component Analysis

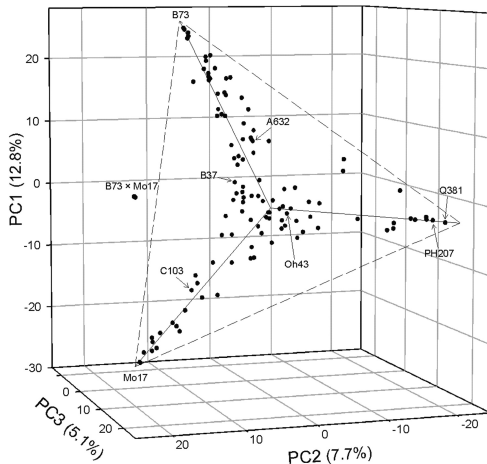


Figure: PCA with Three Components.

Previous Work: Floating-Point Quantization

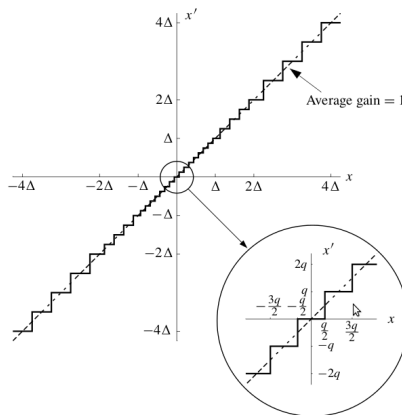


Figure: Quantization with a 3-Bit Mantissa.

Previous Work: Binarization

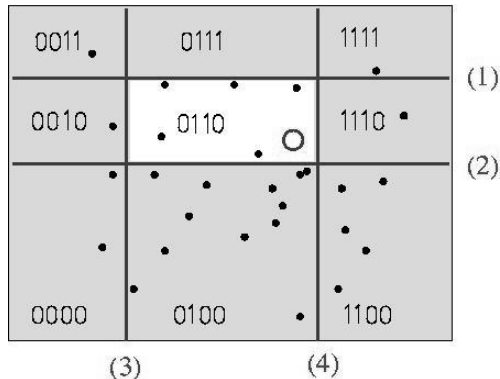


Figure: Locally Sensitive Hashing.

Method: Sampling Distributions

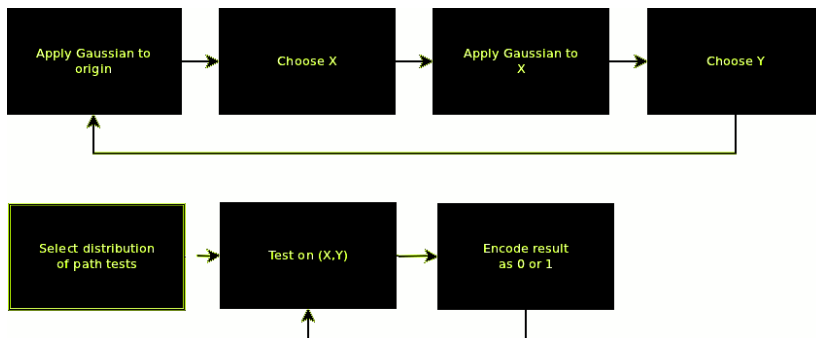


Figure: Sampling distributions.

Method: Patch Test

$$\tau(p; \mathbf{x}, y) := \begin{cases} 1 & \text{if } l(\mathbf{p}, \mathbf{x}) < l(\mathbf{p}, \mathbf{y}) \\ 0 & \text{otherwise} \end{cases} \quad (1)$$

Method: Descriptor Formula

$$\sum_{l \leq i \leq n_d} 2^{i-1} \tau(p; x_i, y_i) \quad (2)$$

Method: Sampling

$$\begin{aligned}\mathbf{X} &\leftarrow \text{Gaussian}(0, \frac{1}{25}, S^2) \\ \mathbf{Y} &\leftarrow \text{Gaussian}(x, \frac{1}{100}, S^2)\end{aligned}\tag{3}$$

Method: Sampling Distributions

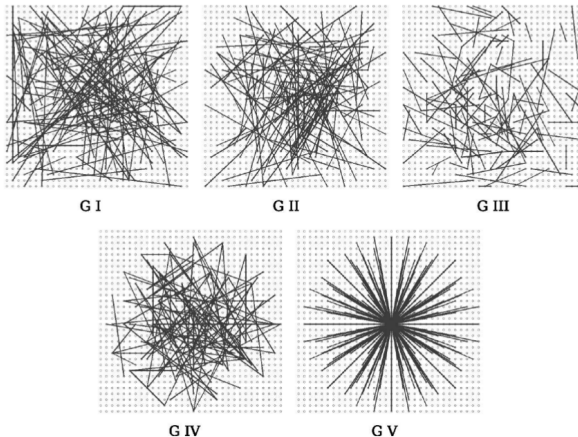
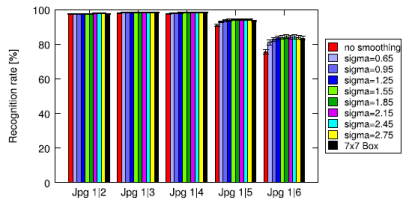
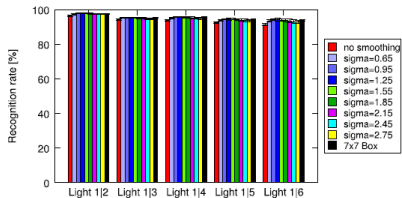
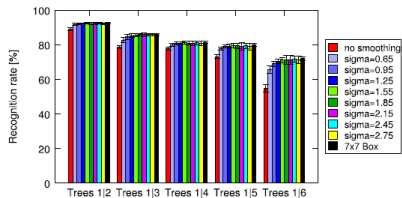
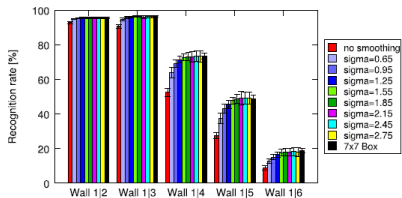
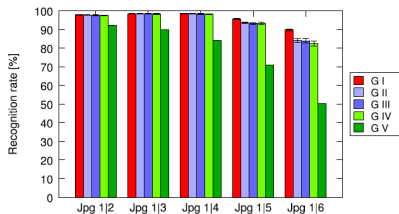
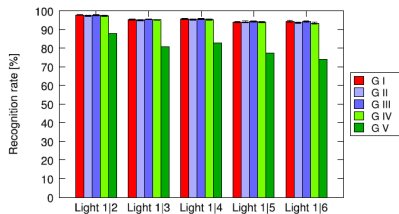
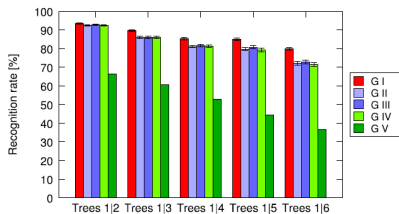
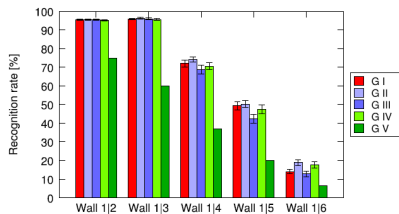
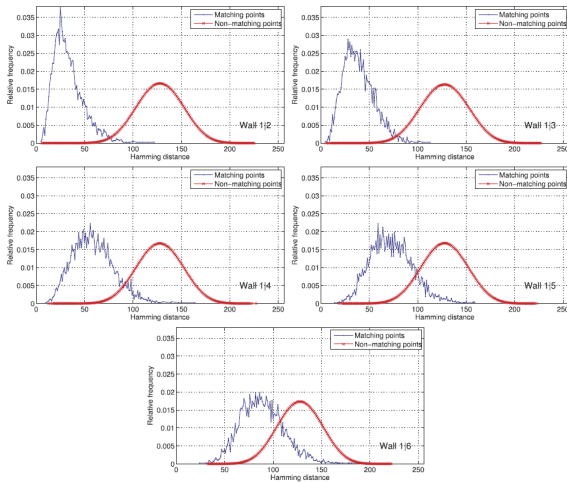
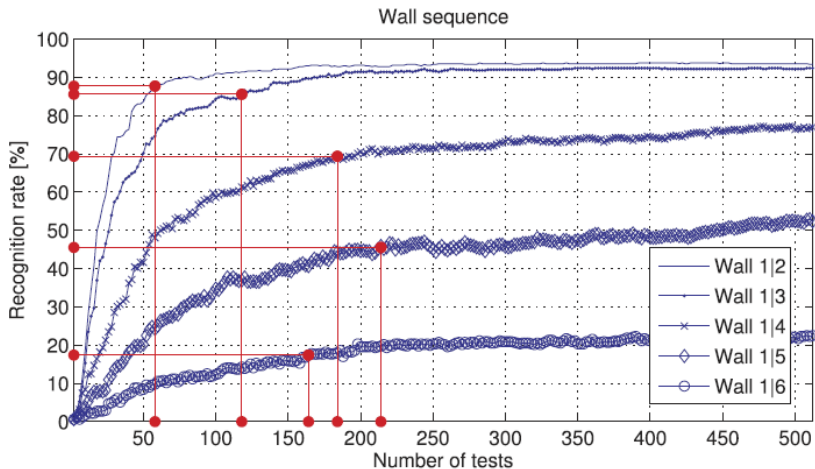


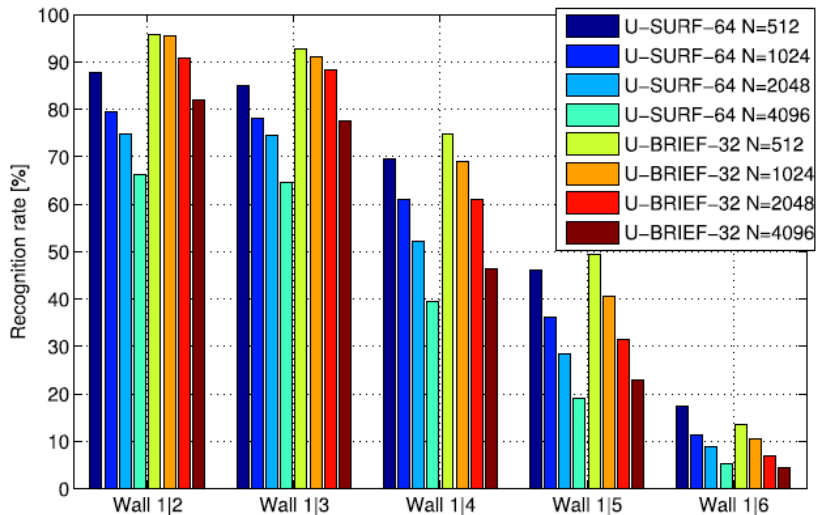
Figure: Sampling distributions.

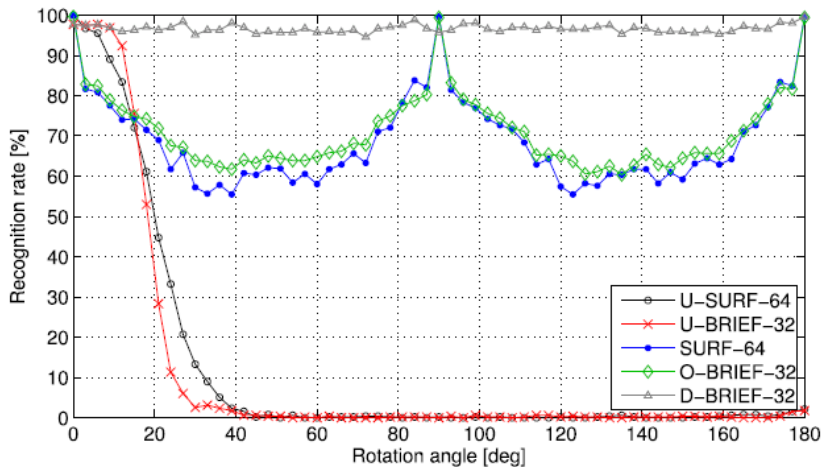


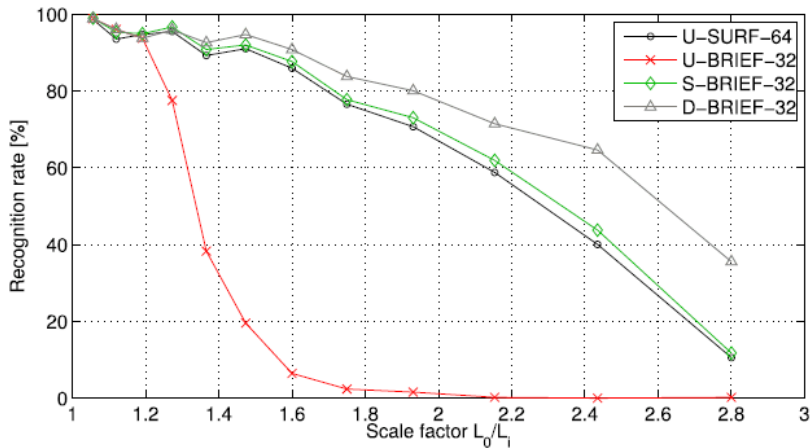


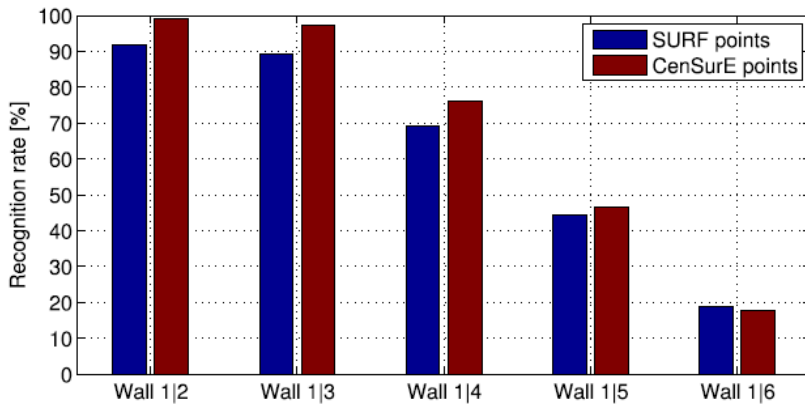


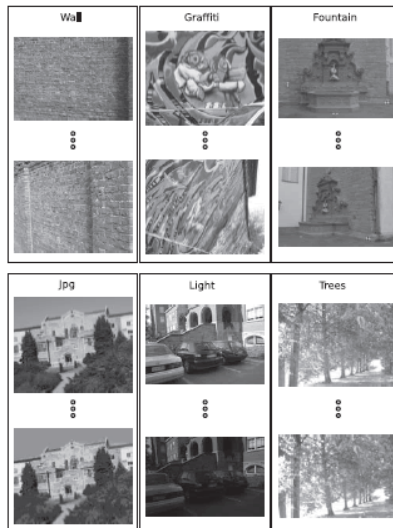








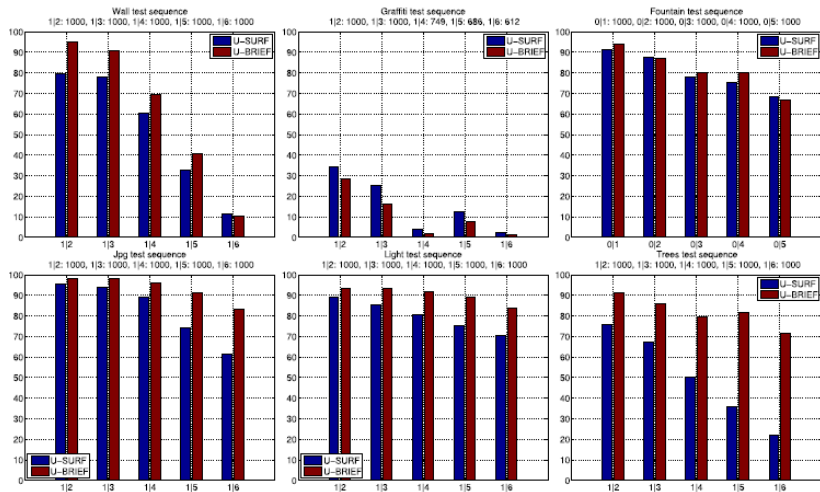


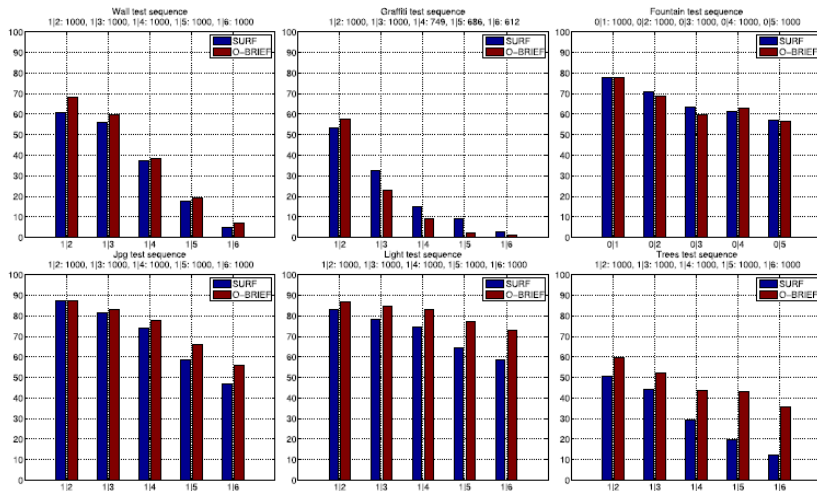


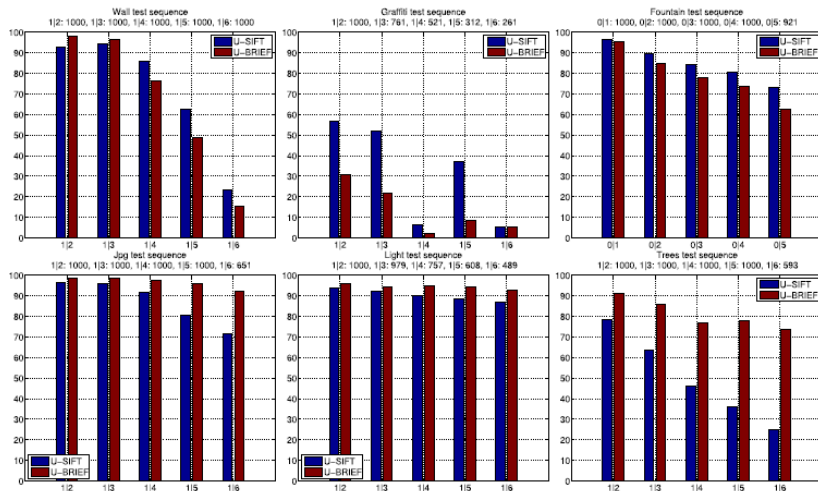
(a)

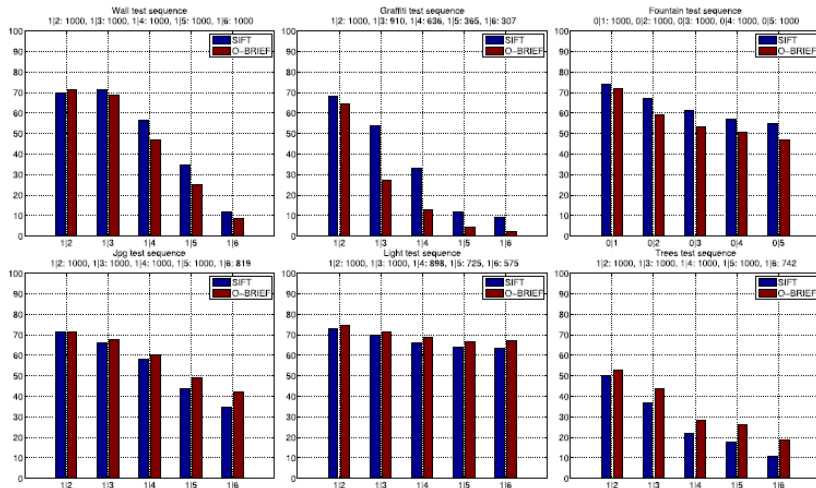


(b)









Descriptor performance for Liberty dataset (average over three subsets)

