Object tracking via adaptive prediction of initial search point on mobile devices

TJ Melanson

Department of Electrical Engineering, Stanford University

Motivation

- Common feature tracking algorithms, such as SIFT and SURF, are fairly slow in runtime due to the processing of a large amount of external data.

- If the object is sufficiently small, outside noise may throw off the object detection device without prior knowledge.

- Machine learning, especially Markov chains, can use prior knowledge to turn a computationally expensive task into a faster, stochastic one.
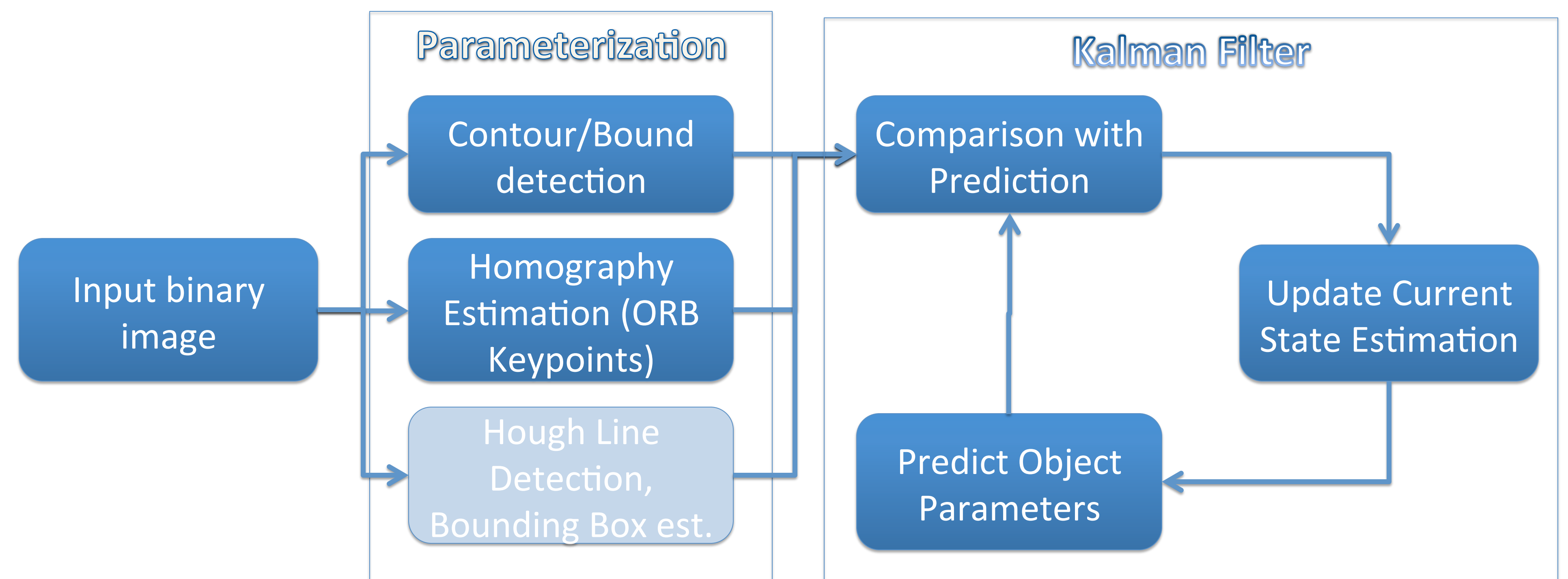
Future Work

- Creating a better template for homography estimation than the first image, which will reduce noise in deteting keypoints

- Generalized algorithm so a template can be chosen on Android without further tuning

- Further integration of the masking region

References

- http://www.cs.cmu.edu/~jiyanpan/papers/lncs06.pdf - Inspiration for this project, uses Kalman filter on the rate of change of affine transformation parameters for adaptive prediction
- Suzuki, S. and Abe, K., *Topological Structural Analysis of Digitized Binary Images by Border Following*. CVGIP 30 1, pp 32-46 (1985)
- Andrew W. Fitzgibbon, R.B.Fisher. *A Buyer's Guide to Conic Fitting*. Proc.5th British Machine Vision Conference, Birmingham, pp. 513-522, 1995. Above two links outline the contour and conic detection methods used to determine the region outline

Adaptive Prediction Technique

Experimental Results

Left: the Kalman filtered box estimation (blue) is more invariant to size and horizontal shifts in position than the standard detector (magenta)

Top:
The descriptor matches contain much less noise with the region masking (left) than without any region masking (right).