

Introduction

Goal

Accurate and efficient automatic tracking of various objects using a feature based tracking method.

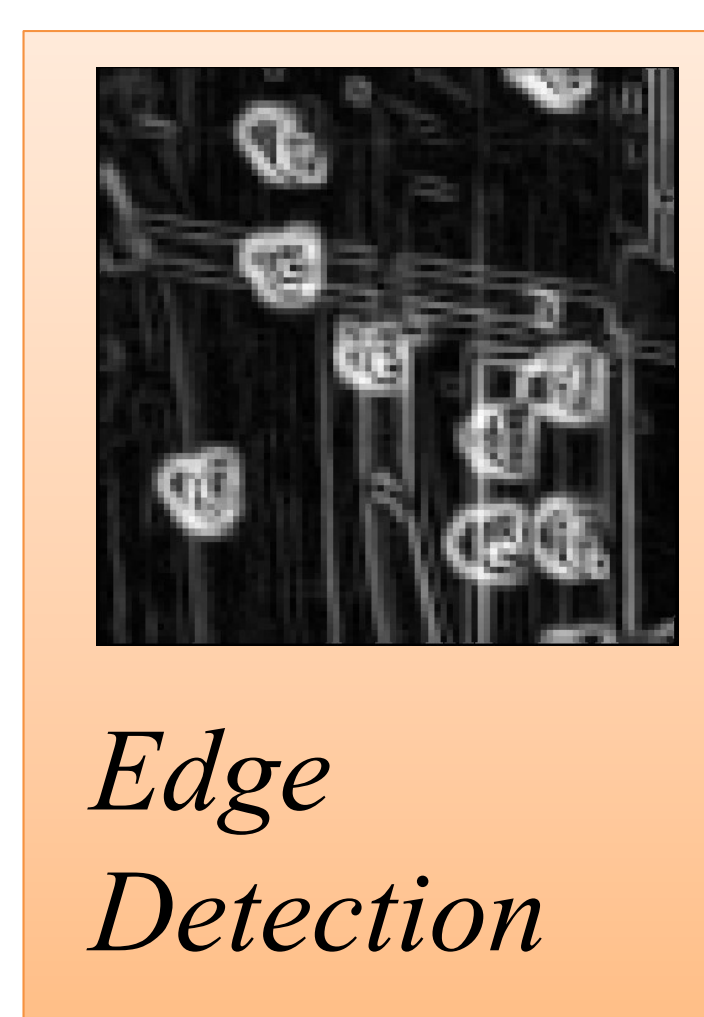
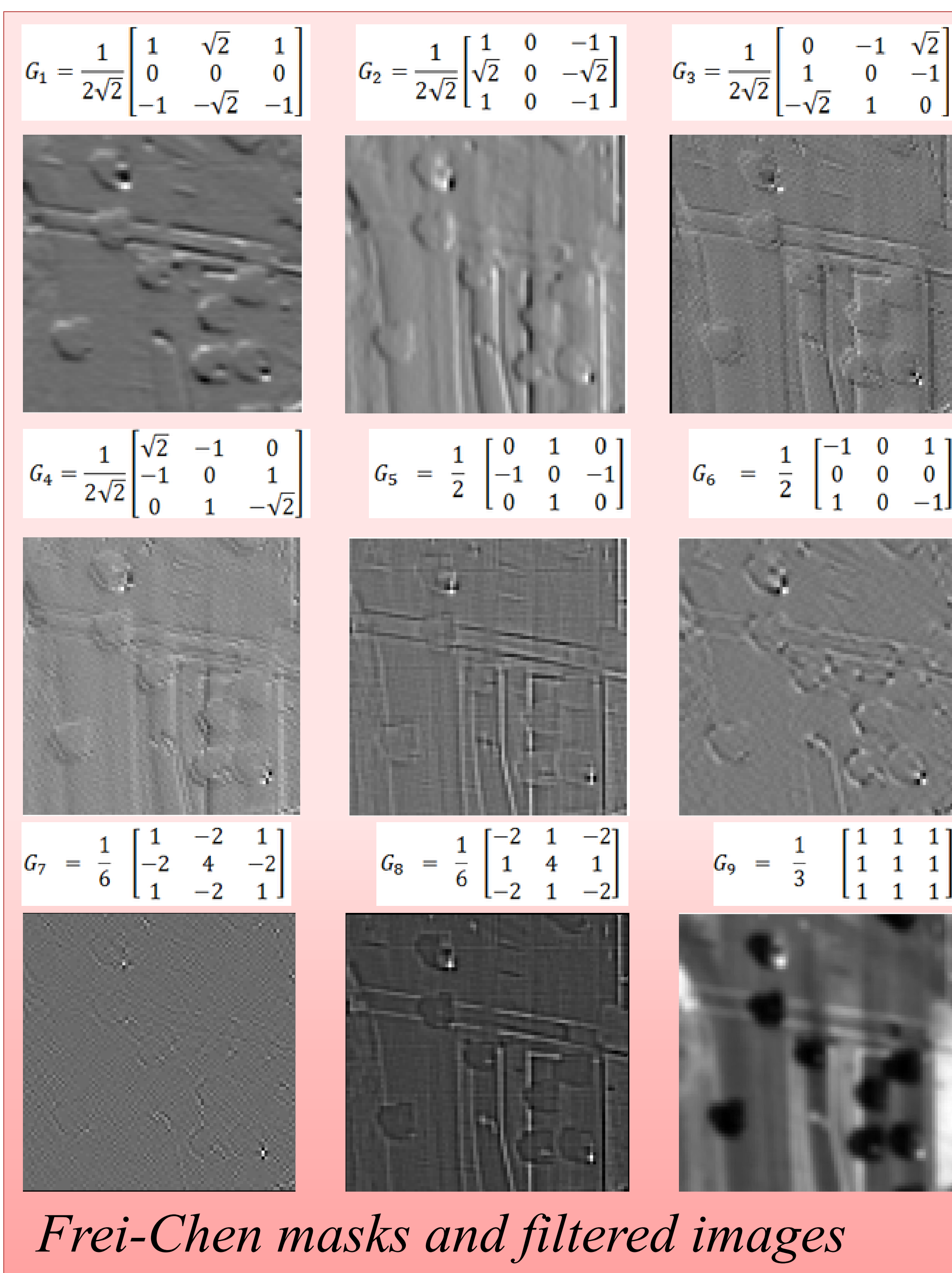
Constraints/Challenges

Target scale change, presence of noise, illumination variation, occlusions, rotation, viewpoint and background variations.

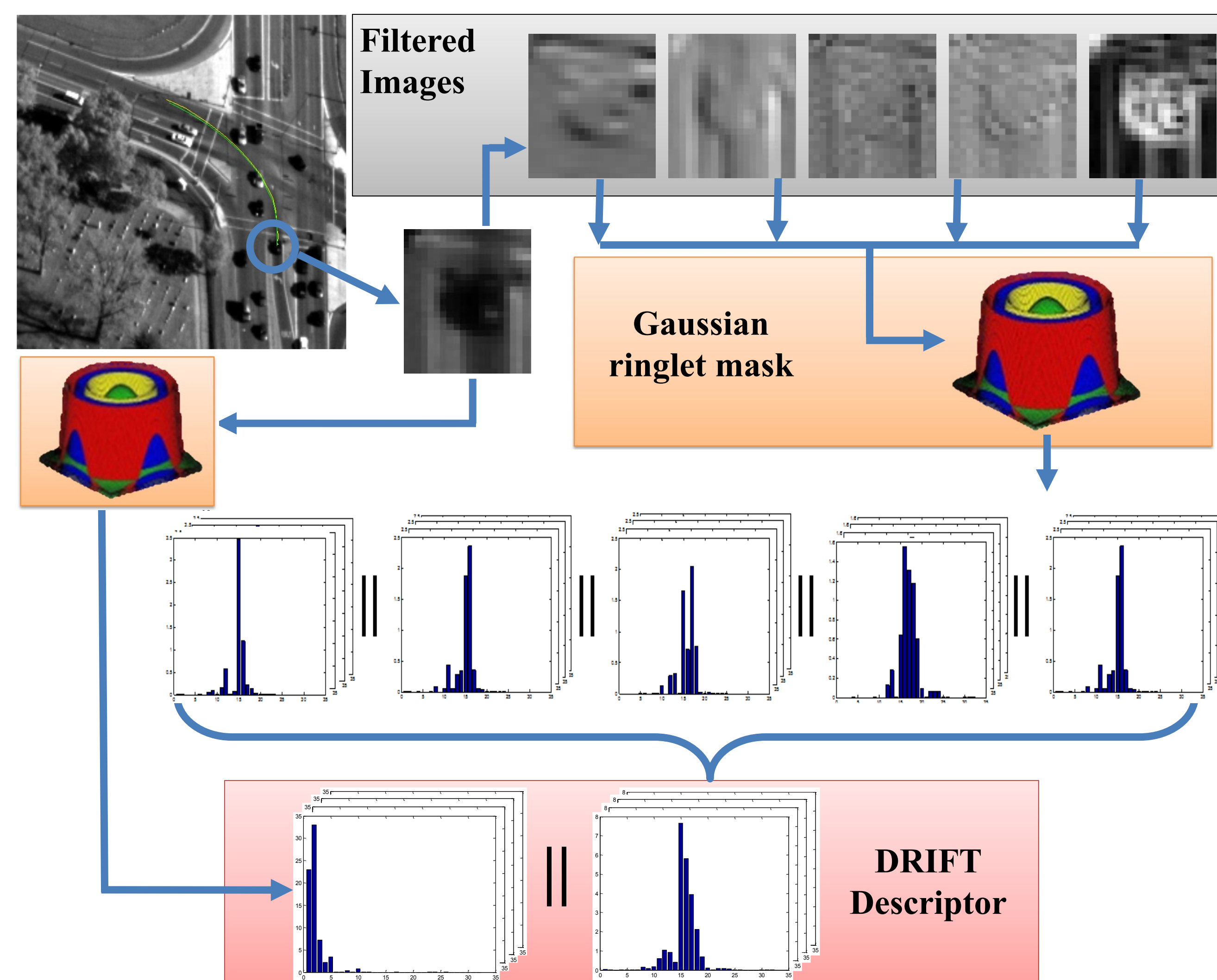
Feature Representation Scheme

Key Feature Extraction Steps:

1. Nine Frei-Chen masks (four edges, four lines, and one average) are used for extracting edge information.
2. Frei-Chen edge detection output found by combining filtered images.
3. Gaussian ringlet mask is applied to achieve rotation invariance.
4. Histograms are concatenated to create a feature descriptor.



Flow Diagram of DRIFT Feature Extraction



Tracking Process

Object center selection (initial frame)

Next frame

Search area selection

Feature extraction

Center point selection

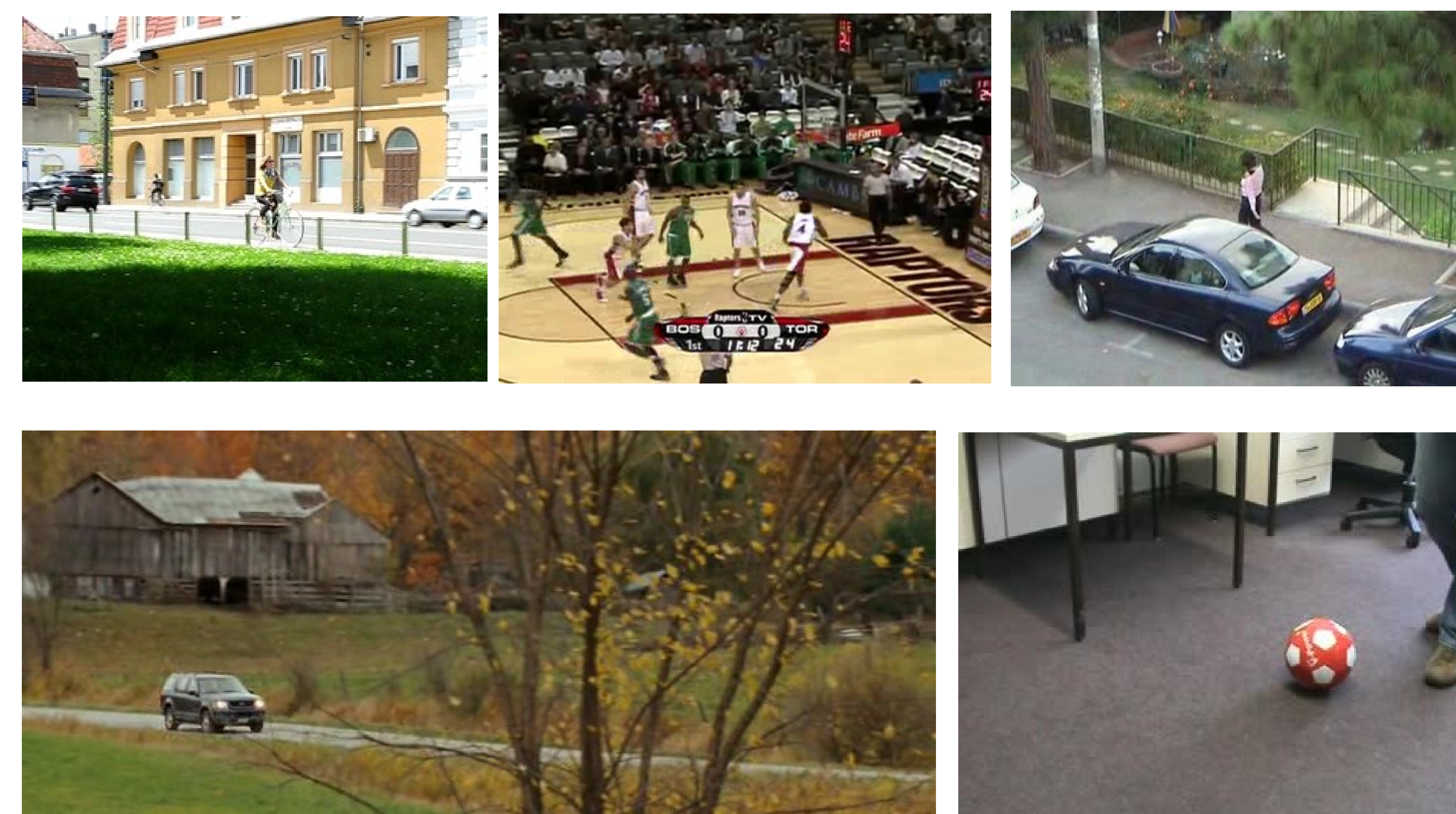
Kalman tracker updated

Tracking details:

- Motion estimation for search area is based on Kalman tracker (position and velocity estimation)
- Feature is extracted for each target candidate.
- Minimum Earth Mover's Distance (EMD) (histogram distance) is used for classification
- The reference feature and Kalman Tracker are updated from the best match in each frame.

Experimental Results

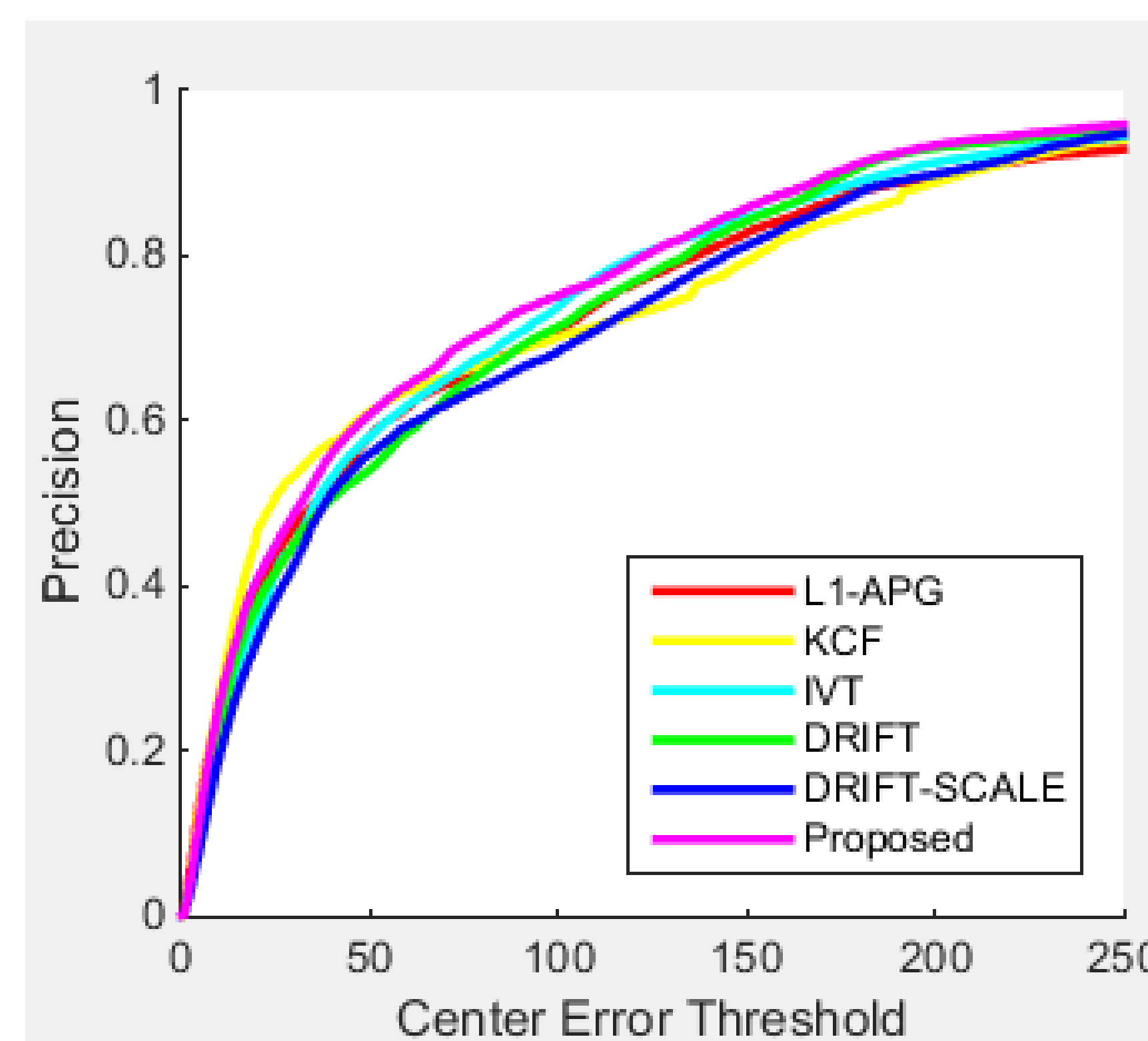
Datasets: Visual Object Tracking 2014 dataset, 25 challenging color sequences



Temporal Robustness Evaluation: Frame Detection Accuracy (FDA), Average Binary Overlap (ABO), Center Pixel Error (CPE), and Average Processing Speed (sec./frame)

	L1-APG	KCF	IVT	DRIFT	DRIFT-SCALE	Proposed
FDA	0.31	0.39	0.30	0.37	0.28	0.40
ABO	65.9	69.3	68.4	68.2	70.2	69.2
CPE	69.9	65.8	69.0	60.2	60.5	61.2
Speed	0.243	0.010	0.190	0.555	4.685	0.746

Precision Plot



Success Plot

