

DETECTING CONTEXTUAL ANOMALIES OF CROWD MOTION IN SURVEILLANCE VIDEO

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1. Problem

- Crowd motion context: most people follow crowd flow
- Contextual normal: crowd follower (follow neighbors)
- Contextual anomalous: crowd outlier (not follow neighbors)



2. Patch Representation & Clustering

- Spatio-temporal patch: $10 \times 10 \times 20$
- Dynamic texture model

$$x_{t+1} = Ax_t + Bv_t$$

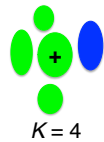
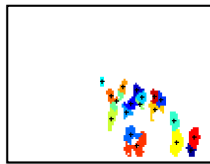
$$y_t = Cx_t + w_t$$



- Calculate (x_t, A, C) given appearance vectors y_t
- Spectral clustering
- Martin distance

3. Pedestrian (Blob) Representation

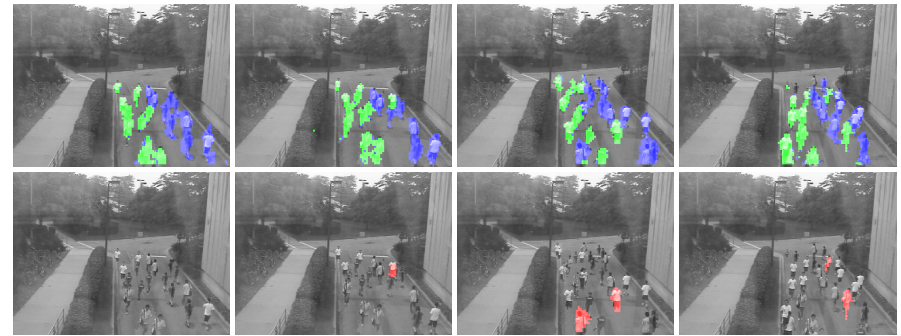
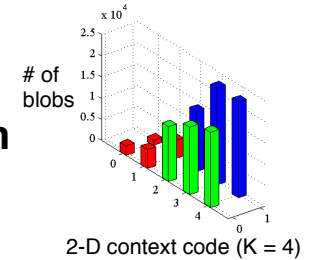
- Region grow assisted by pedestrian size estimation
- Context code
 - Consider K nearest blob neighbors
 - Category label of itself (0 for green, 1 for blue)
 - # of blob neighbors with the same label as itself (0- K)



Context code : (0, 3)

4. Contextual Anomaly Detection

- Context statistics for whole video
- High bins: crowd follower
- Low bins: crowd outlier



5. Another Motion Context

- Another video: pedestrians walking in opposite directions intermingled
- Contextual histogram: reverse statistic

