Novel Dataset for Fine-grained Abnormal Behavior Understanding in Crowd

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Abstract

This work presents a novel crowd dataset contains around 45,000 video clips which annotated by one of the five different fine-grained abnormal behavior categories. We also evaluated two state-of-the-art methods on our dataset, showing that our dataset can be effectively used as a benchmark for fine-grained abnormality detection.
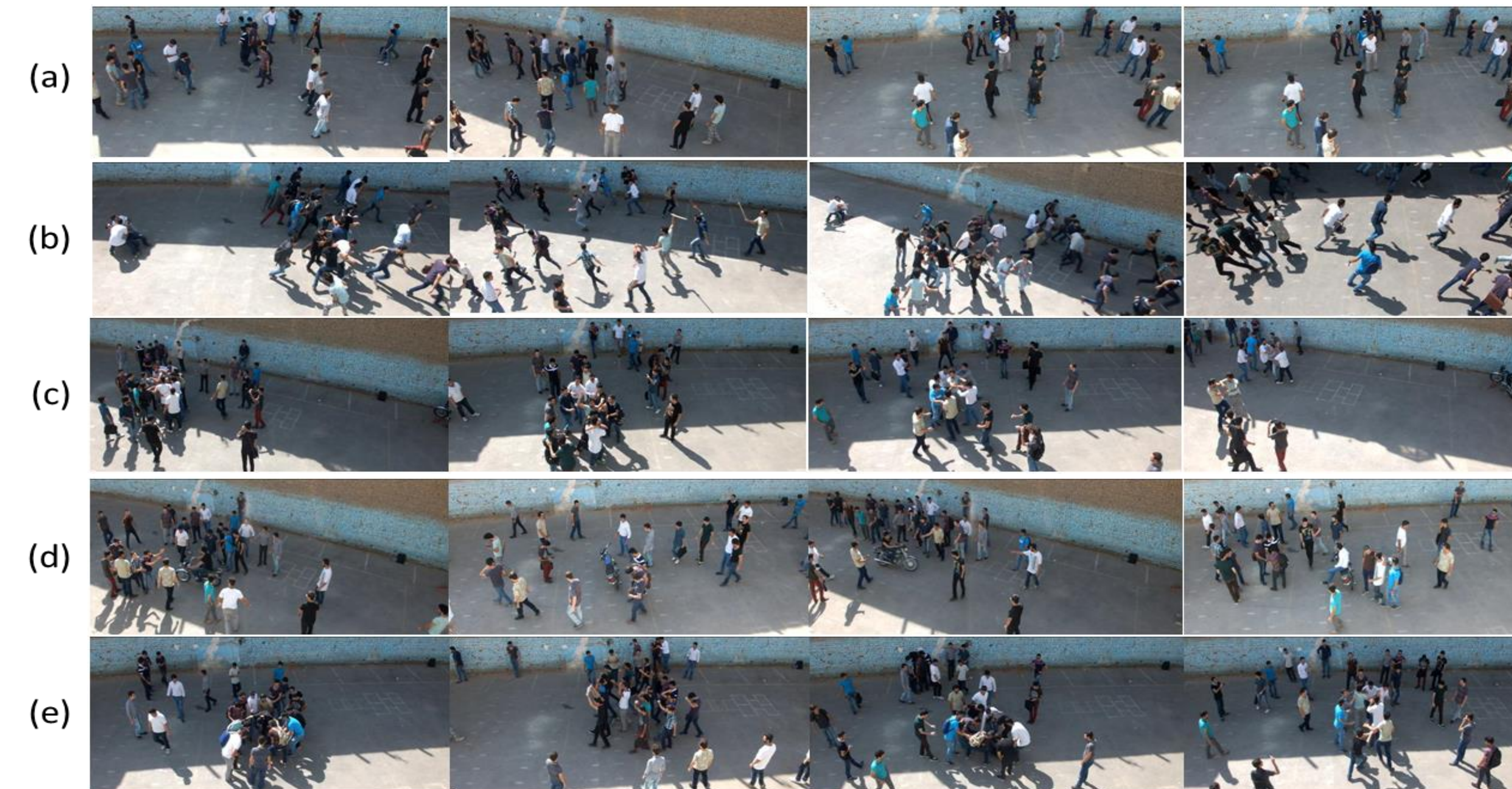
Overview of the Datasets
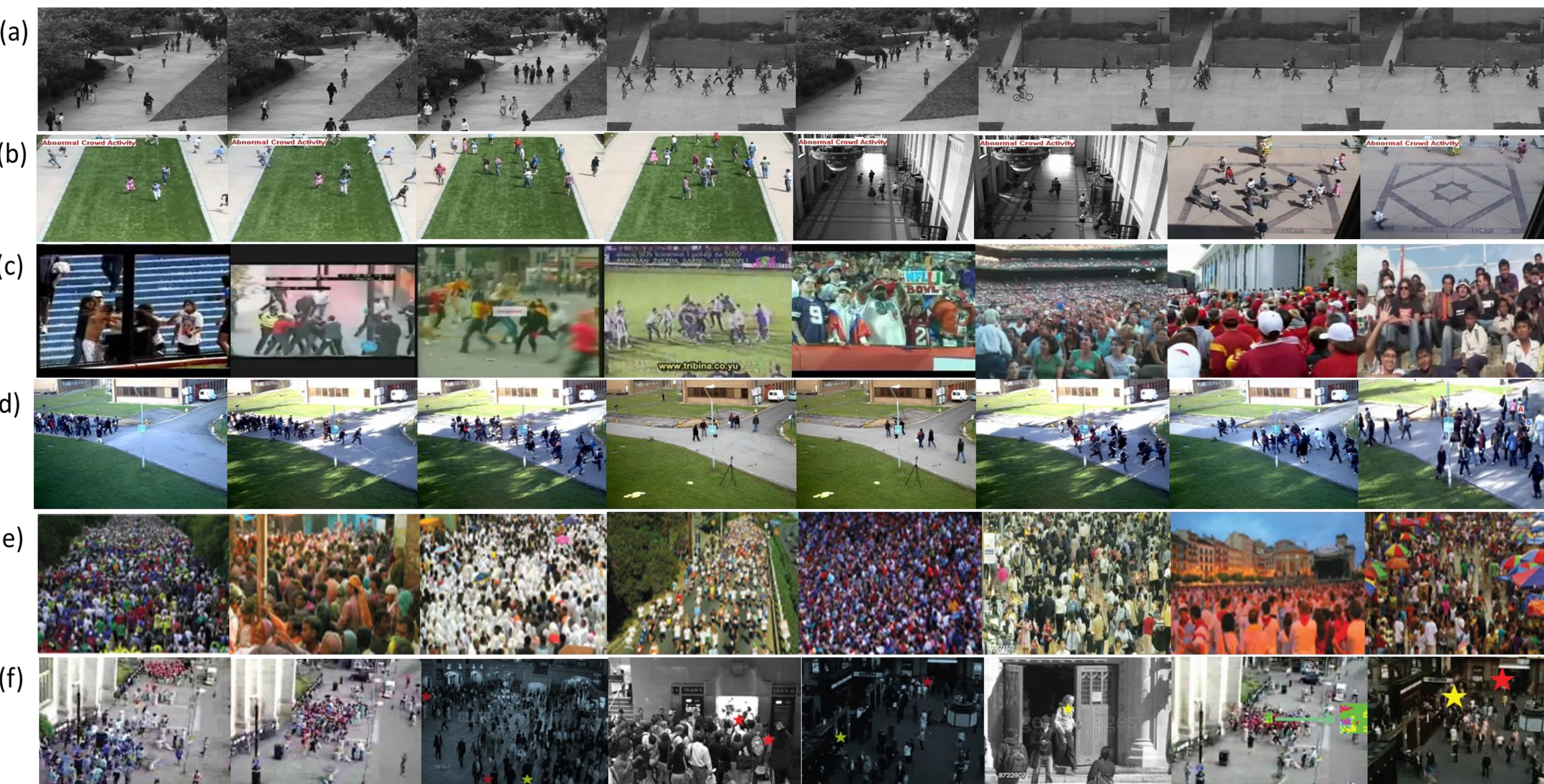
Dataset	UMN [12]	UCSD [11]	PETS2009 [5]	Violent Flows [6]	Rodriguez's [20]	UCF [22]
Number of videos	11	98	59	246	520	61
Annotation level	frame	frame/pixel	frame	video	video	video
Density	medium	high/medium	medium	dense	dense	dense
Type of scenarios	panic	abnormal object	panic	fight	pedestrian	crowd
Indoor/Outdoor	both	outdoor	outdoor	outdoor	outdoor	outdoor

Table 1. Datasets for crowd behavior analysis

Crowd dataset is consist of:

- datasets having only a small number of sequences taken under controlled circumstances with limited behavior classes
- limited number of crowd behavior scenarios,
- a significant gap between accuracy and efficiency of typical behavior in the real world

Proposed Dataset

Type of behavior	Scenarios
Panic	Suspicious backpack
	Hoodlum attack
	Earthquake
	Sniper attack
	Terrorist firework
Fight	Previous Personal issues between individuals that suddenly meet each other in the crowd
	Intentional or unintentional bad physical contact between two or more people in the crowd
Congestion	Demonstration
	Helping out an individual facing Health problem
	Break up a fight between two or more individuals
Obstacle or Abnormal object	Suspicious backpack
	Motorcycle crossing the crowd
	Motorcycle left in the crowd
	Bag theft with motorcycle
	An individual that fell to the ground for some reasons
Neutral	Moving individuals with almost fixed velocity in random direction
	Two or more people meeting one another

Table 3. Scenarios applied for each type of crowd behavior in our dataset

behavior class	# frames
Panic	2002
Fight	4423
Congestion	2368
Obstacle	5120
Neutral	29713
Total:	43626

Proposed dataset is consist of:

- Our dataset consists of a big set of video clips annotated with crowd behavior labels ("panic", "fight", "congestion", "Obstacle", "Neutral")
- Use unstructured crowded scenes in our dataset, so individuals are free to choose random directions and change their ways as they want.
- Unlike previous crowd datasets with limited number of crowd behavior scenarios, our dataset consists of different behavior types implemented by various scenarios make it more realistic
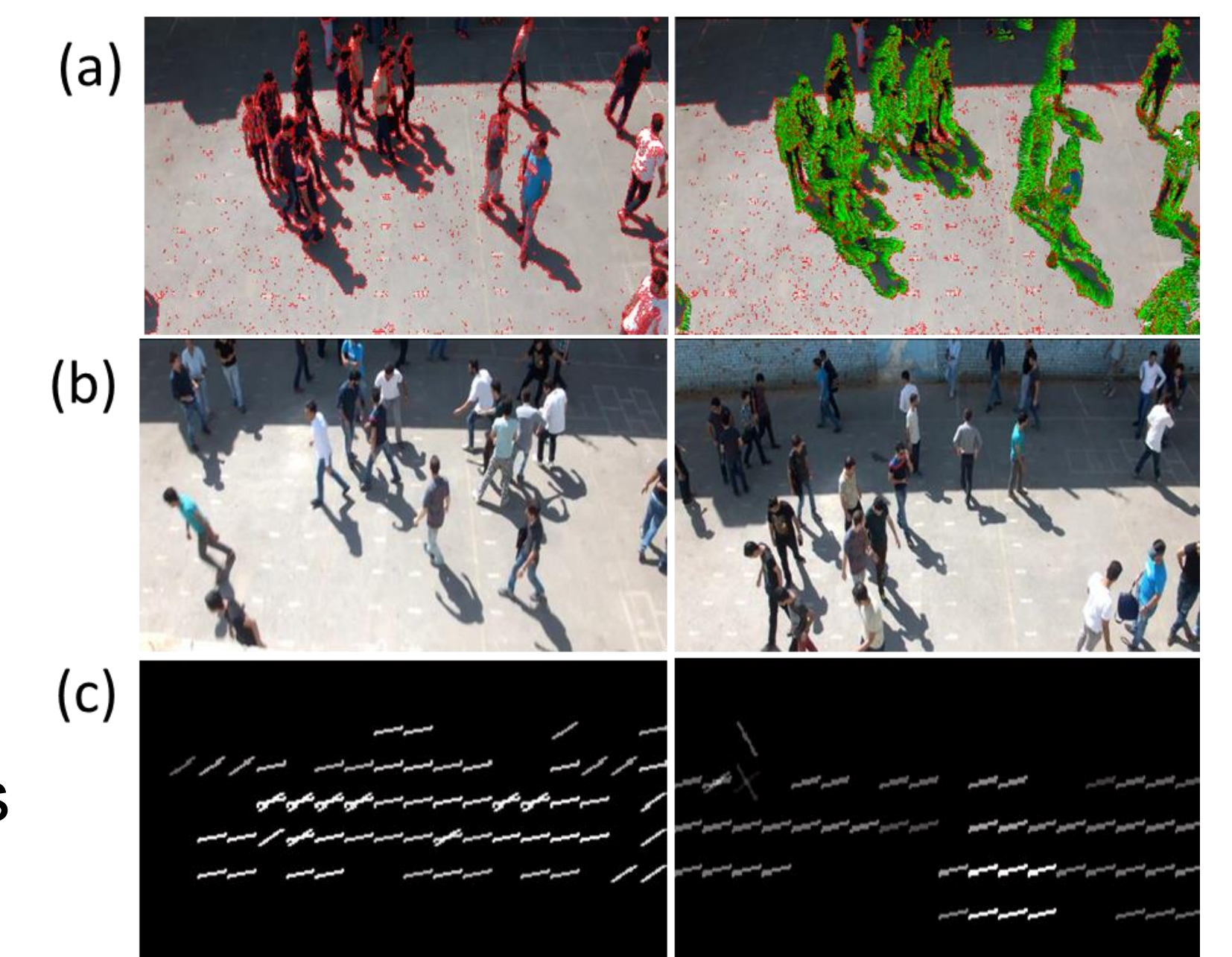
Proposed Benchmark

Dense Trajectory & Histogram of Oriented Tracklets
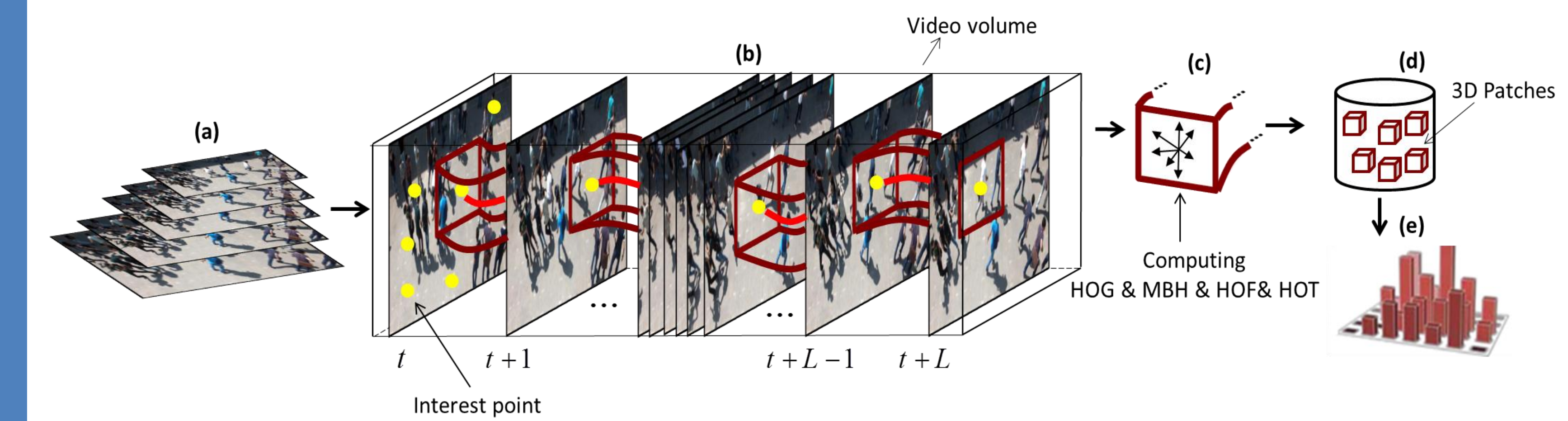
Dense Trajectory

Histogram of Oriented Tracklets

Experiment Result on our dataset

	Our dataset Low-Level Visual Feature
Trajectory	35.30
HOG	38.80
HOF	37.69
MBH	38.53
HOT	38.17
Dense Trajectory	**38.71**

Figure 6. Confusion matrix for DT [26]

Figure 7. Confusion matrix for HOT descriptor [14, 15, 16]

References

[1] H. Mousavi, S. Mohammadi, A. Perina, R. Chellali, and V. Murino. Analyzing tracklets for the detection of abnormal crowd behavior. In WACV 2015 .
[2] H. Wang, A. Kla¨ser, C. Schmid, and C.-L. Liu. Action recog- nition by dense trajectories. In *Computer Vision and Pat- tern Recognition (CVPR)* .