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Action Recognition with HOG-OF Features

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Applications

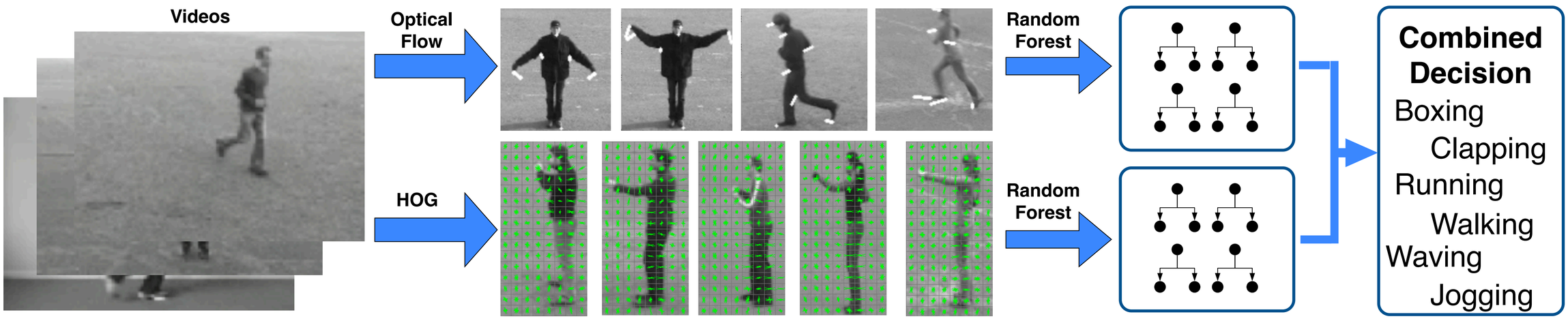
- ✓ YouTube
  - ➡ Video search, indexing, mining
- ✓ Medicine and Sociology
  - ➡ Home-based rehabilition
  - ➡ Behavior analysis
- ✓ Elderly care
- ✓ Human computer-interaction
- ✓ Security, surveillance
- ✓ Crowd-analysis
- ✓ Television and games

Challenges of Human Action Recognition

- ✗ Moving backgrounds
- ✗ Different view points
- ✗ Moving camera
- ✗ Occlusions
- ✗ Intra-class variation
- ✗ Time-varying actions
- ✗ Few training examples
- ✗ Long training time
- ✗ Real-time capability

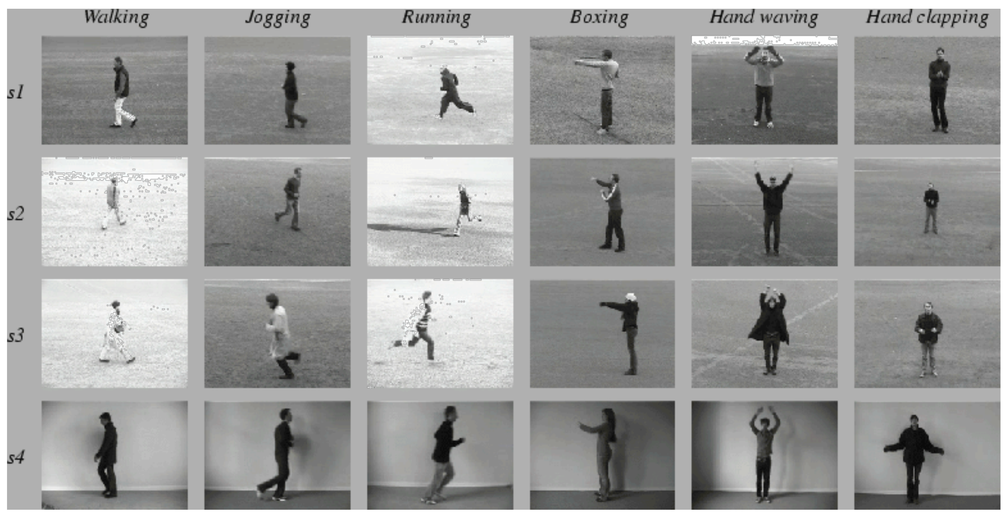
Contribution and Workflow

- ✓ Frame-by-Frame learning approach
- ✓ Create two processing streams
  - ➡ HOGs to gather static object appearances [1]
  - ➡ Optical Flow (OF) to incorporate motion information [2]
- ✓ Separately learning two Random Forest classifiers [3]
- ✓ Combining probability functions by product law
- ✓ Evaluation on the well-known KTH dataset [4]
  - ➡ 5-fold cross-validation
  - ➡ Original training/testing split



KTH Dataset

- ✓ Publicly available and well-known
- ✓ Single-view dataset
- ✓ 25 persons
- ✓ Four different scenarios
- ✓ 600 videos



Experiments

5-fold cross validation

Schindler and Gool	87,98 %
Zhang et al.	94,60 %
Proposed method	**97,59 %**

	box	clap	wave	jog	run	walk
box	0.85	0.05	0.1	0	0	0
clap	0	1	0	0	0	0
wave	0	0	1	0	0	0
jog	0	0	0	1	0	0
run	0	0	0	0	1	0
walk	0	0	0	0	0	1

Original training/testing split

Laptev et al.	91,80 %
Zhang et al.	94,00 %
Wang et al.	94,20 %
Proposed method	**94,44 %**
O'Hara and Draper	97,90 %
Sadanand and Corso	98,20 %

	box	clap	wave	jog	run	walk
box	1	0	0	0	0	0
clap	0.11	0.80	0.09	0	0	0
wave	0	0.12	0.88	0	0	0
jog	0	0	0	1	0	0
run	0	0	0	0	0.98	0.02
walk	0	0	0	0	0	1

Conclusion

- ✓ Frame-by-Frame learning approach
- ✓ Combination of HOG and OF in two parallel streams
- ✓ Simple and efficient
- ✓ State-of-the-art results

References

[1] Dalal N., B. Triggs. "Histograms of oriented gradients for human detection." *CVPR 2005*
[2] B. Horn, Brian G. Schunck. "Determining optical flow." *Artificial intelligence* 1981
[3] L. Breiman. "Random forests." *Machine learning* 45.1 (2001)
[4] C. Schuldt, I. Laptev, B. Caputo. „Recognizing Human Actions: A Local SVM Approach". *ICPR 2004*