Improving Motion-based Activity Recognition with Ego-centric Vision

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Motivation

- Focus on Activities of Daily Living
- Conflicting classes are a problem
  - Food and medicine intake are similar activities when considering body movement
- Usage of wearable sensors
  - Not bound to one location
- Inertial and video sensors have limitations
  - Fusing them may eliminate these

Dataset

- We created a new dataset [3]
- eating, drinking, taking meds, wiping mouth
- Recorded data:
  - Inertial (watch, glasses, tablet)
  - Video (glasses, tablet)

Features

Inertial Sensors

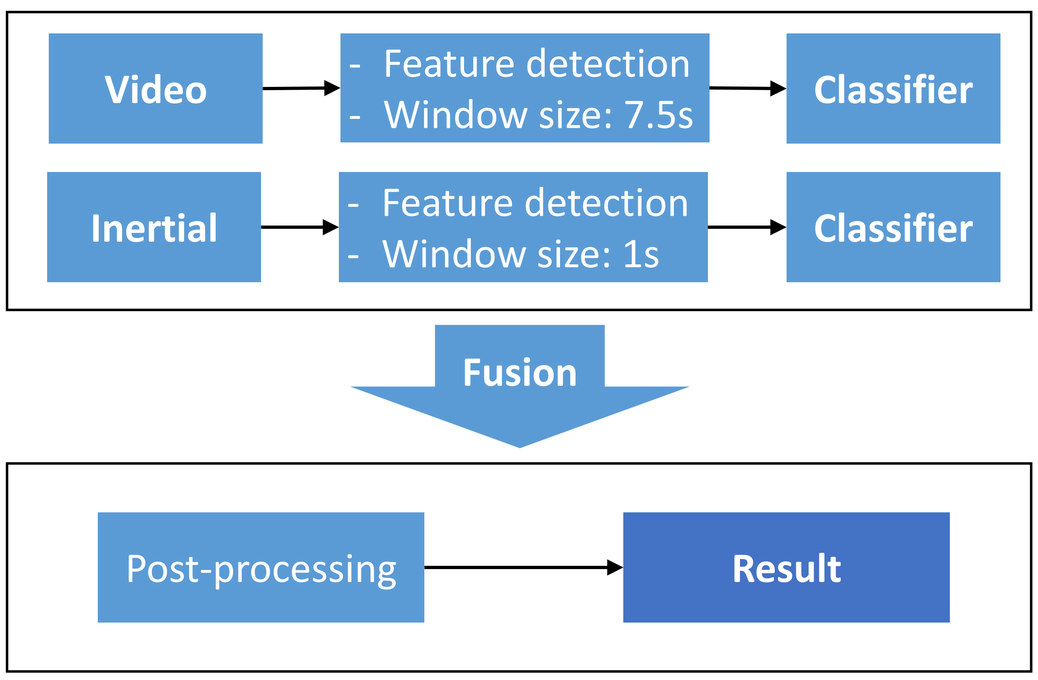
- Sliding window approach
- Features from time and frequency domain [1]

Video Sensor

- Windows of object features [2]
- Window size derived from avg. activity length

Problem → different window length

Methods



Preliminary Results

Subject	Precision	Recall	F_1-measure
S_1	+ 7.4%	+ 6.7%	+ 7.1%
S_2	+ 11.2%	+ 9.4%	+ 10.2%

- Overall improvement for subject S_1 and S_2
  - By considering video data in addition to inertial data
- STDEV of results not stable as of now

Next Steps

- Evaluation of additional image features
- Integrating multiple Inertial sensors
- Chest-mounted tablet vs. data glasses

References

[1] J. R. Kwapisz, G. M. Weiss, and S. A. Moore, “Activity recognition using cell phone accelerometers,” SIGKDD Explorations Newsletter, vol. 12, no. 2, pp. 74–82, 2011.
[2] H. Pirsiavash and D. Ramanan, “Detecting activities of daily living in first-person camera views,” in 2012 IEEE Conference on Computer Vision and Pattern Recognition. IEEE Computer Society, 2012, pp. 2847–2854.
[3] **https://sensor.informatik.uni-mannheim.de/**

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