A Smart Data Annotation Tool for Multi-Sensor Activity Recognition

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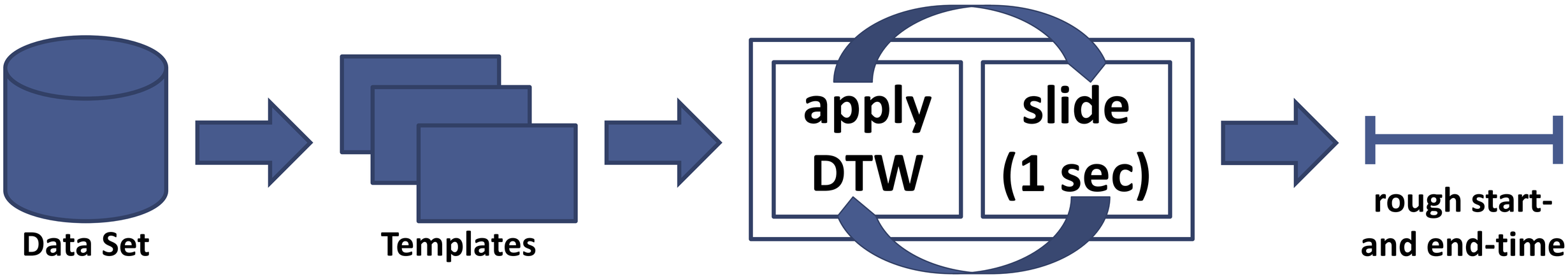
General Approach



Motivation

Annotation of sensor and video data …

- … is always time consuming and expensive
- Wearable devices increase the need of an automated solution

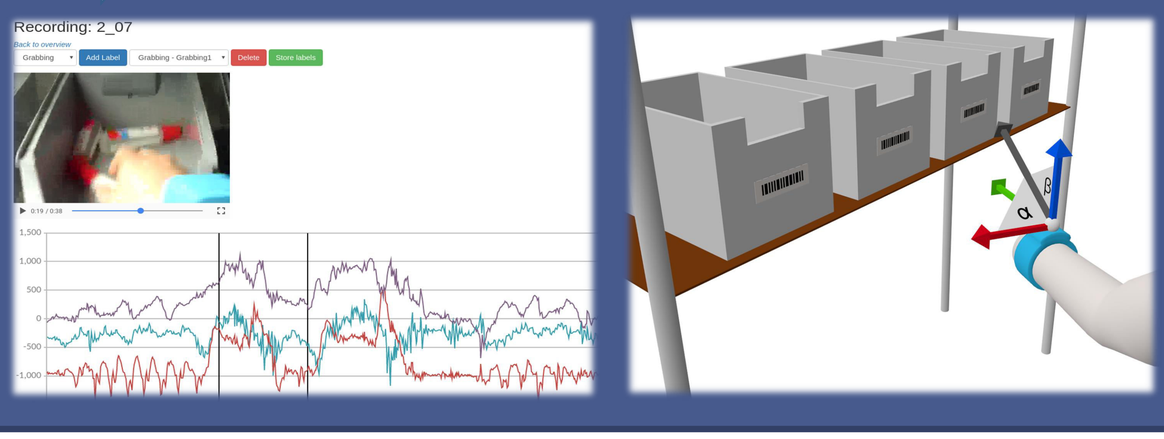
Already existing tools often …

- … only provide visual support
- … do not distinguish between sensor types (semi-supervised support)

➡ We want to use inertial sensor data to provide labels for video data

Method [2]

- Templates slide over unlabeled sensor stream to identify actions / to provide labels
  - ➡ Templates cover sensor dependent features (accelerometer vs. magnetometer)
- Dynamic Time Warping (DTW)
  - ➡ Compares time series of different length



Application [1]

Real environment of a warehouse …

Smart-Glasses (Vuzix)

Smart-Band (Custom)

- **Sensors**: acceleration, gyration, magnetic field, video data
- **Process**: walking, locating, grabbing
- **Focus**: body position and arm movement

Results

- Cross-Subjects grabbing recognition (leave-one-out cross validation)

Data Set	1	2	3	4	5	6	7
Overlap	0.43	0.67	0.78	0.52	0.72	0.74	0.99
Motion [s]	5.02	2.49	2.55	4.23	2.86	2.43	2.04
DStart [s]	1.41	1.89	0.91	0.86	0.71	2.88	0.65
DDur [s]	1.65	0.74	1.40	1.46	0.63	0.68	1.99

References

[1] A. Diete, L. Weiland, T. Sztyler and H. Stuckenschmidt, “Exploring a multi-sensor picking process in the future warehouse”, in Proceedings of the 2016 ACM International Joint Conference on Pervasive and Ubiquitous Computing: Adjunct. ACM, 2016, pp.1755-1758.

[2] J. Margarito, R. Helaoui, A. M. Bianchi, F. Sartor, and A. G. Bonomi, “User-independent recognition of sports activities from a single wrist-worn accelerometer: A template-matching-based approach”, IEEE Transactions on Biomedical Engineering, vol. 63, no. 4, pp.788-796, 2016.

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