**A Smart Data Annotation Tool for Multi-Sensor Activity Recognition**

Alexander Diete, Timo Sztyler, Heiner Stuckenschmidt
Research Group Data and Web Science, University of Mannheim, Germany
{alex|timo|heiner}@informatik.uni-mannheim.de

**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

**General Approach**
- Data Set
- Templates
- apply DTW
- slide (1 sec)
- rough start- and end-time

**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

**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)

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

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

**References**

http://sensor.informatik.uni-mannheim.de