Human Activity Recognition Using New Multi-Sensor Module in Mobile Environment

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Powerful Mobile Devices

- GPS
- Accelerometer
- Internet connection
- Magnetometer
- ...
Activity Recognition

![Graph showing various activities like running, walking, and sitting.]

- bus
- walking
- biking
- metro
How to do the activity recognition

Data Collect
Different kinds of data recorded by the phone.

Feature Extract
Extract features that can be used for classification.

Classifier
Apply classifier to recognize various activities.
Procedure used in this paper

Data Collect
- Acceleration and magnetic field data

Feature Extract
- Mean and variance for each axis

Classifier
- Apply ANN to recognize various activities
Data Collection
Feature Extract
Neural Network (NN)
Brief Introduction of NN
Brief Introduction of NN
Brief Introduction of NN
F(\text{eye}*w_1+\text{nose}*w_2+...+\text{mouth}*w_n)
# Recognition Results

## Table 1: Confusion matrix for the proposed method

<table>
<thead>
<tr>
<th>Actual Class</th>
<th>Predicted Class</th>
<th>Bus</th>
<th>Walk</th>
<th>Run</th>
<th>Stand</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bus</td>
<td></td>
<td>614</td>
<td>34</td>
<td>1</td>
<td>0</td>
<td>94.6%</td>
</tr>
<tr>
<td>Walk</td>
<td></td>
<td>1</td>
<td>1969</td>
<td>37</td>
<td>1</td>
<td>98.1%</td>
</tr>
<tr>
<td>Run</td>
<td></td>
<td>0</td>
<td>16</td>
<td>1994</td>
<td>0</td>
<td>99.2%</td>
</tr>
<tr>
<td>Stand</td>
<td></td>
<td>39</td>
<td>20</td>
<td>1</td>
<td>2075</td>
<td>97.2%</td>
</tr>
<tr>
<td>Accuracy</td>
<td></td>
<td>93.9%</td>
<td>96.6%</td>
<td>98.1%</td>
<td>100%</td>
<td>97.8%</td>
</tr>
</tbody>
</table>
Phone I used

[Image of a mobile phone with a screenshot of the droidShake application displaying configuration options like Enable local storage, Logic option, Upload options, Upload protocol, UDP endpoint, HTTP endpoint, State machine options, Steady time, Buffer time, Streaming time, Steady cap, Trigger threshold, and event details such as Accelerometer values.]
Data I recorded

<table>
<thead>
<tr>
<th>Class</th>
<th>Walk</th>
<th>Run</th>
<th>Sit</th>
<th>Bus/car</th>
<th>Desk</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of Points</td>
<td>100,000</td>
<td>100,000</td>
<td>100,000</td>
<td>100,000</td>
<td>100,000</td>
</tr>
</tbody>
</table>

• For each class, different phone positions were tested, like phone in my pant pocket, jacket pocket, shirt pocket, in hand etc.
## My Results

### Confusion Matrix

<table>
<thead>
<tr>
<th>Actual Class</th>
<th>Predicted Class</th>
<th>Walk</th>
<th>Run</th>
<th>Sit</th>
<th>Car/bus</th>
<th>Desk</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walk</td>
<td>Walk</td>
<td>1940</td>
<td>8</td>
<td>51</td>
<td>1</td>
<td>0</td>
<td>97.00%</td>
</tr>
<tr>
<td></td>
<td>Run</td>
<td>0</td>
<td>2000</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>Sit</td>
<td>0</td>
<td>0</td>
<td>2000</td>
<td>0</td>
<td>0</td>
<td>100%</td>
</tr>
<tr>
<td>Car/bus</td>
<td></td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>1915</td>
<td>82</td>
<td>95.80%</td>
</tr>
<tr>
<td>Desk</td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2000</td>
<td>100%</td>
</tr>
<tr>
<td>Accuracy</td>
<td></td>
<td>100%</td>
<td>99.60%</td>
<td>97.40%</td>
<td>99.90%</td>
<td>96.10%</td>
<td>98.60%</td>
</tr>
</tbody>
</table>
Thank you very much!