

Activity Recognition

WASP_AS_M1_Umeå1: Arka Ghosh, Divya Baura, Joannes Vermant, Julian Alfredo Mendez and Sabine Houy



Preconditions

- Phone is hold in hand while standing, walking, and running
- The phone is not overly moved (not more than it would be when just holding it in your hand while performing one of these activities)
- If one would shake the phone while standing, it would be detected as running



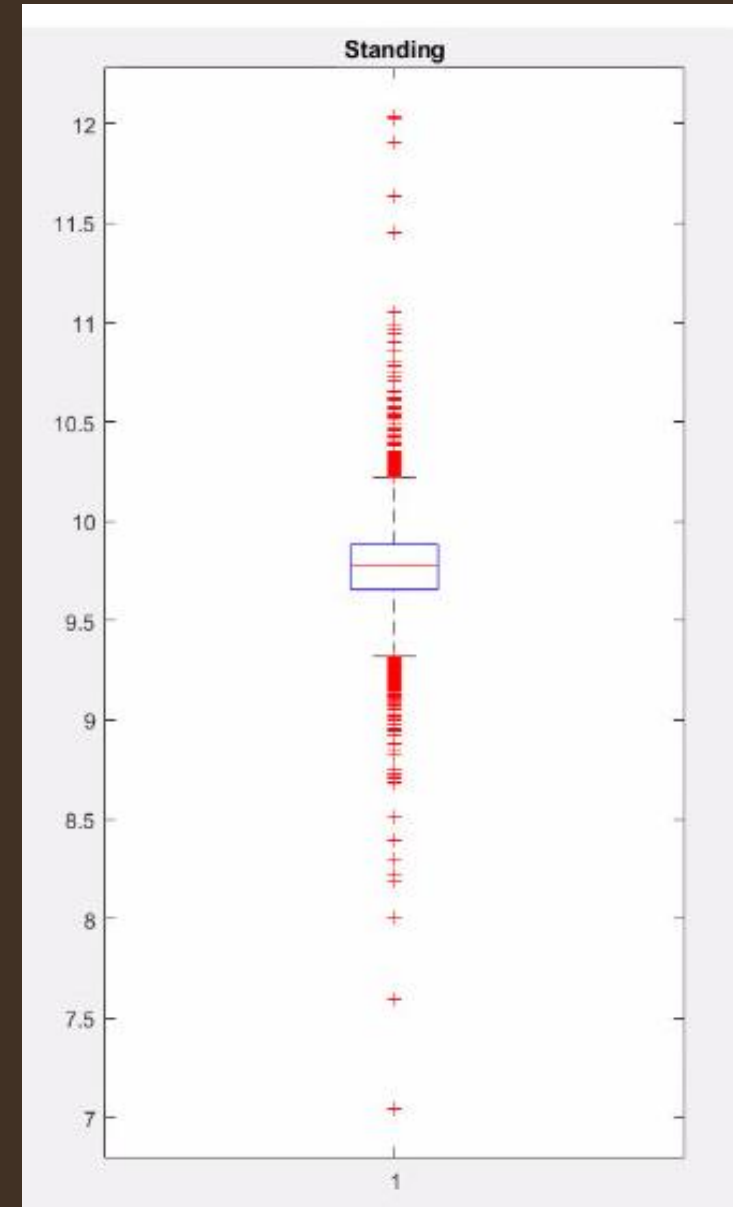
Method

1. We theorized about how the magnitudes would be affected when standing still, walking, and running
2. We took measures of data of standing still, walking, and running
3. We analyzed the data using box plots of acceleration norm values, and compared the results
4. We determined intervals of acceleration norm values to determine the states: standing still, walking, and running



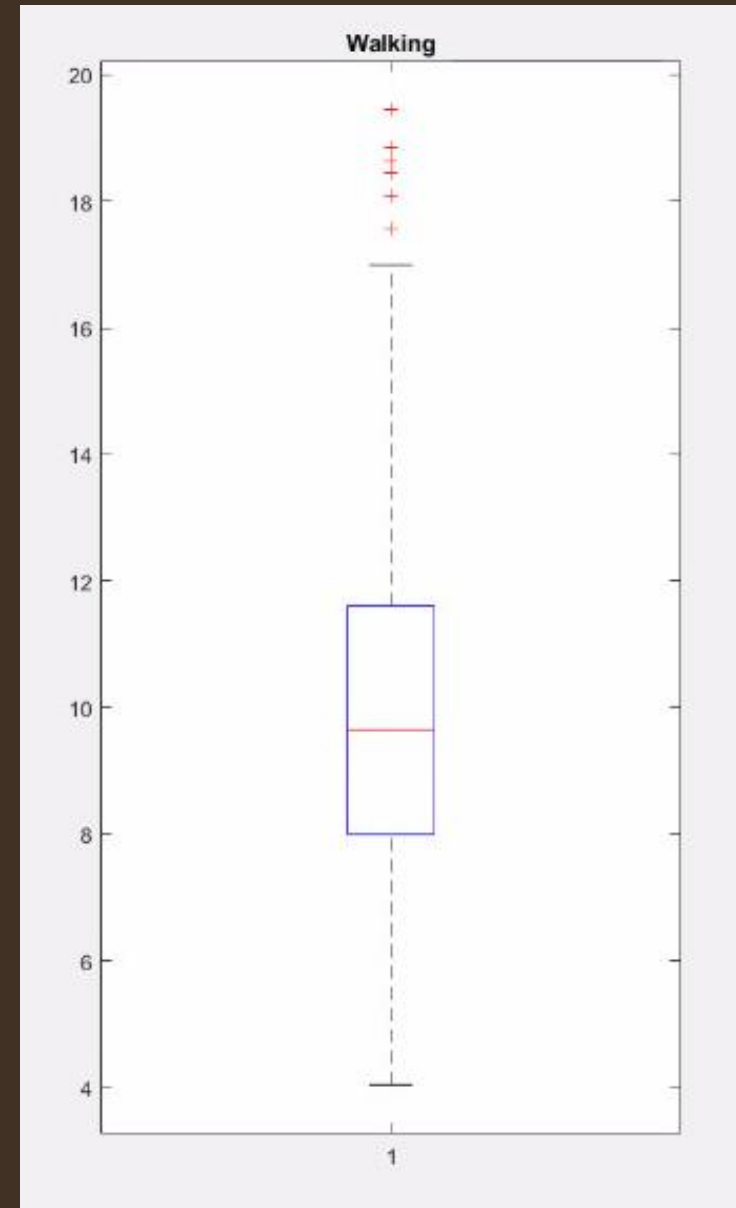
Standing still

- This is characterized by small fluctuations in the acceleration norm
- Most acceleration norm values ranged between 8 m/s² and 11 m/s²



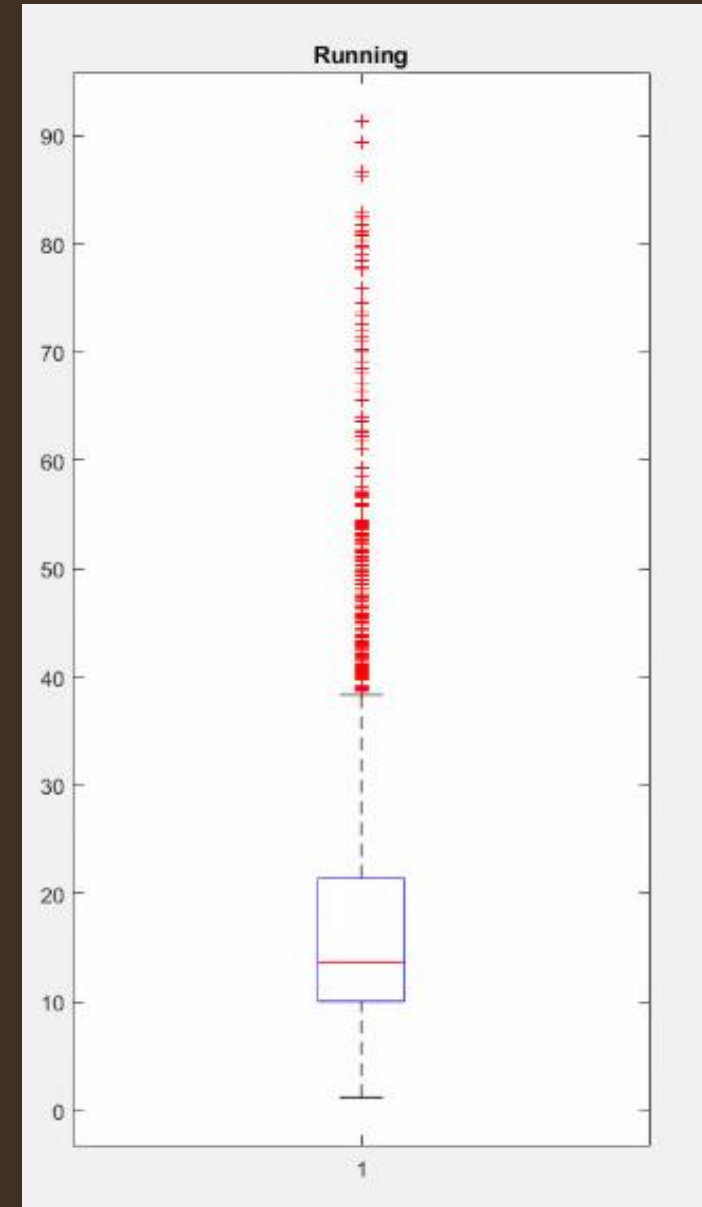
Walking

- This is characterized by acceleration norm values above 17 m/s^2

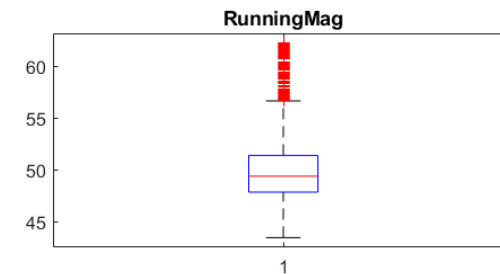
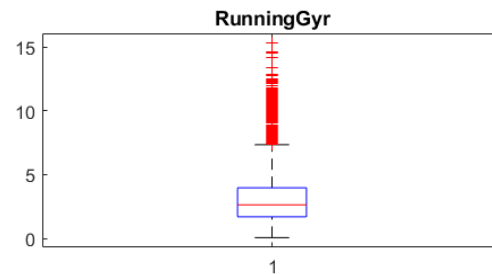
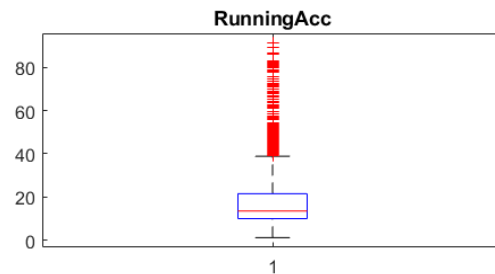
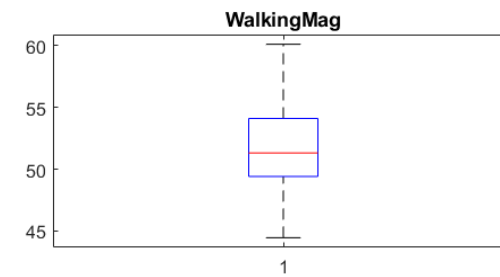
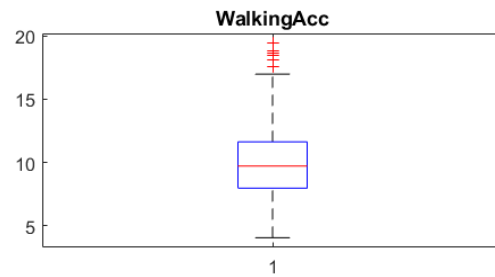
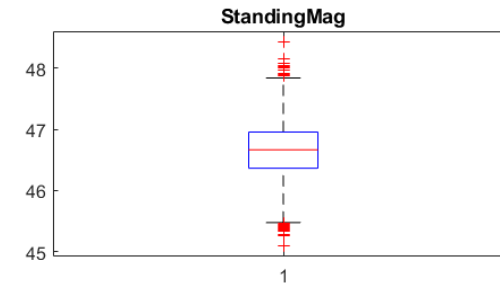
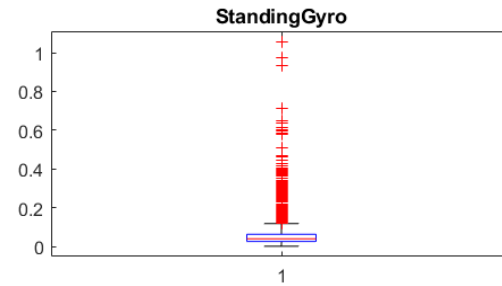
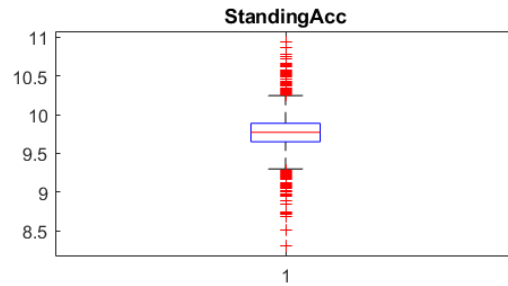


Running

- This is characterized by acceleration norm values above 40 m/s^2



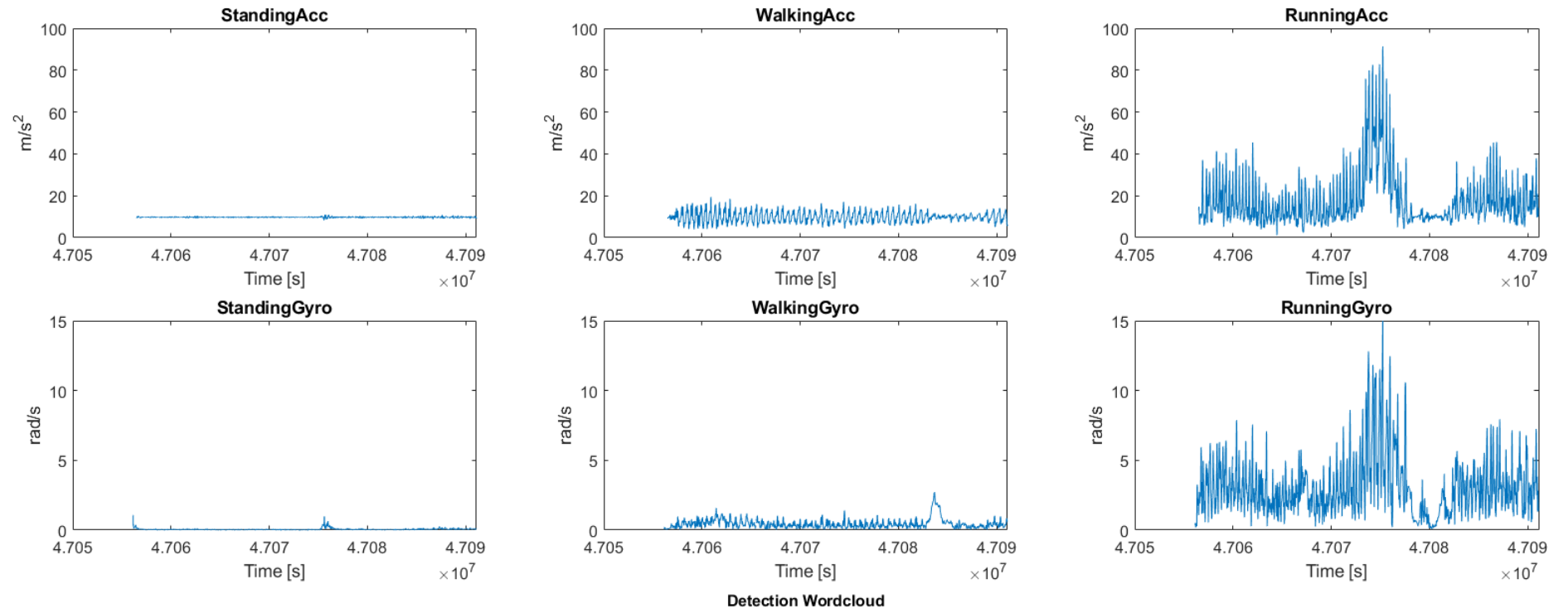
Boxplot from normalized vectors



Analysis of boxplots

- We considered the norms of the accelerometer, gyroscope and magnetometer.
- For acceleration, the means are relatively comparable, though the variances are very different.
- A similar phenomenon is observed for the norm of the gyroscope data
- The (norm of the) magnetometer data is different in the three cases, though the differences are less pronounced.
- Therefore we have decided to use variances of acceleration data to classify.

Detection based on variance over training data



Walking **Running** Standing

Detection (activityDetectionUmu.m)

Input: a sensor log file in text

Output: it will show the following window based on the activity

Threshold Values

```
if var(norm_Acc, 'omitnan') <= 1
    I am standing;
elseif var(norm_Acc, 'omitnan') <= 10
    I am Walking
else
    I am Running;
end
```

Detection Wordcloud

I am Standing