OVERVIEW

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The experiments have been carried out with a group of 30 volunteers within an age bracket of 19-48 years. Each person performed six activities (WALKING, WALKING\_UPSTAIRS, WALKING\_DOWNSTAIRS, SITTING, STANDING, LAYING) wearing a smartphone (Samsung Galaxy S II) on the waist. Using its embedded accelerometer and gyroscope, we captured 3-axial linear acceleration and 3-axial angular velocity at a constant rate of 50Hz.

The sensor signals (accelerometer and gyroscope) were pre-processed by applying noise filters and then sampled in fixed-width sliding windows of 2.56 sec and 50% overlap (128 readings/window). The sensor acceleration signal, which has gravitational and body motion components, was separated using a Butterworth low-pass filter into body acceleration and gravity. The gravitational force is assumed to have only low frequency components, therefore a filter with 0.3 Hz cutoff frequency was used. From each window, a vector of features was obtained by calculating variables from the time and frequency domain. Then the data was averaged by subject and activity type.

How measurements were obtained

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The features selected for this dataset come from the accelerometer and gyroscope 3-axial raw signals tAcc-XYZ and tGyro-XYZ. These time domain signals (prefix 't' to denote time) were captured at a constant rate of 50 Hz. Then they were filtered using a median filter and a 3rd order low pass Butterworth filter with a corner frequency of 20 Hz to remove noise. Similarly, the acceleration signal was then separated into body and gravity acceleration signals (tBodyAcc-XYZ and tGravityAcc-XYZ) using another low pass Butterworth filter with a corner frequency of 0.3 Hz.

Subsequently, the body linear acceleration and angular velocity were derived in time to obtain Jerk signals (tBodyAccJerk-XYZ and tBodyGyroJerk-XYZ). Also the magnitude of these three-dimensional signals were calculated using the Euclidean norm (tBodyAccMag, tGravityAccMag, tBodyAccJerkMag, tBodyGyroMag, tBodyGyroJerkMag).

A Fast Fourier Transform (FFT) was applied to some of these signals producing fBodyAcc-XYZ, fBodyAccJerk-XYZ, fBodyGyro-XYZ, fBodyAccJerkMag, fBodyGyroMag, fBodyGyroJerkMag. (Note the 'f' to indicate frequency domain signals).

Finally, measurement which only represent mean and standard deviation of signals within one window were extracted and averaged by activity type and subject.

For each record it is provided:

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- A 66-feature vector with averaged (by subject and activity) time and frequency domain variables.

- Type of activity during which measurement were done (Activity)

- An identifier of the subject who carried out the experiment. Its range is from 1 to 30 (subject)

Notes:

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- Features are normalized and bounded within [-1,1].

How to read variable names:

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**prefix 't'** denotes time

**‘…Body…’** denotes Body component of initial acceleration signal

**‘…Gravity…’** denotes Gravity component of initial acceleration signal

**‘…Jerk…’** denotes to Jerk signals of body linear acceleration and angular velocity

**‘…Mag…’**denotes to magnitude calculated using the Euclidean norm

**prefix 'f'** indicates frequency domain signals resulted after Fast Fourier Transform (FFT)was applied

**‘…Acc…’**denotes to linear acceleration

**‘…Gyro…’**denotes to angular velocity

**‘…X…’, ‘…Y…’, ‘…Z…’** represents axis of the signal

The the list of measurements presented

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| tBodyAcc-mean()-X |
| tBodyAcc-mean()-Y |
| tBodyAcc-mean()-Z |
| tGravityAcc-mean()-X |
| tGravityAcc-mean()-Y |
| tGravityAcc-mean()-Z |
| tBodyAccJerk-mean()-X |
| tBodyAccJerk-mean()-Y |
| tBodyAccJerk-mean()-Z |
| tBodyGyro-mean()-X |
| tBodyGyro-mean()-Y |
| tBodyGyro-mean()-Z |
| tBodyGyroJerk-mean()-X |
| tBodyGyroJerk-mean()-Y |
| tBodyGyroJerk-mean()-Z |
| tBodyAccMag-mean() |
| tGravityAccMag-mean() |
| tBodyAccJerkMag-mean() |
| tBodyGyroMag-mean() |
| tBodyGyroJerkMag-mean() |
| fBodyAcc-mean()-X |
| fBodyAcc-mean()-Y |
| fBodyAcc-mean()-Z |
| fBodyAccJerk-mean()-X |
| fBodyAccJerk-mean()-Y |
| fBodyAccJerk-mean()-Z |
| fBodyGyro-mean()-X |
| fBodyGyro-mean()-Y |
| fBodyGyro-mean()-Z |
| fBodyAccMag-mean() |
| fBodyBodyAccJerkMag-mean() |
| fBodyBodyGyroMag-mean() |
| fBodyBodyGyroJerkMag-mean() |
| tBodyAcc-std()-X |
| tBodyAcc-std()-Y |
| tBodyAcc-std()-Z |
| tGravityAcc-std()-X |
| tGravityAcc-std()-Y |
| tGravityAcc-std()-Z |
| tBodyAccJerk-std()-X |
| tBodyAccJerk-std()-Y |
| tBodyAccJerk-std()-Z |
| tBodyGyro-std()-X |
| tBodyGyro-std()-Y |
| tBodyGyro-std()-Z |
| tBodyGyroJerk-std()-X |
| tBodyGyroJerk-std()-Y |
| tBodyGyroJerk-std()-Z |
| tBodyAccMag-std() |
| tGravityAccMag-std() |
| tBodyAccJerkMag-std() |
| tBodyGyroMag-std() |
| tBodyGyroJerkMag-std() |
| fBodyAcc-std()-X |
| fBodyAcc-std()-Y |
| fBodyAcc-std()-Z |
| fBodyAccJerk-std()-X |
| fBodyAccJerk-std()-Y |
| fBodyAccJerk-std()-Z |
| fBodyGyro-std()-X |
| fBodyGyro-std()-Y |
| fBodyGyro-std()-Z |
| fBodyAccMag-std() |
| fBodyBodyAccJerkMag-std() |
| fBodyBodyGyroMag-std() |
| fBodyBodyGyroJerkMag-std() |