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Data Collection
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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.

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Feature Selection
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The features selected for this database 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. The sensor signals (accelerometer and gyroscope) were pre-processed by applying noise filters (median & Butterworth ) and then sampled in fixed-width sliding windows of 2.56 sec and 50% overlap (128 readings/window). Here 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).

Finally 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).

These signals were used to estimate variables of the feature vector for each pattern:
'-XYZ' is used to denote 3-axial signals in the X, Y and Z directions.

tBodyAcc-XYZ
tGravityAcc-XYZ
tBodyAccJerk-XYZ
tBodyGyro-XYZ
tBodyGyroJerk-XYZ
tBodyAccMag
tGravityAccMag
tBodyAccJerkMag
tBodyGyroMag
tBodyGyroJerkMag
fBodyAcc-XYZ
fBodyAccJerk-XYZ
fBodyGyro-XYZ
fBodyAccMag
fBodyAccJerkMag
fBodyGyroMag
fBodyGyroJerkMag

The set of variables that were estimated from these signals are:

mean(): Mean value
std(): Standard deviation

Now, for each subject and each activity; average of these measurements are obtained. So final variables in the tidy data set are:

A) subject: Id of each subject
B) activity: Activity label i.e. one of WALKING, WALKING_UPSTAIRS, WALKING_DOWNSTAIRS, SITTING, STANDING, LAYING
C) avg-tBodyAcc-mean()-X
D) avg-tBodyAcc-mean()-Y
E) avg-tBodyAcc-mean()-Z
F) avg-tBodyAcc-std()-X
G) avg-tBodyAcc-std()-Y
H) avg-tBodyAcc-std()-Z
I) avg-tGravityAcc-mean()-X
J) avg-tGravityAcc-mean()-Y
K) avg-tGravityAcc-mean()-Z
L) avg-tGravityAcc-std()-X
M) avg-tGravityAcc-std()-Y
N) avg-tGravityAcc-std()-Z
O) avg-tBodyAccJerk-mean()-X
P) avg-tBodyAccJerk-mean()-Y
Q) avg-tBodyAccJerk-mean()-Z
R) avg-tBodyAccJerk-std()-X
S) avg-tBodyAccJerk-std()-Y
T) avg-tBodyAccJerk-std()-Z
U) avg-tBodyGyro-mean()-X
V) avg-tBodyGyro-mean()-Y
W) avg-tBodyGyro-mean()-Z
X) avg-tBodyGyro-std()-X
Y) avg-tBodyGyro-std()-Y
Z) avg-tBodyGyro-std()-Z
AA) avg-tBodyGyroJerk-mean()-X
BB) avg-tBodyGyroJerk-mean()-Y
CC) avg-tBodyGyroJerk-mean()-Z
DD) avg-tBodyGyroJerk-std()-X
EE) avg-tBodyGyroJerk-std()-Y
FF) avg-tBodyGyroJerk-std()-Z
GG) avg-tBodyAccMag-mean()
HH) avg-tBodyAccMag-std()
II) avg-tGravityAccMag-mean()
JJ) avg-tGravityAccMag-std()
KK) avg-tBodyAccJerkMag-mean()
LL) avg-tBodyAccJerkMag-std()
MM) avg-tBodyGyroMag-mean()

NN) avg-tBodyGyroMag-std()
OO) avg-tBodyGyroJerkMag-mean()
PP) avg-tBodyGyroJerkMag-std()
QQ) avg-fBodyAcc-mean()-X
RR) avg-fBodyAcc-mean()-Y
SS) avg-fBodyAcc-mean()-Z
TT) avg-fBodyAcc-std()-X
UU) avg-fBodyAcc-std()-Y
VV) avg-fBodyAcc-std()-Z
WW) avg-fBodyAccJerk-mean()-X
XX) avg-fBodyAccJerk-mean()-Y
YY) avg-fBodyAccJerk-mean()-Z
ZZ) avg-fBodyAccJerk-std()-X
AAA) avg-fBodyAccJerk-std()-Y
BBB) avg-fBodyAccJerk-std()-Z
CCC) avg-fBodyGyro-mean()-X
DDD) avg-fBodyGyro-mean()-Y
EEE) avg-fBodyGyro-mean()-Z
FFF) avg-fBodyGyro-std()-X
GGG) avg-fBodyGyro-std()-Y
HHH) avg-fBodyGyro-std()-Z
III) avg-fBodyAccMag-mean()
JJJ) avg-fBodyAccMag-std()
KKK) avg-fBodyBodyAccJerkMag-mean()
LLL) avg-fBodyBodyAccJerkMag-std()
MMM) avg-fBodyBodyGyroMag-mean()
NNN) avg-fBodyBodyGyroMag-std()
OOO) avg-fBodyBodyGyroJerkMag-mean()
PPP) avg-fBodyBodyGyroJerkMag-std()