**DATA DICTIONARY - Human Activity Recognition Using Smartphones Data Set**

volunteers 1

volunteers number from 1 to 30.

activity

6 activities performed by volunteers when wearing a smartphone.

WALKING

WALKING\_UPSTAIRS

WALKING\_DOWNSTAIRS

SITTING, STANDING

LAYING

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

fBodyAcc-meanFreq()-X

fBodyAcc-meanFreq()-Y

fBodyAcc-meanFreq()-Z

fBodyAccJerk-mean()-X

fBodyAccJerk-mean()-Y

fBodyAccJerk-mean()-Z

fBodyAccJerk-meanFreq()-X

fBodyAccJerk-meanFreq()-Y

fBodyAccJerk-meanFreq()-Z

fBodyGyro-mean()-X

fBodyGyro-mean()-Y

fBodyGyro-mean()-Z

fBodyGyro-meanFreq()-X

fBodyGyro-meanFreq()-Y

fBodyGyro-meanFreq()-Z

fBodyAccMag-mean()

fBodyAccMag-meanFreq()

fBodyBodyAccJerkMag-mean()

fBodyBodyAccJerkMag-meanFreq()

fBodyBodyGyroMag-mean()

fBodyBodyGyroMag-meanFreq()

fBodyBodyGyroJerkMag-mean()

fBodyBodyGyroJerkMag-meanFreq()

angle(tBodyAccMean,gravity)

angle(tBodyAccJerkMean),gravityMean)

angle(tBodyGyroMean,gravityMean)

angle(tBodyGyroJerkMean,gravityMean)

angle(X,gravityMean)

angle(Y,gravityMean)

angle(Z,gravityMean)

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()

Demonstration of these variables:

the data listing in the table is the average of each variable for each activity and each subject.

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. 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).

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.

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

mean(): Mean value

std(): Standard deviation

meanFreq(): Weighted average of the frequency components to obtain a mean frequency

angle(): Angle between to vectors.

Additional vectors obtained by averaging the signals in a signal window sample. These are used on the angle() variable:

gravityMean

tBodyAccMean

tBodyAccJerkMean

tBodyGyroMean

tBodyGyroJerkMean