DATA DICTIONARY – HUMAN ACTIVITY RECOGNITION USING SMARTPHONE DATASET

1 - DESCRIPTION

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.

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
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

2- INDIVIDUAL VARIABLE NAMES, TYPES AND DEFINITIONS

activityName   Factor
  WALKING
  WALKING_UPSTAIRS
  WALKING_DOWNSTAIRS
  SITTING
  STANDING
  LAYING

subject   Int
  1..30 Unique identifier for each individual tester

tBodyAccMeanX   Num
  Mean of the measurements of mean timed body acceleration along the X axis

tBodyAccMeanY   Num
  Mean of the measurements of mean timed body acceleration along the Y axis

tBodyAccMeanZ   Num
  Mean of the measurements of mean timed body acceleration along the Z axis

tBodyAccStdX   Num
  Mean of the measurements of the standard deviation of the timed body acceleration along the X axis

tBodyAccStdY   Num
  Mean of the measurements of the standard deviation of the timed body acceleration along the Y axis

tBodyAccStdZ   Num
     Mean of the measurements of the standard deviation of the timed body acceleration
     along the Z axis

tGravityAccMeanX   Num
     Mean of the measurements of mean timed gravity acceleration along the X axis

tGravityAccMeanY   Num
     Mean of the measurements of mean timed gravity acceleration along the Y axis

tGravityAccMeanZ   Num
     Mean of the measurements of mean timed gravity acceleration along the Z axis

tGravityAccStdX   Num
     Mean of the measurements of the standard deviation of the timed gravity acceleration
     along the X axis

tGravityAccStdY   Num
     Mean of the measurements of the standard deviation of the timed gravity acceleration
     along the Y axis

tGravityAccStdZ   Num
     Mean of the measurements of the standard deviation of the timed gravity acceleration
     along the Z axis

tBodyAccJerkMeanX   Num
     Mean of the measurements of mean timed body linear acceleration derived in time to
     obtain jerk signals along the X axis

tBodyAccJerkMeanY   Num
     Mean of the measurements of mean timed body linear acceleration derived in time to
     obtain jerk signals along the Y axis

tBodyAccJerkMeanZ   Num
     Mean of the measurements of mean timed body linear acceleration derived in time to
     obtain jerk signals along the Z axis

tBodyAccJerkStdX   Num
     Mean of the measurements of the standard deviation of the timed body linear
     acceleration derived in time to obtain jerk signals along the X axis

tBodyAccJerkStdY   Num
     Mean of the measurements of the standard deviation of the timed body linear
     acceleration derived in time to obtain jerk signals along the Y axis

tBodyAccJerkStdZ   Num

    Mean of the measurements of the standard deviation of the timed body linear
    acceleration derived in time to obtain jerk signals along the Z axis

tBodyGyroMeanX   Num

    Mean of the measurements of mean timed gyroscopic acceleration along the X axis

tBodyGyroMeanY   Num

    Mean of the measurements of mean timed gyroscopic acceleration along the Y axis

tBodyGyroMeanZ   Num

    Mean of the measurements of mean timed gyroscopic acceleration along the Z axis

tBodyGyroStdX   Num

    Mean of the measurements of the standard deviation of the timed gyroscopic
    acceleration along the X axis

tBodyGyroStdY   Num

    Mean of the measurements of the standard deviation of the timed gyroscopic
    acceleration along the Y axis

tBodyGyroStdZ   Num

    Mean of the measurements of the standard deviation of the timed gyroscopic
    acceleration along the Z axis

tBodyGyroJerkMeanX   Num

    Mean of the measurements of mean timed gyroscopic acceleration derived in time to
    obtain jerk signals along the X axis

tBodyGyroJerkMeanY   Num

    Mean of the measurements of mean timed gyroscopic acceleration derived in time to
    obtain jerk signals along the Y axis

tBodyGyroJerkMeanZ   Num

    Mean of the measurements of mean timed gyroscopic acceleration derived in time to
    obtain jerk signals along the Z axis

tBodyGyroJerkStdX   Num

    Mean of the measurements of the standard deviation of the timed gyroscopic
    acceleration derived in time to obtain jerk signals along the X axis

tBodyGyroJerkStdY   Num

Mean of the measurements of the standard deviation of the timed gyroscopic acceleration derived in time to obtain jerk signals along the Y axis

tBodyGyroJerkStdZ   Num

Mean of the measurements of the standard deviation of the timed gyroscopic acceleration derived in time to obtain jerk signals along the Z axis

tBodyAccMagMean   Num

Mean of the measurements of the mean time body acceleration magnitude

tBodyAccMagStd   Num

Mean of the measurements of the standard deviation of the time body acceleration magnitude

tGravityAccMagMean   Num

Mean of the measurements of the mean time gravity acceleration magnitude

tGravityAccMagStd   Num

Mean of the measurements of the standard deviation of the time gravity acceleration magnitude along the X axis

tBodyAccJerkMagMean   Num

Mean of the measurements of the mean timed body linear acceleration derived in time to obtain jerk magnitude signals

tBodyAccJerkMagStd   Num

Mean of the measurements of the standard deviation of the timed body linear acceleration derived in time to obtain jerk magnitude signals

tBodyGyroMagMean   Num

Mean of the measurements of mean timed gyroscopic acceleration magnitude

tBodyGyroMagStd   Num

Mean of the measurements of the standard deviation of the gyroscopic acceleration magnitude

tBodyGyroJerkMagMean   Num

Mean of the measurements of mean timed gyroscopic acceleration derived in time to obtain jerk magnitude signals

tBodyGyroJerkMagStd   Num

Mean of the measurements of standard deviation of the timed gyroscopic acceleration derived in time to obtain jerk magnitude signals

fBodyAccMeanX   Num

      Mean of the measurements of mean frequency domain signals body acceleration along the X axis

fBodyAccMeanY   Num

      Mean of the measurements of mean frequency domain signals body acceleration along the Y axis

fBodyAccMeanZ   Num

      Mean of the measurements of mean frequency domain signals body acceleration along the Z axis

fBodyAccStdX   Num

      Mean of the measurements of the standard deviation of the frequency domain signals body acceleration along the X axis

fBodyAccStdY   Num

      Mean of the measurements of the standard deviation of the frequency domain signals body acceleration along the Y axis

fBodyAccStdZ   Num

      Mean of the measurements of the standard deviation of the frequency domain signals body acceleration along the Z axis

fBodyAccMeanFreqX   Num

      Mean of the measurements of the mean of the frequency domain signals body acceleration along the X axis

fBodyAccMeanFreqY   Num

      Mean of the measurements of the mean of the frequency domain signals body acceleration along the Y axis

fBodyAccMeanFreqZ   Num

      Mean of the measurements of the mean of the frequency domain signals body acceleration along the Z axis

fBodyAccJerkMeanX   Num

      Mean of the measurements of the mean of the body linear acceleration derived by frequency domain signals to obtain jerk signals along the X axis

fBodyAccJerkMeanY   Num

      Mean of the measurements of the mean of the body linear acceleration derived by frequency domain signals to obtain jerk signals along the Y axis

fBodyAccJerkMeanZ   Num
   Mean of the measurements of the mean of the body linear acceleration derived by
   frequency domain signals to obtain jerk signals along the Z axis

fBodyAccJerkStdX   Num
   Mean of the measurements of the standard deviation of the body linear acceleration
   derived by frequency domain signals to obtain jerk signals along the X axis

fBodyAccJerkStdY   Num
   Mean of the measurements of the standard deviation of the body linear acceleration
   derived by frequency domain signals to obtain jerk signals along the Y axis

fBodyAccJerkStdZ   Num
   Mean of the measurements of the standard deviation of the body linear acceleration
   derived by frequency domain signals to obtain jerk signals along the Z axis

fBodyAccJerkMeanFreqX   Num
   Mean of the measurements of the mean of the body linear acceleration derived by
   frequency domain signals to obtain jerk signals along the X axis

fBodyAccJerkMeanFreqY   Num
   Mean of the measurements of the mean of the body linear acceleration derived by
   frequency domain signals to obtain jerk signals along the Y axis

fBodyAccJerkMeanFreqZ   Num
   Mean of the measurements of the mean of the body linear acceleration derived by
   frequency domain signals to obtain jerk signals along the Z axis

fBodyGyroMeanX   Num
   Mean of the measurements of mean gyroscopic acceleration frequency domain signals
   along the X axis

fBodyGyroMeanY   Num
   Mean of the measurements of mean gyroscopic acceleration frequency domain signals
   along the Y axis

fBodyGyroMeanZ   Num
   Mean of the measurements of mean gyroscopic acceleration frequency domain signals
   along the Z axis

fBodyGyroStdX   Num
   Mean of the measurements of the standard deviation of the gyroscopic acceleration
   frequency domain signals along the X axis

fBodyGyroStdY   Num

 Mean of the measurements of the standard deviation of the gyroscopic acceleration frequency domain signals along the Y axis

fBodyGyroStdZ   Num

 Mean of the measurements of the standard deviation of the gyroscopic acceleration frequency domain signals along the Z axis

fBodyGyroMeanFreqX   Num

 Mean of the measurements of mean gyroscopic acceleration frequency domain signals along the X axis

fBodyGyroMeanFreqZ   Num

 Mean of the measurements of mean gyroscopic acceleration frequency domain signals along the Z axis

fBodyAccMagMean   Num

 Mean of the measurements of the mean body acceleration magnitude over frequency domain signals

fBodyAccMagStd   Num

 Mean of the measurements of the standard deviation of the body acceleration magnitude over frequency domain signals

fBodyAccMagMeanFreq   Num

 Mean of the measurements of the mean body acceleration magnitude over frequency domain signal frequency

fBodyBodyAccJerkMagMean Num

 Mean of the measurements of the mean of the magnitude of the body linear acceleration derived by frequency domain signals to obtain jerk signals

fBodyBodyAccJerkMagStd   Num

 Mean of the measurements of the standard deviation of the magnitude of the body linear acceleration derived by frequency domain signals to obtain jerk signals

fBodyBodyAccJerkMagMeanFreq Num

 Mean of the measurements of the mean of the magnitude of the body linear acceleration derived by frequency domain signals to obtain jerk signal frequency

fBodyBodyGyroMagMean   Num

 Mean of the measurements of mean gyroscopic acceleration magnitude derived by frequency domain signals

fBodyBodyGyroMagStd   Num

  Mean of the measurements of the standard deviation of the gyroscopic acceleration
  magnitude derived by frequency domain signals

fBodyBodyGyroMagMeanFreq   Num

  Mean of the measurements of mean gyroscopic acceleration magnitude derived by
  frequency domain signal frequency

fBodyBodyGyroJerkMagMean   Num

  Mean of the measurements of mean gyroscopic acceleration derived by frequency
  domain signals to obtain the jerk magnitude

fBodyBodyGyroJerkMagStd   Num

  Mean of the measurements of standard deviation of the gyroscopic acceleration derived
  by frequency domain signals to obtain the jerk magnitude

fBodyBodyGyroJerkMagMeanFreq Num

  Mean of the measurements of mean gyroscopic acceleration derived by frequency
  domain signals to obtain the jerk magnitude frequency

angletBodyAccMeanGravity   Num

  Mean of the measurements of the angle of mean timed body acceleration vs. gravity

angletBodyAccJerkMeanGravityMean Num

  Mean of the measurements of the angle of mean timed body linear acceleration derived
  in time to obtain jerk signals vs. gravity

angletBodyGyroMeanGravityMean Num

  Mean of the measurements of the angle of mean timed gyroscopic acceleration vs
  gravity

angletBodyGyroJerkMeanGravityMean Num

  Mean of the measurements of the angle of mean timed gyroscopic acceleration derived
  in time to obtain jerk signals vs. gravity

angleXGravityMean   Num

  Mean of the mean measurements of the angle on the X axis vs. gravity

angleYGravityMean   Num

  Mean of the mean measurements of the angle on the Y axis vs. gravity

angleZGravityMean   Num

  Mean of the mean measurements of the angle on the Z axis vs. gravity