Codebook for 'run_analysis.R'

Version 1.0

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Introduction

This codebook describes the variables used in a study on human activity recognition using smartphones. The raw dataset was obtained from the study “Human Activity Recognition Using Smartphones Dataset” by Reyes-Ortiz et al. (2012).

Experiment overview

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 experiments have been video-recorded to label the data manually. The obtained dataset has been randomly partitioned into two sets, where 70% of the volunteers was selected for generating the training data and 30% the test data.

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.

Features measured

Variable Name	Variable Definition	Unit
tBodyAcc-XYZ	Body linear acceleration signal, time domain	m/s^2
tGravityAcc-XYZ	Gravity acceleration signal, time domain	m/s^2
tBodyAccJerk-XYZ	Body linear acceleration – Jerk signal, time domain	m/s^2
tBodyGyro-XYZ	Body angular acceleration signal, time domain	ω
tBodyGyroJerk-XYZ	Body angular acceleration – Jerk signal, time domain	ω
tBodyAccMag	Body linear acceleration signal magnitude (Euclidean norm), time domain	m/s^2
tGravityAccMag	Gravity linear acceleration signal magnitude (Euclidean norm), time domain	m/s^2
tBodyAccJerkMag	Body linear acceleration – Jerk signal magnitude (Euclidean norm), time domain	m/s^2
tBodyGyroMag	Body angular acceleration signal magnitude (Euclidean norm), time domain	ω
tBodyGyroJerkMag	Body angular acceleration signal magnitude (Euclidean norm), time domain	ω
fBodyAcc-XYZ	Body linear acceleration signal, frequency domain	m/s^2
fBodyAccJerk-XYZ	Body linear acceleration – Jerk signal, frequency domain	m/s^2
fBodyGyro-XYZ	Body angular acceleration signal, frequency domain	ω
fBodyAccMag	Body linear acceleration signal magnitude (Euclidean norm), frequency domain	m/s^2

fBodyAccJerkMag	Body linear acceleration – Jerk signal magnitude (Euclidean norm), frequency domain	m/s^2
fBodyGyroMag	Body angular acceleration signal magnitude (Euclidean norm), frequency domain	ω
fBodyGyroJerkMag	Body angular acceleration signal magnitude (Euclidean norm), frequency domain	ω

-XYZ denotes 3-axial signals in the X, Y and Z directions for the respective feature.

In the data set produced by ‘run_analysis.R’, the average of the mean and standard deviation (mean and std respectively) of each feature is tabulated.