Data Dictionary - Human Activity Recognition Using Smartphones

Derivation of Features and Selection for Tidy Data

The "subjectID" feature denotes one of 30 subjects examined. The "activity" feature denotes one of six activities the subjects performed. The remaining features selected for this tidy data come from the accelerometer and gyroscope 3-axial raw signals (X,Y,or Z). The feature labels end with one of these signal characters.

The feature labels begin with "time" or "freq" to denote whether the feature measured a time or frequency domain signal, respectively. Furthermore, acceleration ("Accel") and gyroscope ("Gyro") signals were separated into body ("BodyAccel" or "BodyGyro") and gravitation ("GravityAccel" or "GravityGyro") signals.

In addition, body linear acceleration and angular velocity were derived to obtain Jerk ("Jerk") signals ("BodyAccelJerk" and "BodyGyroJerk"). The magnitudes ("Magnitude") of these signals was also calculated.

Features included in the tidy data only include estimated signals for the mean ("Mean") and Standard deviation ("Std") values for the above mentioned features.

Feature Details

The mean values for all observations for a given subject and corresponding activity are represented in the tidy data for each of the following 81 features. Again, the numeric features are the mean values for each subject for each activity. For example, if subject 10 was measured for "WALKING" over 20 observations for a variable timeBodyAccelMeanX, the number reported for that variable is the mean of those 20 observations.

*Note: Although it may be recommended to have all lowercase characters for descriptive label names for the features, in this case, I would argue that camelBack naming is better given the length and readability of the labels.

Feature	Class	Description	Domain Signal	Mean|Std	Axial Signal	Range
subjectID	Integer	The ID number for the subject/person	NA	NA	NA	[1 ..30]
activity	Character	The activity performed by the subject	NA	NA	NA	[LAYING, SITTING, STANDING, WALKING, WALKING_DOWNSTAIRS, WALKING_UPSTAIRS]
timeBodyAccelMeanX	Numeric	Body acceleration via accelerometer	time	Mean	X	[-1..1]
timeBodyAccelMeanY	Numeric	Body acceleration via accelerometer	time	Mean	Y	[-1..1]
timeBodyAccelMeanZ	Numeric	Body acceleration via accelerometer	time	Mean	Z	[-1..1]
timeBodyAccelStdX	Numeric	Body acceleration via accelerometer	time	Std	X	[-1..1]
timeBodyAccelStdY	Numeric	Body acceleration via accelerometer	time	Std	Y	[-1..1]
timeBodyAccelStdZ	Numeric	Body acceleration via accelerometer	time	Std	Z	[-1..1]
timeGravityAccelMeanX	Numeric	Gravity acceleration via accelerometer	time	Mean	X	[-1..1]
timeGravityAccelMeanY	Numeric	Gravity acceleration via accelerometer	time	Mean	Y	[-1..1]
timeGravityAccelMeanZ	Numeric	Gravity acceleration via accelerometer	time	Mean	Z	[-1..1]
timeGravityAccelStdX	Numeric	Gravity acceleration via accelerometer	time	Std	X	[-1..1]
timeGravityAccelStdY	Numeric	Gravity acceleration via accelerometer	time	Std	Y	[-1..1]
timeGravityAccelStdZ	Numeric	Gravity acceleration via accelerometer	time	Std	Z	[-1..1]
timeBodyAccelJerkMeanX	Numeric	Linear body acceleration via accelerometer	time	Mean	X	[-1..1]
timeBodyAccelJerkMeanY	Numeric	Linear body acceleration via accelerometer	time	Mean	Y	[-1..1]
timeBodyAccelJerkMeanZ	Numeric	Linear body acceleration via accelerometer	time	Mean	Z	[-1..1]
timeBodyAccelJerkStdX	Numeric	Linear body acceleration via accelerometer	time	Std	X	[-1..1]
timeBodyAccelJerkStdY	Numeric	Linear body acceleration via accelerometer	time	Std	Y	[-1..1]

Feature	Class	Description	Domain Signal	Mean|Std	Axial Signal	Range
timeBodyAccelJerkStdZ	Numeric	Linear body acceleration via accelerometer	time	Std	Z	[-1..1]
timeBodyGyroMeanX	Numeric	Body gyration via gyroscope	time	Mean	X	[-1..1]
timeBodyGyroMeanY	Numeric	Body gyration via gyroscope	time	Mean	Y	[-1..1]
timeBodyGyroMeanZ	Numeric	Body gyration via gyroscope	time	Mean	Z	[-1..1]
timeBodyGyroStdX	Numeric	Body gyration via gyroscope	time	Std	X	[-1..1]
timeBodyGyroStdY	Numeric	Body gyration via gyroscope	time	Std	Y	[-1..1]
timeBodyGyroStdZ	Numeric	Body gyration via gyroscope	time	Std	Z	[-1..1]
timeBodyGyroJerkMeanX	Numeric	Angular body velocity via gyroscope	time	Mean	X	[-1..1]
timeBodyGyroJerkMeanY	Numeric	Angular body velocity via gyroscope	time	Mean	Y	[-1..1]
timeBodyGyroJerkMeanZ	Numeric	Angular body velocity via gyroscope	time	Mean	Z	[-1..1]
timeBodyGyroJerkStdX	Numeric	Angular body velocity via gyroscope	time	Std	X	[-1..1]
timeBodyGyroJerkStdY	Numeric	Angular body velocity via gyroscope	time	Std	Y	[-1..1]
timeBodyGyroJerkStdZ	Numeric	Angular body velocity via gyroscope	time	Std	Z	[-1..1]
timeBodyAccelMagnitudeMean	Numeric	Magnitude of body acceleration via accelerometer	time	Mean	NA	[-1..1]
timeBodyAccelMagnitudeStd	Numeric	Magnitude of body acceleration via accelerometer	time	Std	NA	[-1..1]
timeGravityAccelMagnitudeMean	Numeric	Magnitude of gravity acceleration via accelerometer	time	Mean	NA	[-1..1]
timeGravityAccelMagnitudeStd	Numeric	Magnitude of gravity acceleration via accelerometer	time	Std	NA	[-1..1]
timeBodyAccelJerkMagnitudeMean	Numeric	Magnitude of linear body acceleration via accelerometer	time	Mean	NA	[-1..1]
timeBodyAccelJerkMagnitudeStd	Numeric	Magnitude of linear body acceleration via accelerometer	time	Std	NA	[-1..1]
timeBodyGyroMagnitudeMean	Numeric	Magnitude of body gyration via gyroscope	time	Mean	NA	[-1..1]
timeBodyGyroMagnitudeStd	Numeric	Magnitude of body gyration via gyroscope	time	Std	NA	[-1..1]
timeBodyGyroJerkMagnitudeMean	Numeric	Magnitude of angular velocity via gyroscope	time	Mean	NA	[-1..1]
timeBodyGyroJerkMagnitudeStd	Numeric	Magnitude of angular velocity via gyroscope	time	Std	NA	[-1..1]
freqBodyAccelMeanX	Numeric	Body acceleration via accelerometer	frequency	Mean	X	[-1..1]
freqBodyAccelMeanY	Numeric	Body acceleration via accelerometer	frequency	Mean	Y	[-1..1]
freqBodyAccelMeanZ	Numeric	Body acceleration via accelerometer	frequency	Mean	Z	[-1..1]
freqBodyAccelStdX	Numeric	Body acceleration via accelerometer	frequency	Std	X	[-1..1]
freqBodyAccelStdY	Numeric	Body acceleration via accelerometer	frequency	Std	Y	[-1..1]
freqBodyAccelStdZ	Numeric	Body acceleration via accelerometer	frequency	Std	Z	[-1..1]
freqBodyAccelJerkMeanX	Numeric	Linear body acceleration via accelerometer	frequency	Mean	X	[-1..1]
freqBodyAccelJerkMeanY	Numeric	Linear body acceleration via accelerometer	frequency	Mean	Y	[-1..1]
freqBodyAccelJerkMeanZ	Numeric	Linear body acceleration via accelerometer	frequency	Mean	Z	[-1..1]
freqBodyAccelJerkStdX	Numeric	Linear body acceleration via accelerometer	frequency	Std	X	[-1..1]
freqBodyAccelJerkStdY	Numeric	Linear body acceleration via accelerometer	frequency	Std	Y	[-1..1]
freqBodyAccelJerkStdZ	Numeric	Linear body acceleration via accelerometer	frequency	Std	Z	[-1..1]
freqBodyGyroMeanX	Numeric	Body gyration via gyroscope	frequency	Mean	X	[-1..1]
freqBodyGyroMeanY	Numeric	Body gyration via gyroscope	frequency	Mean	Y	[-1..1]
freqBodyGyroMeanZ	Numeric	Body gyration via gyroscope	frequency	Mean	Z	[-1..1]
freqBodyGyroStdX	Numeric	Body gyration via gyroscope	frequency	Std	X	[-1..1]
freqBodyGyroStdY	Numeric	Body gyration via gyroscope	frequency	Std	Y	[-1..1]
freqBodyGyroStdZ	Numeric	Body gyration via gyroscope	frequency	Std	Z	[-1..1]
freqBodyAccelMagnitudeMean	Numeric	Magnitude of body acceleration via accelerometer	frequency	Mean	NA	[-1..1]
freqBodyAccelMagnitudeStd	Numeric	Magnitude of body acceleration via accelerometer	frequency	Std	NA	[-1..1]
freqBodyAccelJerkMagnitudeMean	Numeric	Magnitude of linear body acceleration via accelerometer	frequency	Mean	NA	[-1..1]
freqBodyAccelJerkMagnitudeStd	Numeric	Magnitude of linear body acceleration via accelerometer	frequency	Std	NA	[-1..1]
freqBodyGyroMagnitudeMean	Numeric	Magnitude of body gyration via gyroscope	frequency	Mean	NA	[-1..1]
freqBodyGyroMagnitudeStd	Numeric	Magnitude of body gyration via gyroscope	frequency	Std	NA	[-1..1]
freqBodyGyroJerkMagnitudeMean	Numeric	Magnitude of angular velocity via gyroscope	frequency	Mean	NA	[-1..1]
freqBodyGyroJerkMagnitudeStd	Numeric	Magnitude of angular velocity via gyroscope	frequency	Std	NA	[-1..1]