



Arduino LAB

Assignment 1

Pedometer:

A **pedometer** is a device, usually portable and electronic or electromechanical, that counts each step a person takes by detecting the motion of the person's hands or hips. Because the distance of each person's step varies, an informal calibration, performed by the user, is required if presentation of the distance covered in a unit of length (such as in kilometers or miles) is desired, though there are now pedometers that use electronics and software to automatically determine how a person's step varies.



It is required to create an efficient pedometer using the MPU6050 or LSM303D accelerometers.

In order to understand how accelerometers can be used to measure the human steps, you can refer to the internet or try to understand this article: <http://www.analog.com/library/analogdialogue/archives/44-06/pedometer.html>

The main challenges you will face when designing the pedometer are the following:

- 1- Gather the accelerometer readings and interpret them according to the location of the sensor. (readings are different when the accelerometer is placed on your pocket than when it is handheld).
- 2- Calibrate the accelerometer depending on its location and finding an optimal sampling time.
- 3- The most important part is the algorithm which will convert the readings into the final result which is the number of steps taken by the user. Here, there are many factors that would affect your accuracy and efficiency e.g. whether the user is walking or running, whether he is simply rotating his hands without moving, etc..

You can find here some gathered data (accelerometer readings) done by an experiment based on many individuals with different ages, sensor locations and heights.

<http://www.cl.cam.ac.uk/~ab818/ubicomp2013.html>

also you can find another dataset retrieved directly from a similar sensor on this link:

<http://www.instructables.com/files/orig/FYJ/355V/ICRXRBDN/FYJ355VICRXRBDN.xlsx>

Requirements

- Use your accelerometers to gather the appropriate data and understand the pattern changes that occur during a simple walking exercise.
 - You are free to place the accelerometer whether on your pockets or by holding it while walking. (trying multiple scenarios is highly encouraged).
 - Try to learn more about the calibration process, the optimal sampling time (Consider the EEPROM small size) and how to auto detect the proper values.
 - Compare your results with the above datasets to determine whether your work is consistent or not.
 - Try to think of an algorithm to convert these readings into human steps count (An efficient pedometer).
 - Start implementing the algorithm on the Arduino and test it to make sure it works correctly.
 - Use the LCD shield to display the number of **steps made**, **distance travelled**, **velocity** and **calories** burnt.
 - In order to have a free movement, the Arduino and the sensor should be powered by an external battery (It is not possible to walk with the Arduino attached to your laptop during the test phase).
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Good Luck