

Assignment 2 – Embedded Computing with Particle Photon

Release Date/Time: Feb 16th (Tuesday), 2022

Due Date/Time: March 2nd (Wednesday), 2022, by midnight EST

Last Updated: Feb 21, 2022 8:00pm EST

Hardware: Particle Argon, Particle-Grove Shield, Sparkfun Qwiic Shield, Qwiic Accelerometer (MMA8452Q based), 1 x Qwiic Cable, 1 x RGB LED

Project Description: You will build a simple gesture detector using the Particle Argon and the Qwiic based accelerometer we have provided, and be able to send the gestures to the cloud. The aim of this assignment is to learn how to write basic micro-controller code, interface with a sensor, and stream data over the serial port (for debugging) and to the particle cloud. We also want you to use some of the particle programming constructs demonstrated in the class (Particle Variables, Particle Functions).

Part A (Detecting 4 gestures and showing a visual notification): Using the Accelerometer library on Particle cloud (search for SparkFunMMA8452Q), you will sample raw data from it, do some pre-processing (basic filtering) and direction calculation on the micro-controller itself. You are supposed to detect 4 gestures (**up, down, left and right**). You are welcome to use whatever heuristics that you like to detect the gestures, but you must do the detection on the particle Argon itself. While, it is tempting to stream all the raw data from the sensor to a laptop or the cloud, often for multiple reasons that is not tenable (e.g. for battery lifetime, or for communication bandwidth). Next, connect the Grove chainable LED (tri-color, Red, Green, Blue in one) to the Particle-Grove Shield. Assign each of the 4 gestures to a color (e.g. Up=Red, Down=Green, left = Blue, right = Magenta) so that when you do the gesture the appropriate color is shown on the LED. At rest, you can switch the LED off.

Part B (Connecting to the cloud): Next, send the gestures recorded to the Particle cloud using Particle PubSub functionality. Your goal is to show using the “particle subscribe” command in a terminal that the detected gesture is sent. Additionally, using the particle functions implement a function wherein you can send the gestures you want to detect (e.g. “up down”) and only those gestures are sent over the pubsub channel and the rest are not sent.

Part C (Detecting more complex gestures) : To make it more interesting, implement a way to detect more complex gestures, for example detecting if the user draws any 3 (three) of the alphabet (“a” - “z”, or “A” - “Z”) in the “air” using the accelerometer. For Part C, you can just output the detected gesture character using the Particle PubSub functionality and show it using “particle subscribe” on the terminal or even just using the “particle serial monitor” if you send it over the serial port.

Deliverables:

- (a) Particle Source Code, including information on how to test and run it.
- (b) Video showing the output of all the parts working (A, B and part C).
- (c) Demo of your system during the TA or Instructor office hours during the week of March 2nd.

Grade distribution:

Part A (Focus: accuracy of gesture detection) :	40%
Part B (Cloud Connection) :	15%
Part C (Accurately detecting 3 “alphabets”) :	25%
End-to-End Demo :	20%

Total Pts	: 100%
-----------	--------
