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Smart Watch

This is a smart wrist wearable that counts steps using an IMU, measures heart rate and displays the results on an OLED Screen.

Components Used:

- 1.) Arduino Pro Mini
- 2.) [OLED Screen](#)
- 2.) MPU6050
- 3.) [Pulse Sensor](#)
- 4.) 3.7V 500mAH Lipo Battery (dim. 35x25x4mm)
- 5.) Tactile Push Button
- 6.) Pin Headers, 10k resistor, wires, screws.



Dimensions: 44 x 44 x 17mm

Assembly:

At the top lies the Screen and Push Button

Then Arduino

Then the PCB board

MPU6050

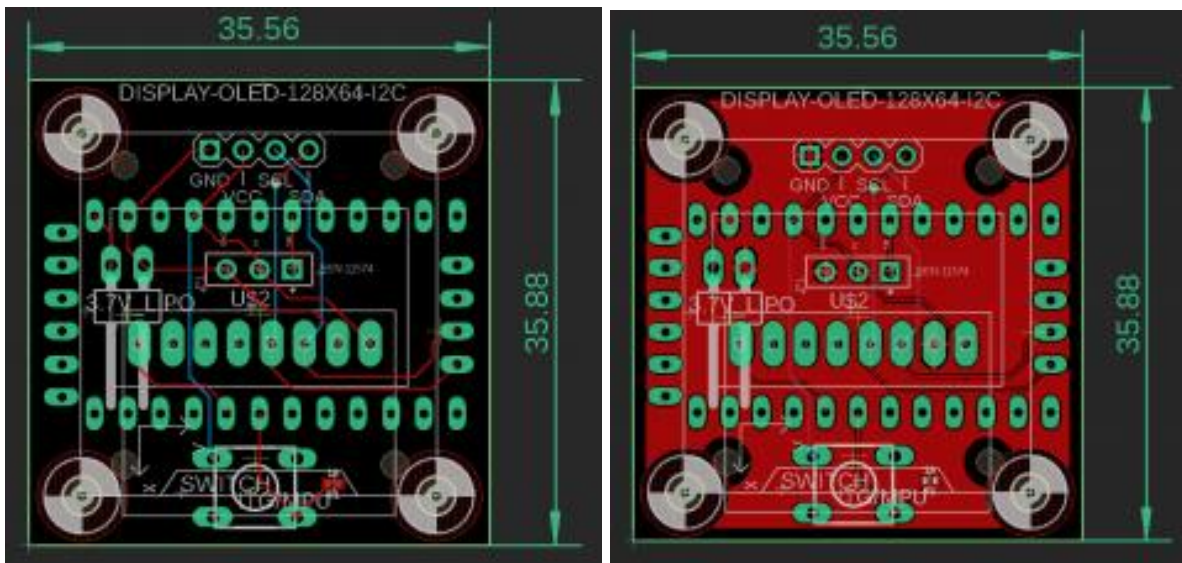
Battery

At last Pulse sensor

The Arduino and the MPU6050 can be directly mounted on to the board. Arduino being above the board and MPU below.

This way the holes for other components will not be overlapped by anything and other components can be connected using different sized Pin Headers and wires.

PCB Design:



Working:

Push-button can be used to reset the no. of steps.

Pulse Sensor is used to measure the BPM.

A timer function keeps track of time using millis().

MPU for counting steps:

Two checks will be performed to confirm whether a step has been taken or not.

StepCheckA:

first the angular rotation values along all the axes are calculated. average of these values is taken in each direction for 100 recent readings.

To detect the swinging motion of the arm in the XY plane, the average angular velocities are being compared by the real time angular velocities. If the velocity goes higher than average then one step is detected and a flag is pulled high until it goes less than (in negative direction) average angular velocity.

StepCheckB:

To make sure that the step is only counted when hand has been vigorously moved while walking or running and not while slowly moving the hand.

stepCheckB keeps check of the accn values in all directions.

Magnitudes of total accn vector and avg accn vector (which is calculated in the same way as avg angular velocity) are subtracted and compared to a threshold value(jerk). if this comes out to be greater than the threshold value this should imply that the arm is swinging vigorously.

Finally, when both the stepChecks are true a step is counted.

All of these values are then printed to the screen.

Here is the [Link](#) for code, Schematics and CAD files.