Task (0) | The Secret Box | Workday (2) | 10.3.24

Today's output:

- Started with MPU6050 module/code and adjusted it to return all rotation angles, yaw, pitch, and roll.
- The MPU6050 has to be adjusted horizontally with what's written on it facing upwards, any other way of mounting gives wrong readings.
- Next, coded the ultrasonic sensor module, it's super simple, just defining the trigger and echo pins as output and input pins respectively then another function to calculate the distance.
- After that was the battery module, again simple, at least for now. A voltage divider circuit with 2 equal resistors (10Kohms) to ease the calculations (measured voltage will be multiplied by 2 to get battery voltage), connecting one resistor to ground and ESP32 analog pin, pin 14 and the other resistor connected to positive battery terminal and same analog pin, pin 14.
- The system is composed of a 3x4.3 volts battery system, being this too much to power the ESP32, a voltage regulator with 5 volts output was considered, later this will be reduced to a 1x4.3 Volt battery only.
- With the above configuration/connection the analog pin was observed to give only 4.77 volt reading instead of 5 volts.
- To overcome this, the maximum voltage coded was 4.77 and not 5 volts to get correct battery percentage.
- The 0% battery doesn't mean a 0-volt battery but rather 2.3 volts; minimum ESP32 threshold to operate and power on.
- Finally for today was integrating all modules together.
- Now, if the system is titled in any direction except the yaw direction for an angle of more than 30 degrees the ESP32 built-in LED will keep blinking with a rate of 0.5 seconds and print "BOX IS FALLING" to the serial monitor.
- And if the ultrasonic sensor detects a distance of more than 20cm it will also blink the built-in LED but with a rate of 100ms and print "Box has fallen down" to the serial monitor.
- Battery percentage and voltage are printed to the serial monitor too.

Next Coding Steps:

- To add timestamps to the notifications to be sent, falling, or opening.
- Final part and it's the database/mobile app part, or directly to a remote server/MySQL, to be searched.

Hardware Configuration:

- We settled on meeting next Tuesday Insha'Allah to go to El-Warsha, we asked him on WhatsApp and yes, they do different shapes.
- It's going to be a box, 20x20x20 cm^3, like Adam's counting toy.
- It's to have 2 holes or something for aeriation, one at the bottom and another at the top for air flow, like the one done in RMU units if I can remember correctly, these circular holes are to have a mesh on them so as not to allow insects, dust in as much as possible.
- For a later version it was discussed adding a fan inside too for aeriation.
- I think of using two 7-segment screens instead of an LCD as I don't have one, displaying percentage on the outside as separate digits, the point is how to mount it on the outside still being connected internally to the microcontroller?
- Maybe open 2x(2 rails) for both 7-segments, rails here I mean the left and right pins' rails.
- I want to make it an acrylic or wooden box, acrylic preferred to be more user friendly, and adding a rubber part maybe covering only the upper and lower faces of the box and them being thick to as to absorb any falling shocks/stresses on the box and not to get broken. Just an initial thought.
- El-Warsha need a solid works file and that's a different problem, hope they can make it without, even if I give them Adam's toy as a prototype.

Limitations:

- Rotating around any direction affects other directions too! For example, if I rotate the MPU6050 around the X-axis or roll the yaw and pitch are changed too in a completely random manner, for me and for now at least, yet to be fair, the rotation around z for example even if it affects the roll and pitch angles too but not to the extent to reach the falling criteria and so blinking the LED. And so this so far doesn't affect the operation.
- I'll need to consider different alarms/LEDS for roll and pitch to detect if one of them affects the other too.
- Try an extreme yaw angle change too and see if the LED blinks.

To do next:

- Thinking about mounting the entire system with batteries and sensors at the bottom of the box for ease of attachment and gravity, not adding excess force on it.
- Since an inner depth in the closing upper part is to be considered and therefore nobody can open the box with the ultrasonic sensor not detecting them, then no need to mount it at the upper closing/opening side.

Done for today, hoping all will be done by Wednesday maximum!