Lab 8 report ECE445L

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Semester: Spring 2024
Course: ECE445L

A) *Objectives*:
1. In a few sentences, describe the purpose of the lab.
   a) The purpose of this lab was to test our components and finalize our PCB design before ordering the PCBs. We want to run tests on our components and understand how we are going to use everything before wiring up because we have limited time to complete this project and only one free PCB.

B) *Hardware Design Deliverables:*
1. Deliverable 1: Using **KiCad**, create a schematic for your design. Include a screenshot in the space below.
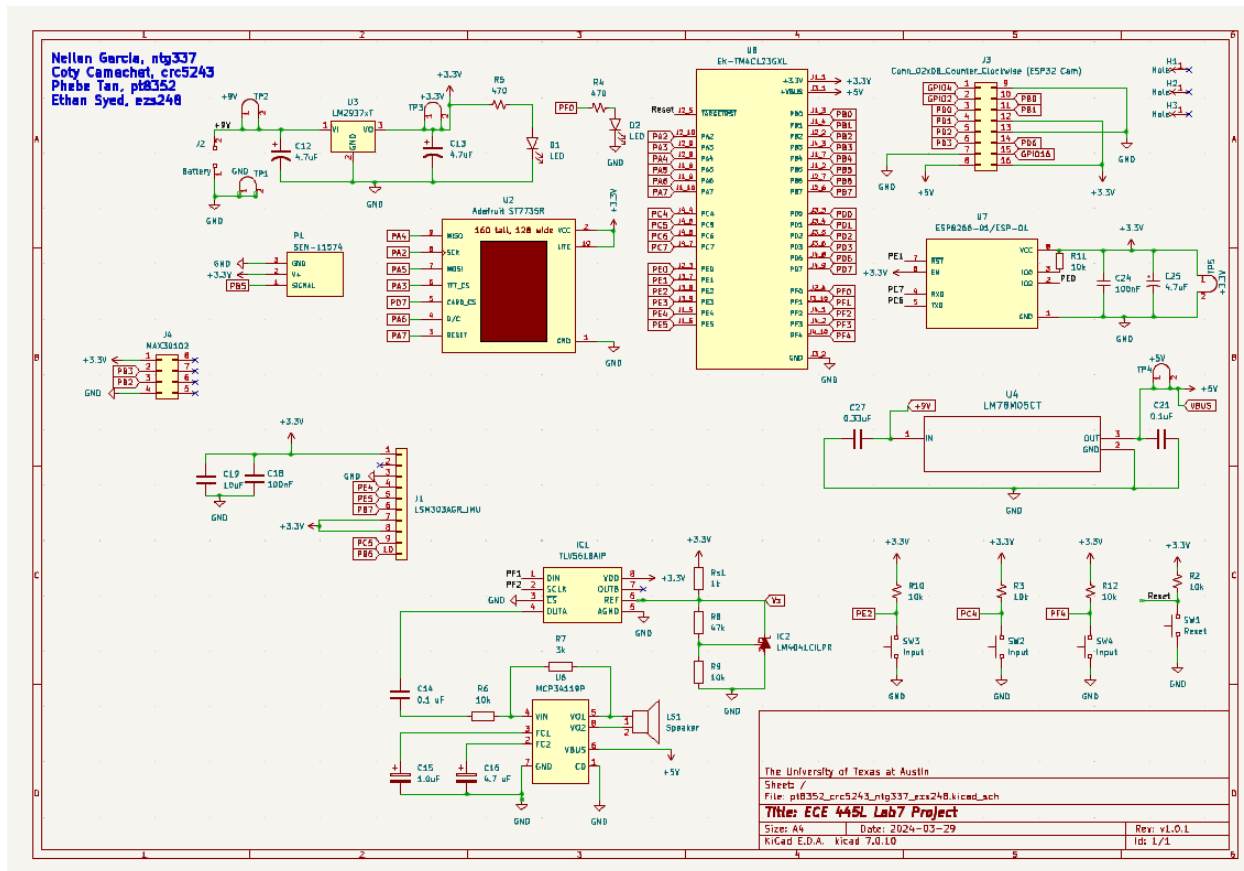
2. Deliverable 2: Using **KiCad**, create a Layout for your design. Include a screenshot in the space below.

C) *Software Design Deliverables:*

1. I have pushed my project to GitHub for grading (Yes/No):

   Yes

2. Deliverable 3: System design diagram of the modules created.
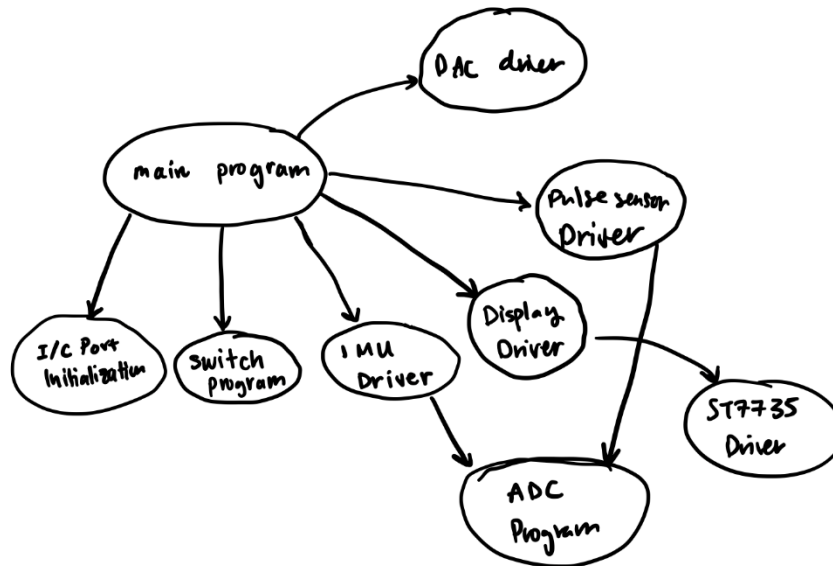
D) *General Deliverables:*

1. Deliverable 4: Total cost estimate

I have updated the bill of materials (Yes/No): Yes
Out of pocket costs: $93.02
Adjusted competition costs: $37.09

2. Deliverable 5: Description of tests added for lab 8

In Lab 8, we added unit tests to verify the functionality of our modules and their integration. Specifically, we focused on testing the Heartbeat Sensor and IMU (Inertial Measurement Unit) units.

Heartbeat Sensor Unit Tests: We wrote tests to accurately sample the IR, BPM, and average BPM for the sensor and verify that the outputs were valid and within a certain range. These tests ensure that the sensor was accurately detecting heartbeats. We also wrote tests cases to simulate scenarios where the Heartbeat sensor would encounter invalid data inputs to confirm that our system would filter out trash values.

IMU Unit Tests: We wrote unit tests that calibrated the accelerometer of the IMU unit and verified that it returned accurate readings in different orientations. This test ensured that the IMU provided reliable data for measuring acceleration. We also wrote tests to test the gyroscope data verified its accuracy in measuring angular velocity. We tested the gyroscope under various rotation scenarios to ensure it would be able to fit the needs of our system.

Integration Tests: After conducting individual unit tests for the Heartbeat Sensor and IMU, we performed integration with main to tests seamless integration.

3. Deliverable 6 (10pt EC): Discrete IC usage

4. Deliverable 7 (10pt EC): Characterization of the system

E) *Analysis and Discussion Questions:*
   1. What is the required naming scheme of the PCB submitted to us for review and ordering?

      a. [Student 1 EID]_[Student 2 EID]_[Student 3 EID]_[Student 4 EID].kicad_pro
      b. [Student 1 EID]_[Student 2 EID]_[Student 3 EID]_[Student 4 EID].kicad_sch
      c. [Student 1 EID]_[Student 2 EID]_[Student 3 EID]_[Student 4 EID].kicad_pcb

   on the PCB:
      Team names, UTX_FALL_2023, TA's name, project name.