Embedded Report

Presented to Eng. Hesham Salah, Eng. Ahmed Hassabou & Eng. Omar Tarek

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Contents

1 Drive Links

Source Code: `https://drive.google.com/file/d/1WnaQbP2aaU3TcLC71L1fcrIElFEy1Brp/view?usp=sharing`

Demo Video: `https://drive.google.com/file/d/1xBqg03AaIPVS4baGUvgylXFtN4H5KYvu/view?usp=sharing`

2 Team Members Contribution

2.1 Omar AbdAlAal

Lamp & Plug, C code and physical connections.
Generally assisted with debugging & problem solving.

2.2 Ahmed Mohamed

Temperature sensor & Alarm, C code and physical connections.
UART connection between the Python GUI and the Tiva program.

2.3 Ahmed Khalil
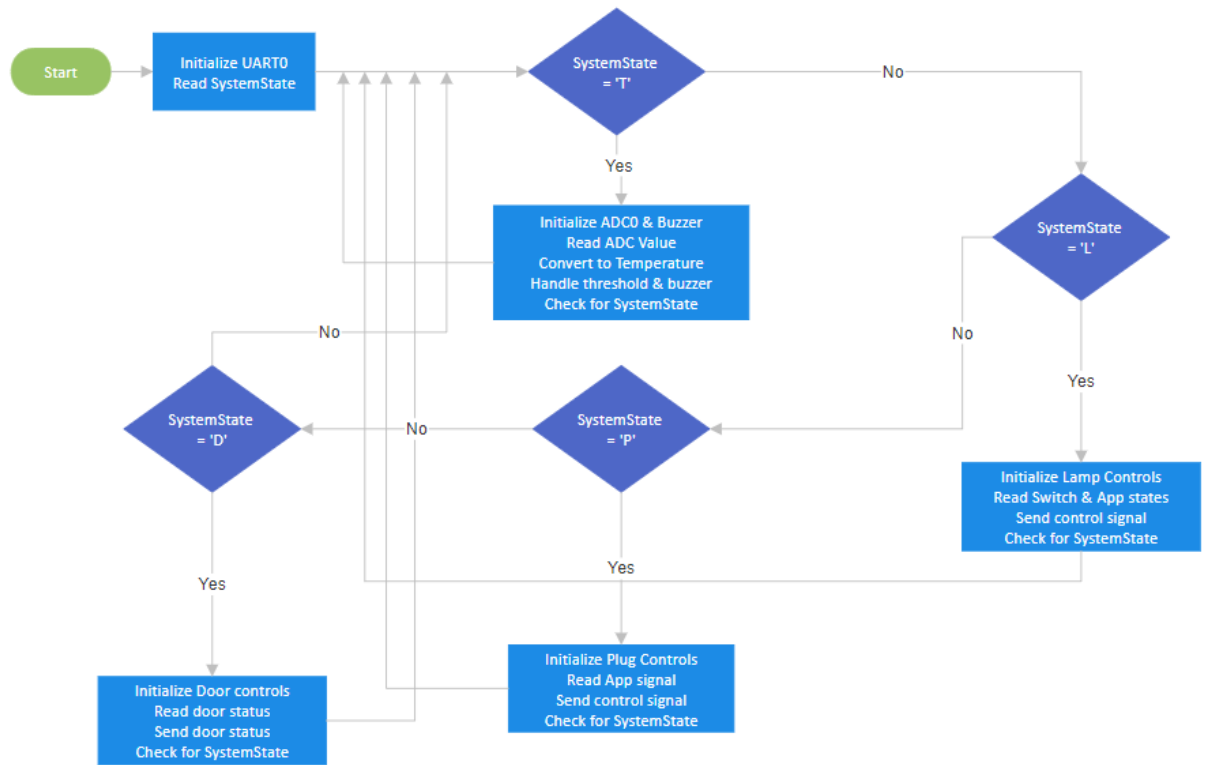
Python GUI.
Assisted in magnetic switch code.

2.4 Omar Ebrahim

Assisted in technical report & physical connections.

2.5 Muhammad Ayman

Magnetic switch, C code & physical connections.
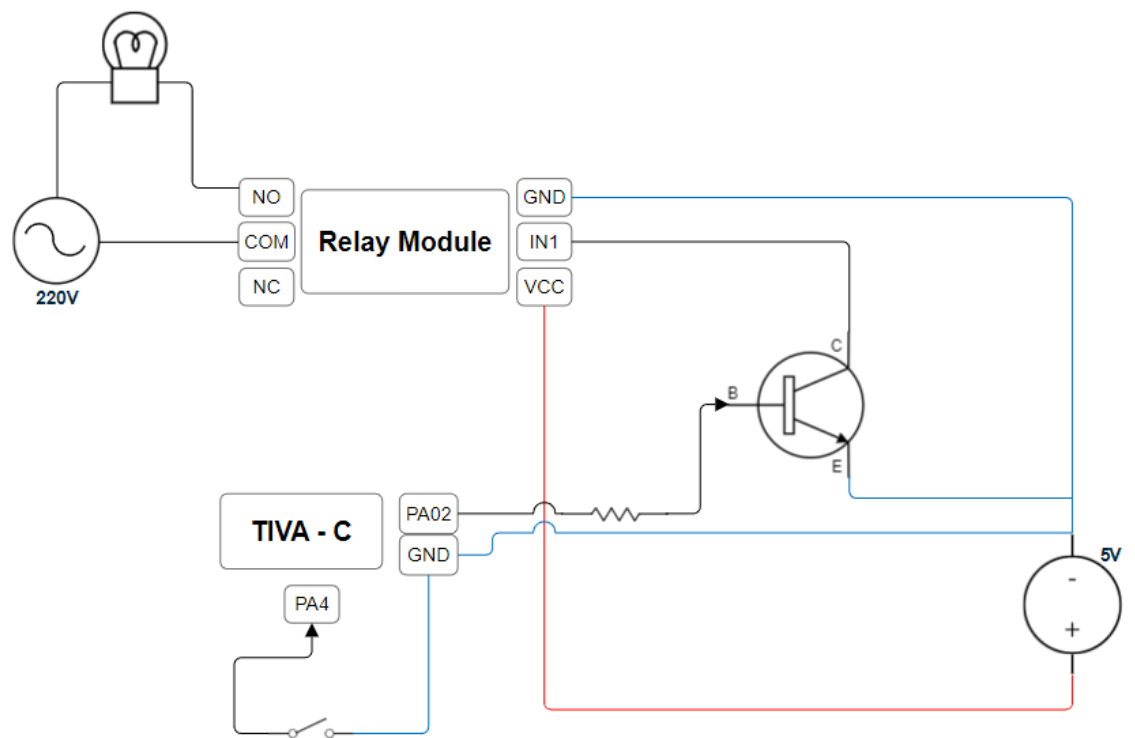
3 Flowchart

4 Components & Wiring

4.1 Components

- TM4C123G LaunchPad - ARM Cortex Based Microcontroller
- 5V DC Source (Phone charger)
- Relay Modules (SRD-05VDC-SL-C)
- NPN BJT (2N2222)
- Temperature Sensor (LM35DZ)
- Buzzer (TMB12A03)
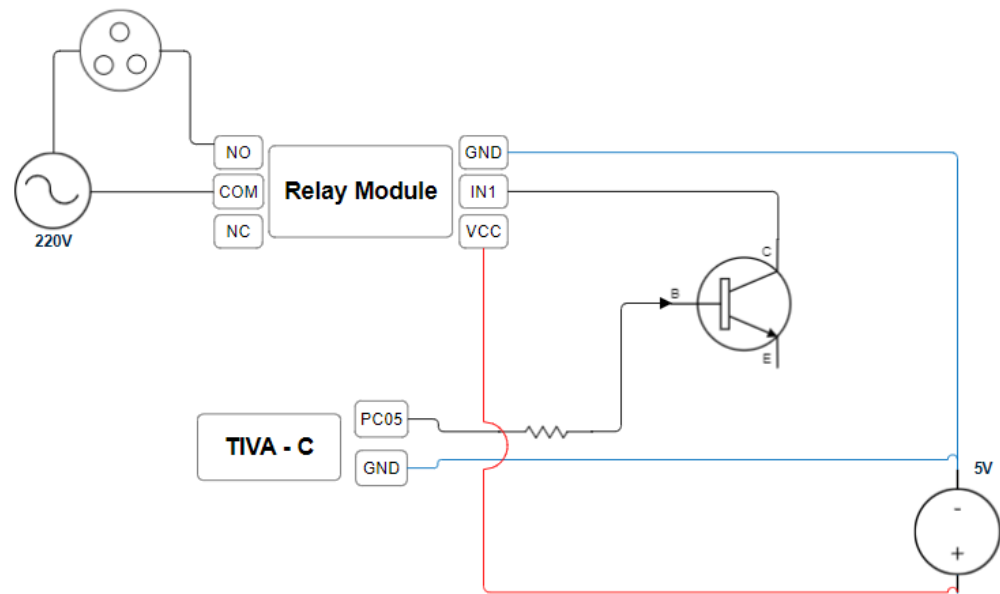- Magnetic Switch (MC-38)
- 220V Lamp

- Female Plug

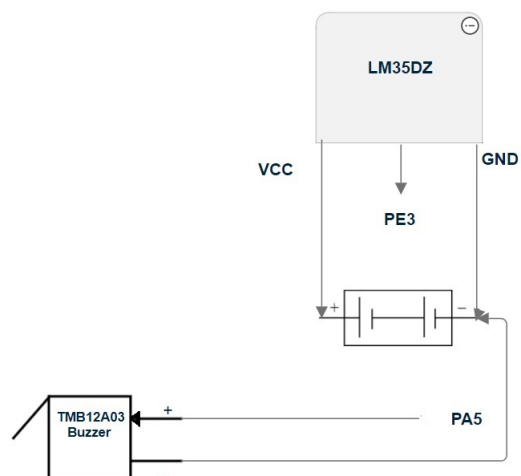- Resistors

- Jumper wires

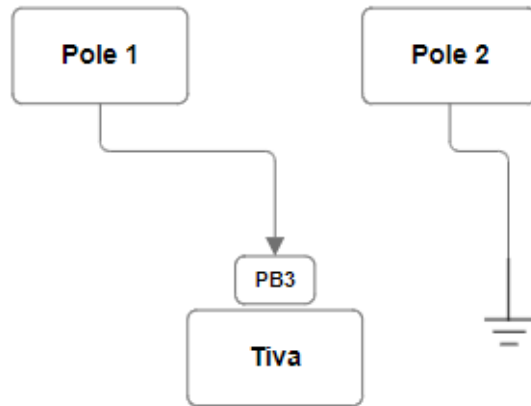- Breadboards

4.2 Wiring

4.2.1 Lamp Circuit

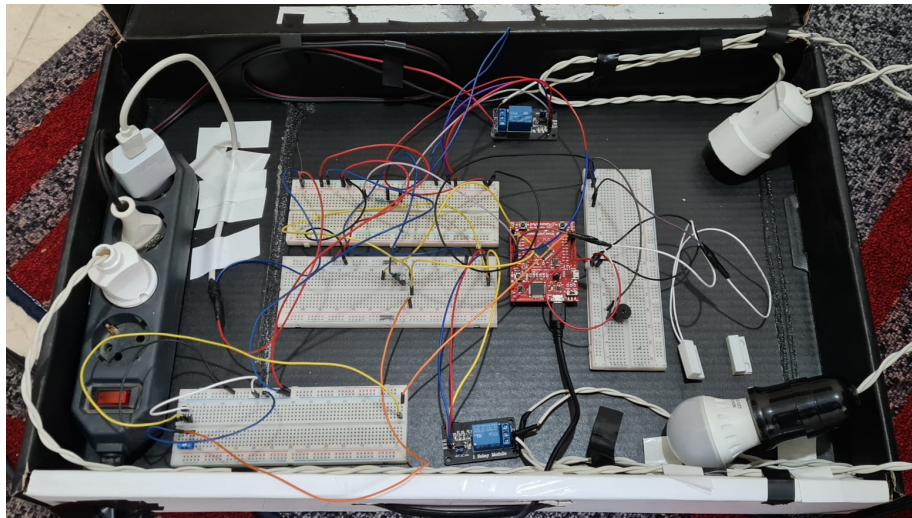### 4.2.2   Plug Circuit

4.2.3   Temperature Sensor & Buzzer Circuit

4.2.4 Magnetic Switch Circuit

5 Prototype

6 Problems & Solutions

- **Problem:** Finding a stable 5V DC source to power the relay module.
  Solution: We tried using a 9V battery and series resistors, it didn't work well. Then we used a phone charging adapter and it worked perfectly.

- **Problem:** Shifting up the 3.3V signal from the Tiva to 5V to control the relay.
  Solution: Using an NPN BJT with the 5V source. [1]

- **Problem:** Figuring out the relay connections.
  Solution: Trial & error and online resources. It took us a while to figure out that the relay we have is *active low* and make the connections as such. [2]

- **Problem:** Several logical problems in the C code which resulted in unexpected behaviors in the hardware components. [3]
  Solution: Using IAR debugging, using debugging tools like simple LEDs, & using AI assistants. [4]

- **Problem:** Running more than one functionality in the GUI, like sounding the buzzer and continuing to read and display the temperature.
  Solution: Using simple Python multithreading library to run concurrent functions.

- **Problem:** We accidentally caused a short-circuit by connecting the ground pin of the Tiva to the VCC of the 5V source. This caused some pins on the Tiva to break (PA7, PA1).
  Solution: We tested all the pins and used the ones that are working properly.

- **Problem:** Figuring out the correct physical connections of hardware componenets.
  Solution: Watching videos from Eng. Hesham Salah & Eng. Ahmed Hassabou.

References

[1] Hesham Salah. "Embedded Video 1". In: *ASU Engineering* (2024).

[2] Ahmed Hassabou. "Embedded Video 2". In: *ASU Engineering* (2024).

[3] Ahmed Hassabou. "PDFs". In: *ASU Engineering* (2024).

[4] Hesham Salah. "PDFs". In: *ASU Engineering* (2024).