Department of Electronic & Telecommunication Engineering
University of Moratuwa

EN2160 - Electronic Design Realization

Photographs for Project Evaluation

Obstacle Avoidance System for Warehouse AMR and AGV

Group H

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Photographs of Physicallly Built Enclosre

The bottom part of the enclosure is designed to house the battery and the two PCBs. It also accommodates the two motors essential for driving the wheels. The design features specific mounts for attaching the two main wheels and the caster wheels, ensuring stability and efficient movement of the robot.The top part of the enclosure is designed to include the three ultrasonic sensors for obstacle detection.

Figure 1: Enclosure Bottom Part Bottom View

Figure 2: Enclosure Bottom Part Top View

Figure 3: Enclosure Top Part Bottom View

Figure 4: Enclosure Top Part Top View

Here, we have included photographs of the bare PCBs, the soldered PCBs, and the enclosure to provide a visual representation of our progress. For our project, we designed two PCBs: the main PCB, which houses the microcontroller and its associated components, and the motor controller PCB. We have successfully completed the soldering and testing of the PCBs for both the main circuit and the motor controller.

In the main PCB, we have integrated the ATmega328p microcontroller along with input pins for connecting ultrasonic sensors and output pins designated for the motor driver circuit. The motor controller PCB, on the other hand, incorporates several key features. It includes a power supply section designed to accept a 12V input and features a protection circuit for safeguarding against reverse polarity. Additionally, a 5V regulator circuit is implemented to derive a stable 5V output from the 12V input. The PCB also houses four motor driver ICs, each comprising a Half H-bridge configuration, essential for controlling motor operations. Furthermore, the PCB includes input indicators, motor outputs, and a circuit for measuring current drawn by the motors, crucial for monitoring and control purposes.

Photographs of Bare PCBs

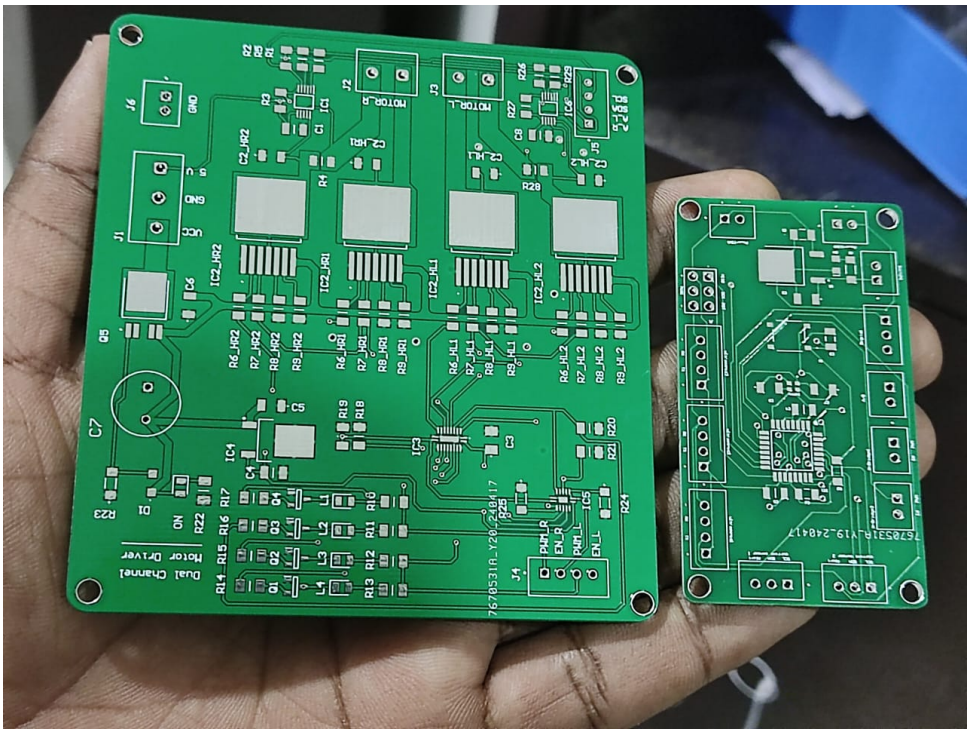

Figure 5: Bare PCBs

We opted for SMD PCBs manufactured by JLC PCB to adhere to industrial standards. To ensure high quality and reliability, components were sourced from Mouser Electronics for our project.

Photographs of Main PCB

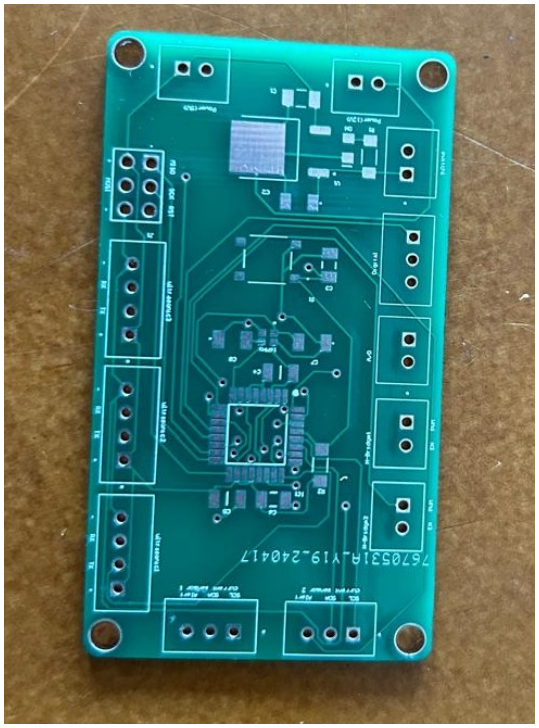

Figure 6: Bare Main PCB - Top View

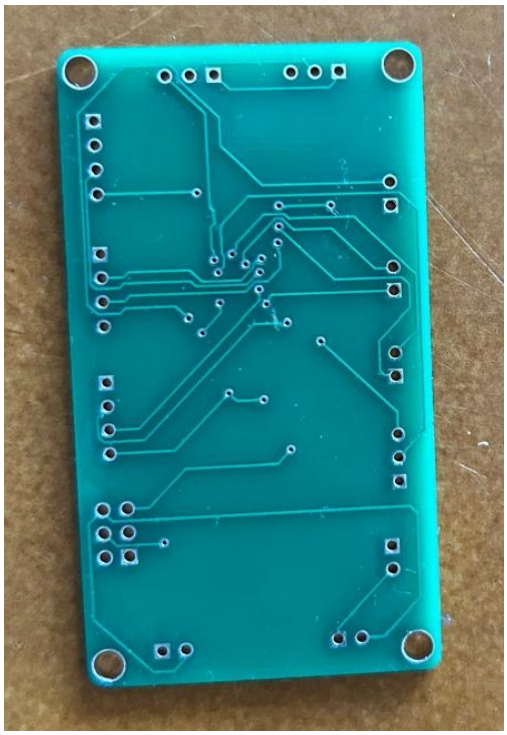

Figure 7: Bare Main PCB - Bottom View

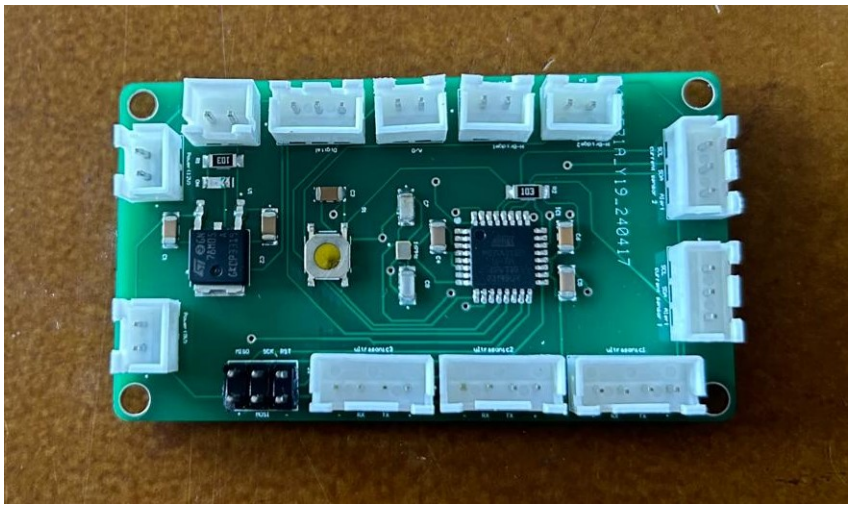

Figure 8: Soldered Main PCB

Photographs of Motor Controller PCB

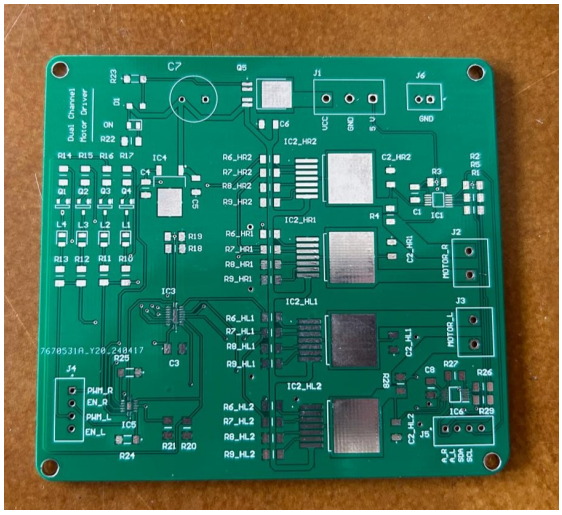

Figure 9: Bare Motor Controller PCB - Top View

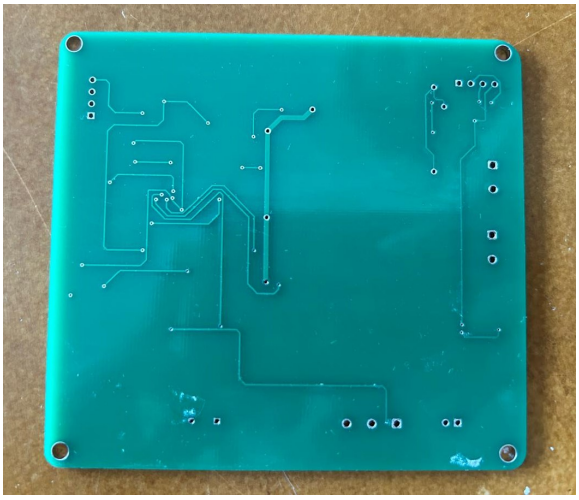

Figure 10: Bare Motor Controller PCB - Bottom View

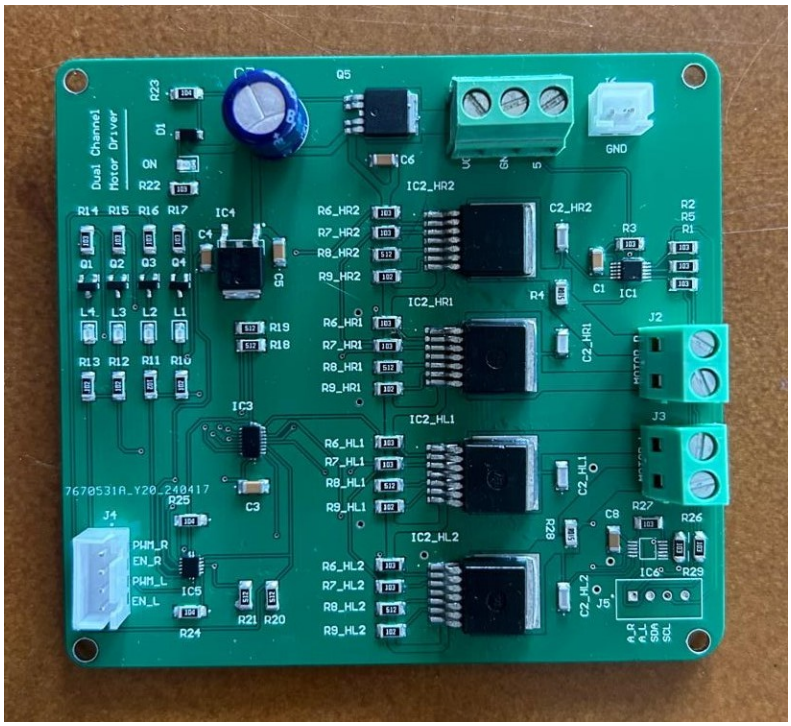

Figure 11: Soldered Motor Controller PCB

Testing for PCBs

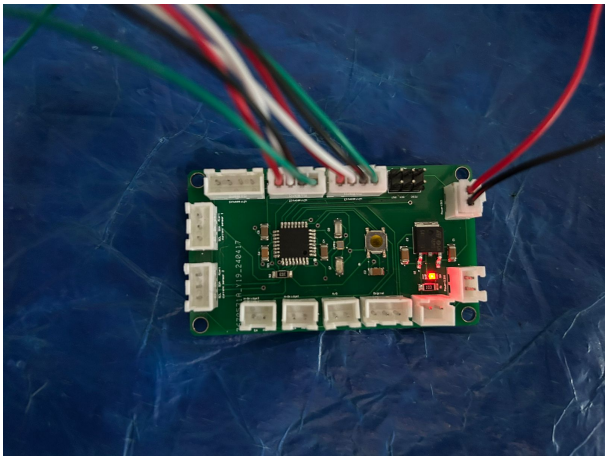

Figure 12: Working PCB

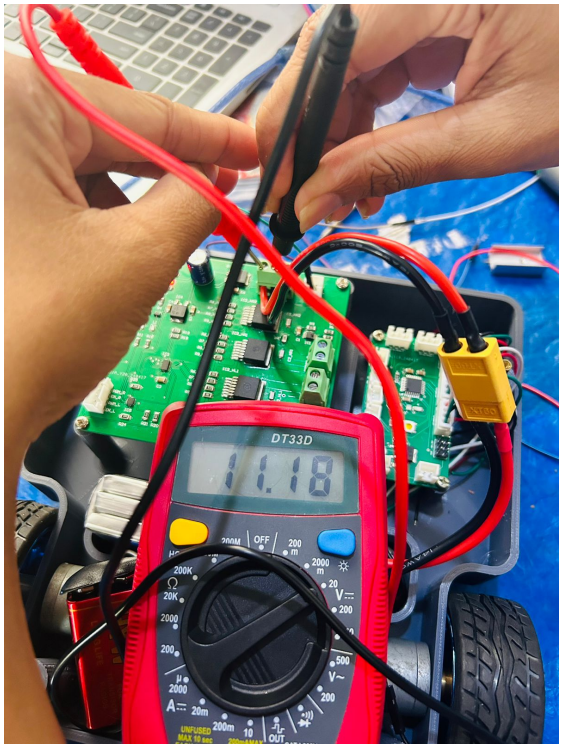

Figure 13: Input for the motor driver PCB

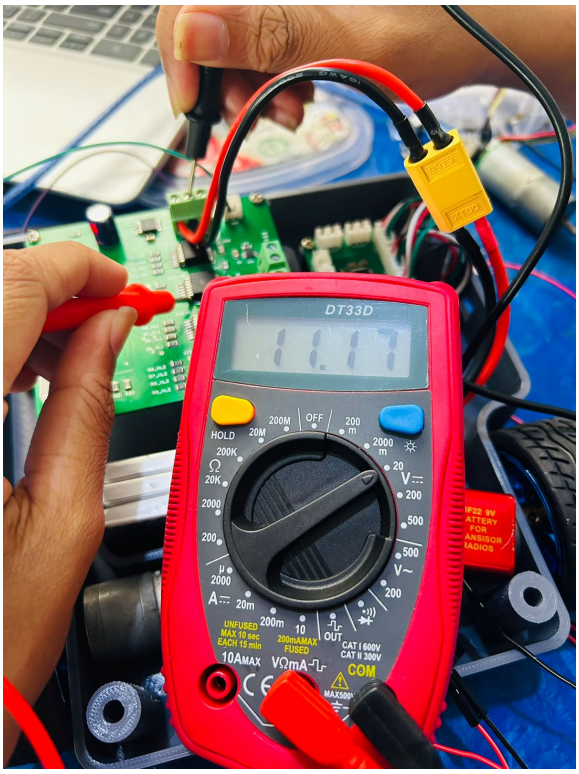

Figure 14: Input Volage for the motor driver IC after reverse polarity protection

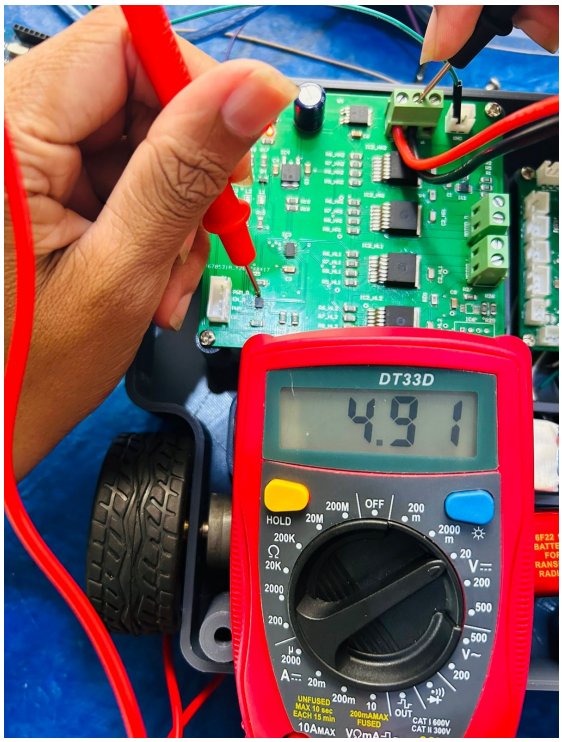

Figure 15: Testing for NAND gate IC

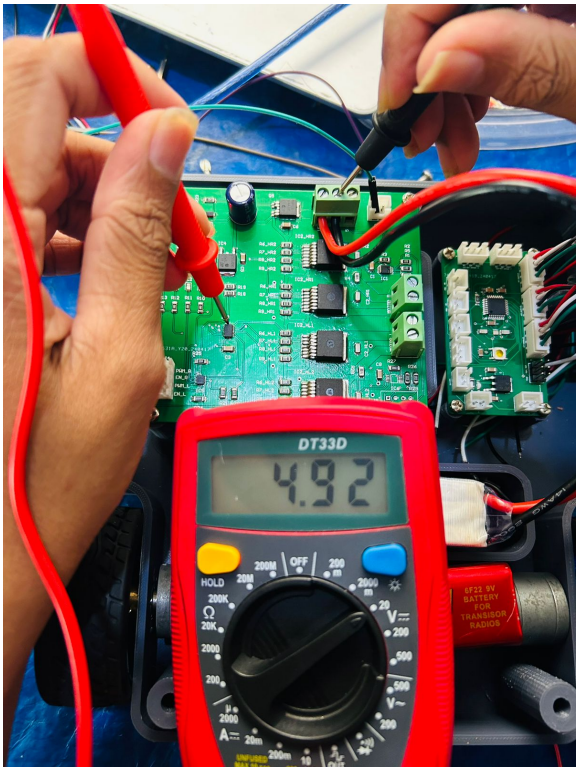

Figure 16: Testing for line driver IC

We have done testing on the both PCBs main PCB and the motor driver PCB. We tested individual components and ICs part by part. We performed tests for the motor driver ICs (BTS7960B) line driver IC (74HC244BQQ100) , and NAND gate IC (74HC00BQ), and found that they work properly. However, the current sensor did not work as we expected. We are trying to figure out the issue. Except for that IC, the other components worked as expected.

We also tested the main PCB, where we specifically checked the ATmega 328P IC. This IC worked as expected, performing its functions correctly.

Physical Intregation

Figure 17: Front View

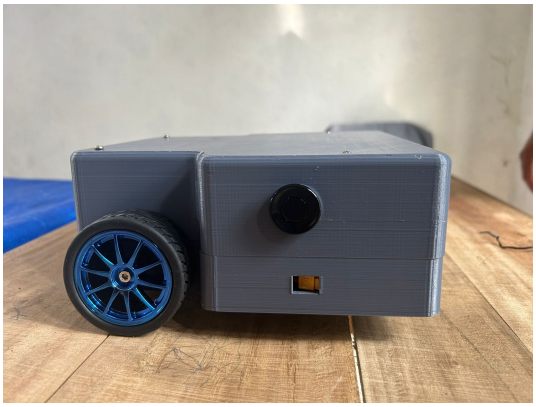

Figure 18: Side View

Figure 19: Rear View

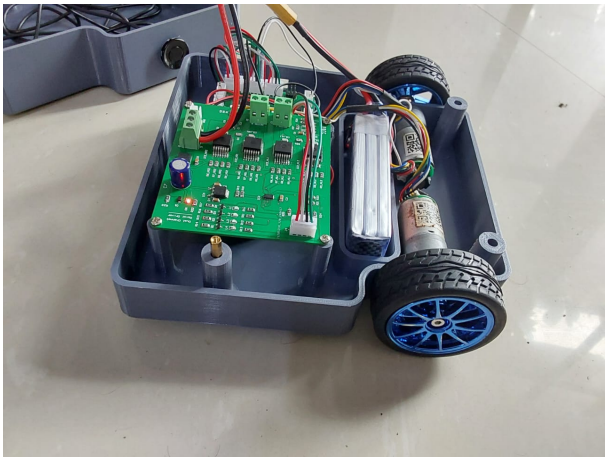

Figure 20: Inside View