



Princess Sumaya
University
for Technology

Automatic Vacuum Cleaner

Y. Dawod, Y. Alkderat, and M. Benzabalah

Supervisor: Dr. Esam Qaralleh

Embedded Systems Final Design Project, Fall 2024

King Abdullah II School of Engineering

Princess Sumaya University for Technology

Introduction

Robotic vacuum cleaners, or roombas, have been a household item for many years. They are the logical use of new technologies and innovations, minimising human labor and letting machines do all the work. They are more efficient in cleaning and electrical consumption than the regular vacuum cleaner. Obviously such a machine will need a microcontroller which makes it a perfect display of the usefulness of the PIC16F877A.

Design

Our design allows for a simple and effective approach to path making. It is effectively shown off in this flowchart:

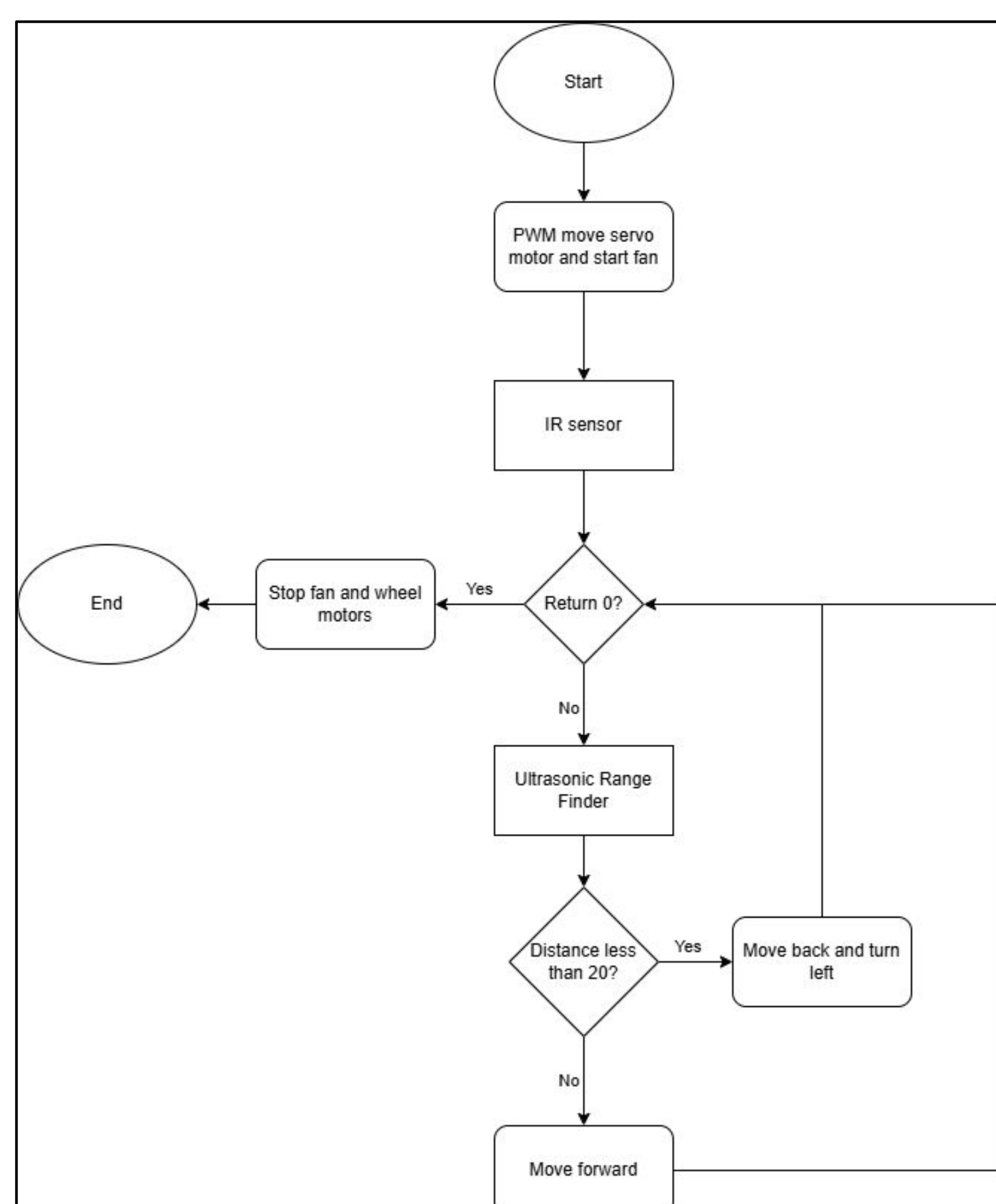


Figure 1: Logic Flowchart

The electrical design is also very intuitive:

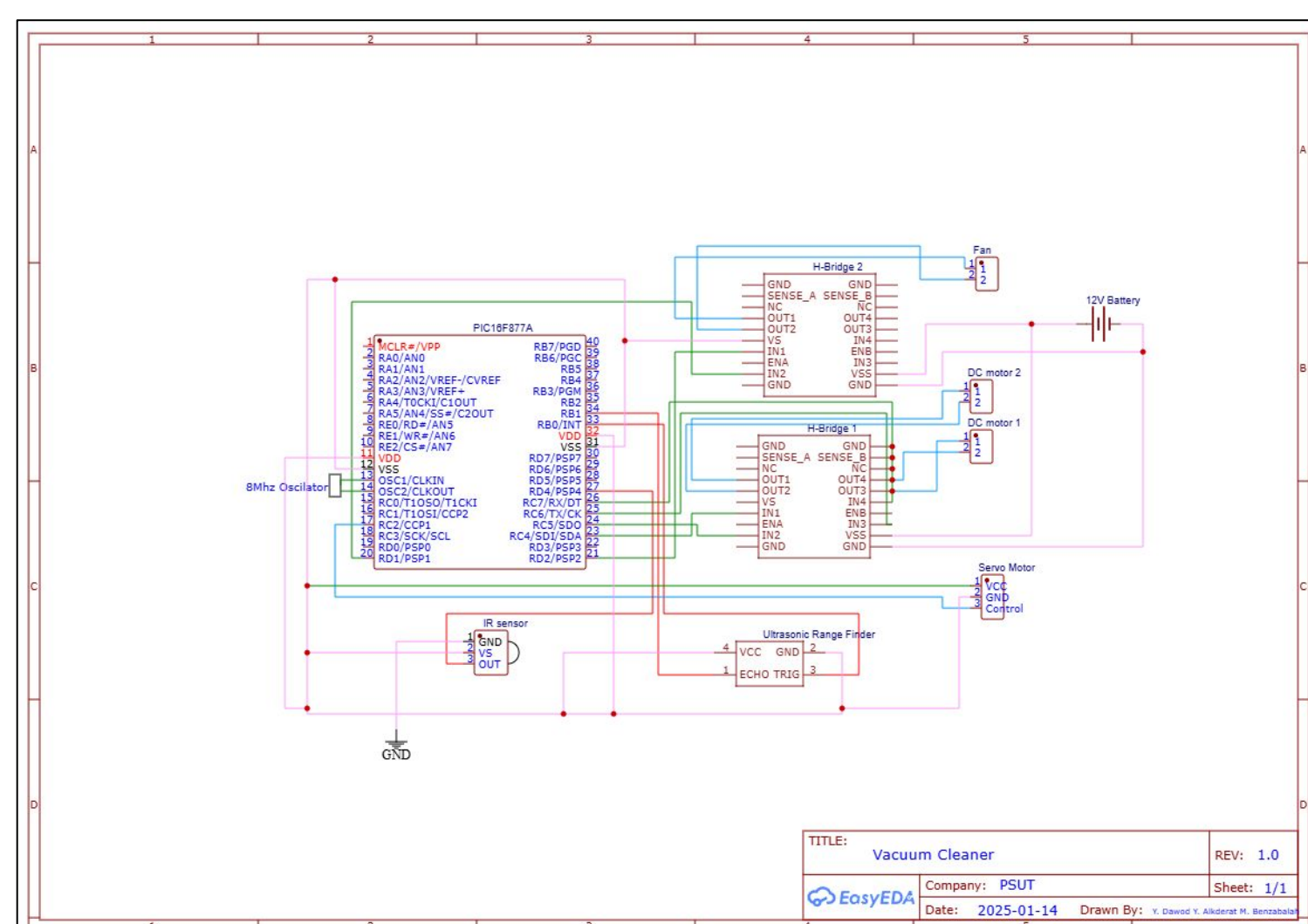


Figure 2: Electrical Diagram

Results

Our design in both the electrical and mechanical component aims for efficient and effective use of resources, getting the most out of every component used.



Figure 3: Vacuum Cleaner Front Image.

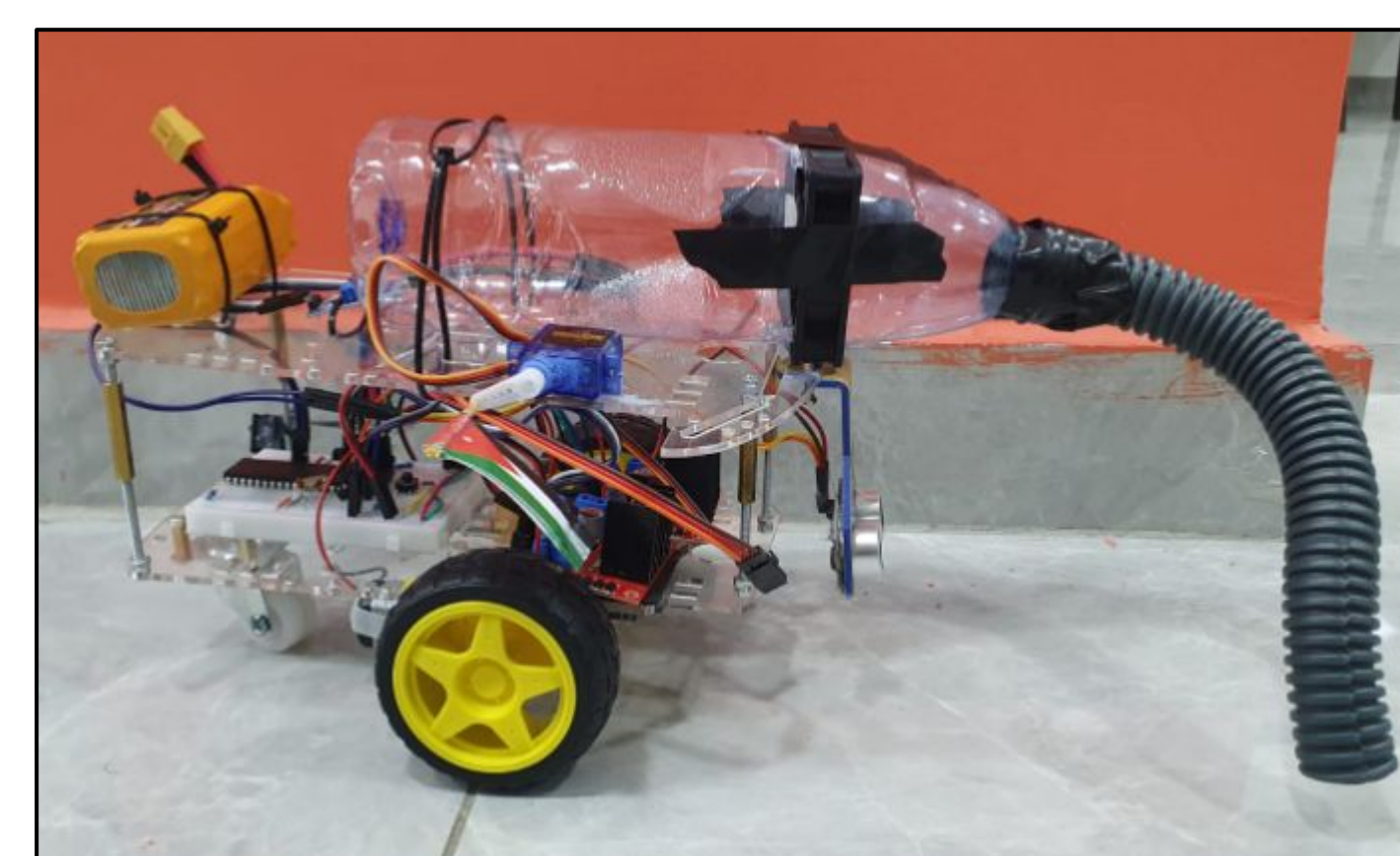


Figure 4: Vacuum Cleaner Side Image.

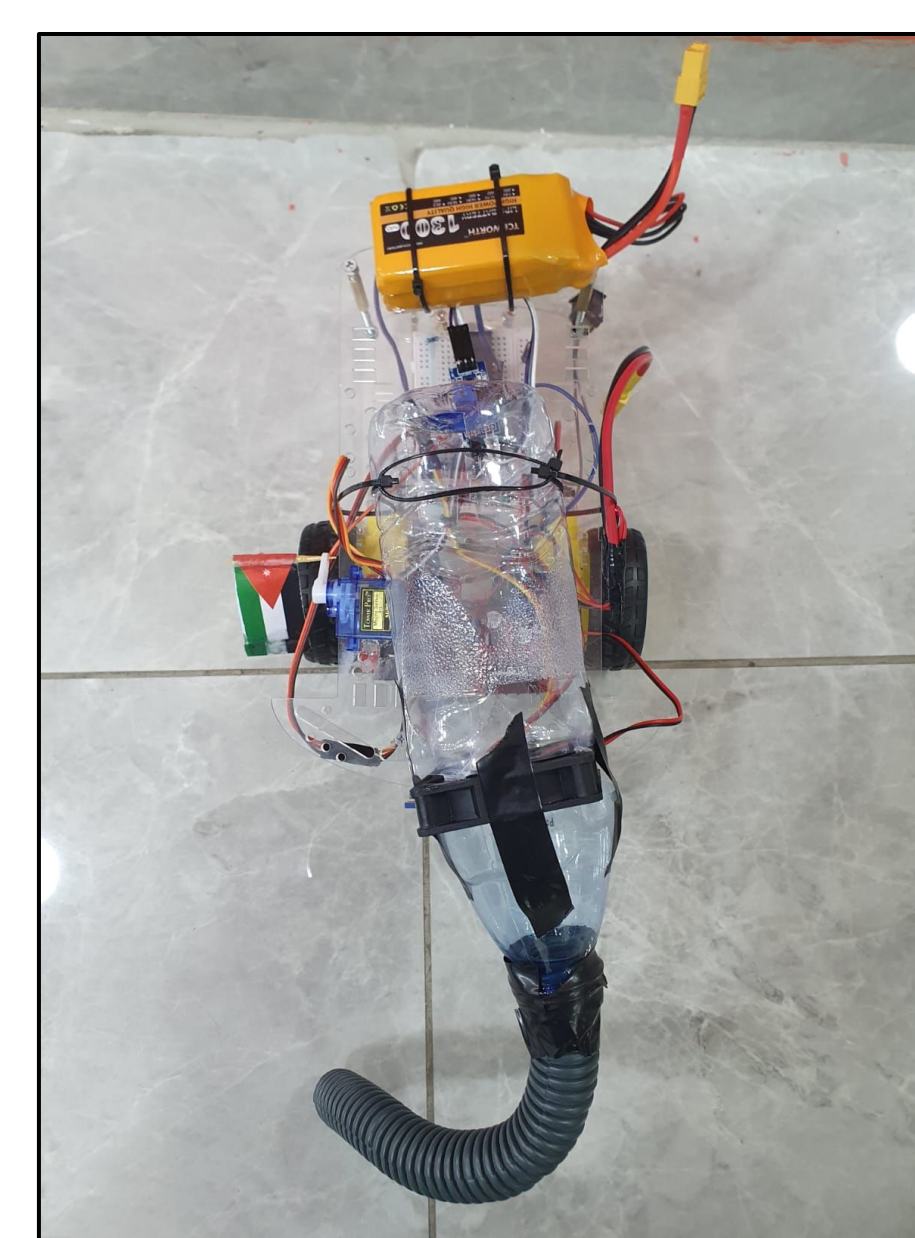


Figure 5: Vacuum Cleaner Top Image.

The images display the storage component, ultrasonic and IR sensors, DC motors, fan, and servo motor, as well as an on/off switch and a reset button. The battery that powers the wheel DC motors, fans, and the PIC16F877A microcontroller by using the h-bridge 5V out instead of a step down. The design is light, efficient and feature rich

Conclusion

This project successfully showcased the design and implementation of our vacuum cleaner controlled by a PIC16F877A microcontroller. It achieved key goals, including autonomous navigation, obstacle avoidance, and effective cleaning. The seamless integration of components such as ultrasonic sensors, motors, and a PWM-controlled fan ensured efficient operation and adaptability to various different conditions. The total project cost was about 63 JOD, covering the components and their assembly, this also includes expenses like replacing damaged components. Completing the project within this budget emphasized its cost-effectiveness and demonstrated our team's ability to manage resources effectively.