



Princess Sumaya
University
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جامعة
الأميرة سميرة
للتكنولوجيا

Electric Service Dog

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Embeddded Systems Final Design Project Fall 2024

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Introduction

Integration of embedded systems into assistive tech enables innovations like the Electric Service Dog—an assistive device mimicking service animals. Powered by microcontroller-based systems, it helps users navigate, perform routine tasks, and lead more independent lives.

Design

Software Design

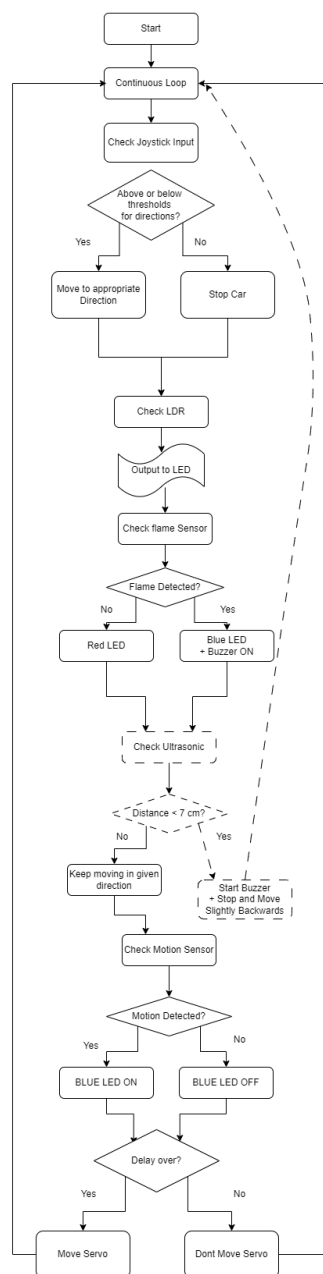


Fig 1: Flow Chart

Hardware Design

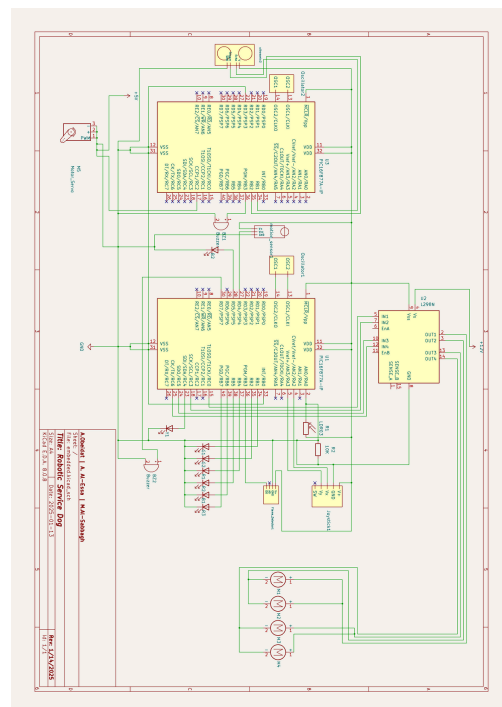


Fig 2L Hardware Schematic

The Electric Service Dog uses a joystick for manual movement control and integrates several sensors for assistive functionality. An ultrasonic sensor on a servo detects obstacles, triggering a buzzer and slight backward movement. A flame detector activates an LED and distinct buzzer pattern for fire hazards, while a motion sensor turns on an LED to signal nearby activity. Additionally, an LDR lights all LEDs in low-light conditions, ensuring visibility. The system, powered by the PIC16F877A, combines manual and automatic features for enhanced user safety and navigation.

Results

We have created a robotic service dog that was made for the disabled, it was made such that it would be a reliable yet cost-effective solution.

Our project would successfully detect whenever there are dangers around, like a sudden motion in the front, or a fire in a house that might not be smelled or felt.

The robot also handled collisions well as it would stop and back up to where it would tap the owner's leg, signifying an end-of-the-line interrupt. It was also created such that it's dimensions would be visible to other people.

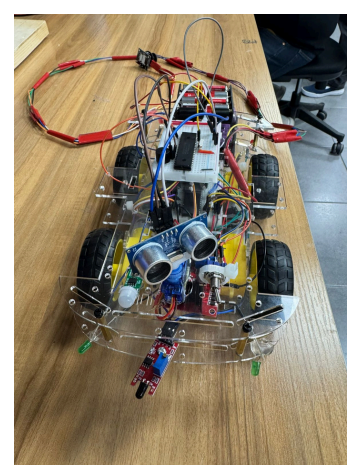


Fig 3: Upper-Front Facing Picture

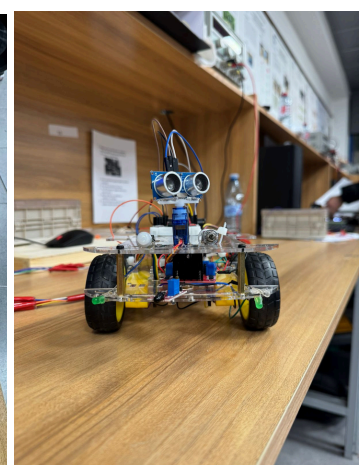


Fig 4: Front Facing Picture

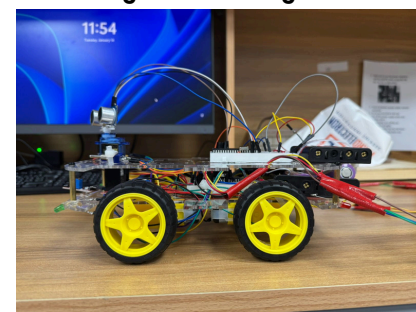


Fig 5: Side Facing Picture

Conclusion

The Electric Service Dog successfully aids blind individuals in navigating their surroundings and detecting potential fire hazards. Using the PIC16F877A microcontroller, the system provides reliable obstacle detection and early flame warnings, enhancing user safety and independence. This project demonstrates the potential of cost-effective embedded systems in assistive technology.