Level 6 Project

LIVERPOOL JOHN MOORES UNIVERSITY

Faculty of Engineering & Technology

School of Engineering - Electronics & Elec. Eng. Group

Student: Gado, Ali

Supervisor: Q. Zhang

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Title: Cane for Visually Impaired

Introduction

- The visually impaired encounter major challenges while navigating their environment, frequently relying on traditional canes.
- This project creates a self-navigating smart cane that detects impediments and alerts users via vibrations.

Aims

- To create a smart cane that improves activity for visually impaired people by using advanced sensor technologies.
- To develop an intuitive obstacle detection system based on ultrasonic sensors and vibration feedback.

Objectives

- Determine the need for improved assistive technology in mobility aids and research the market need for smart canes.
- Examine technical specifications to identify the best sensors, microcontrollers, and feedback methods for obstacle detection.
- Create a 3D model that efficiently contains all components while assuring ergonomic and practical use.
- Assemble and integrate the smart cane with the appropriate hardware and software components.
- To evaluate system performance, do trials that simulate real-life conditions (for example, blindfolded testing).
- Analyse field test findings to determine system viability and identify potential improvements.
- Assess the project's success based on correctness, usability, and dependability in accomplishing its goals.
- Propose future additions such as AI-based object identification, GPS integration, or voice help to improve accessibility.

Methodology

System Design

- Created a block diagram depicting system components and connections.
- Created a SolidWorks model for a 3D-printed enclosure to hold electronic components.
- Designed a circuit schematic that includes the Arduino microcontroller, sensors, motors, and an LED indication.

Hardware & Software Development

- Built the physical prototype using: 1. Arduino is the processing unit. 2. Three ultrasonic sensors detect impediments from the front, left, and right. 3. Three vibration motors will offer directional feedback. 4. LED indication of system status.

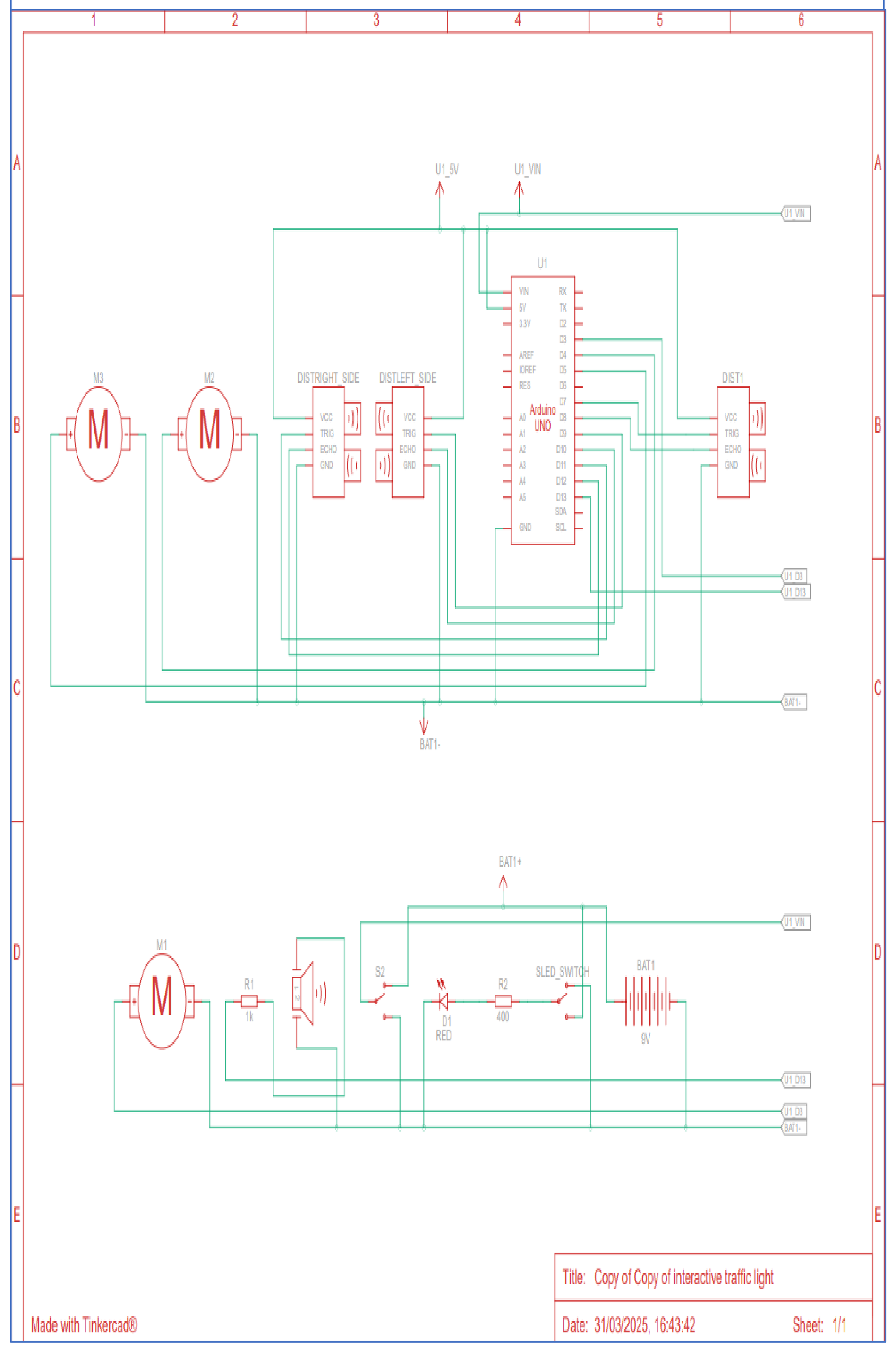
Testing and Refinement

- To imitate real-world usage, blindfolded user trials were conducted.

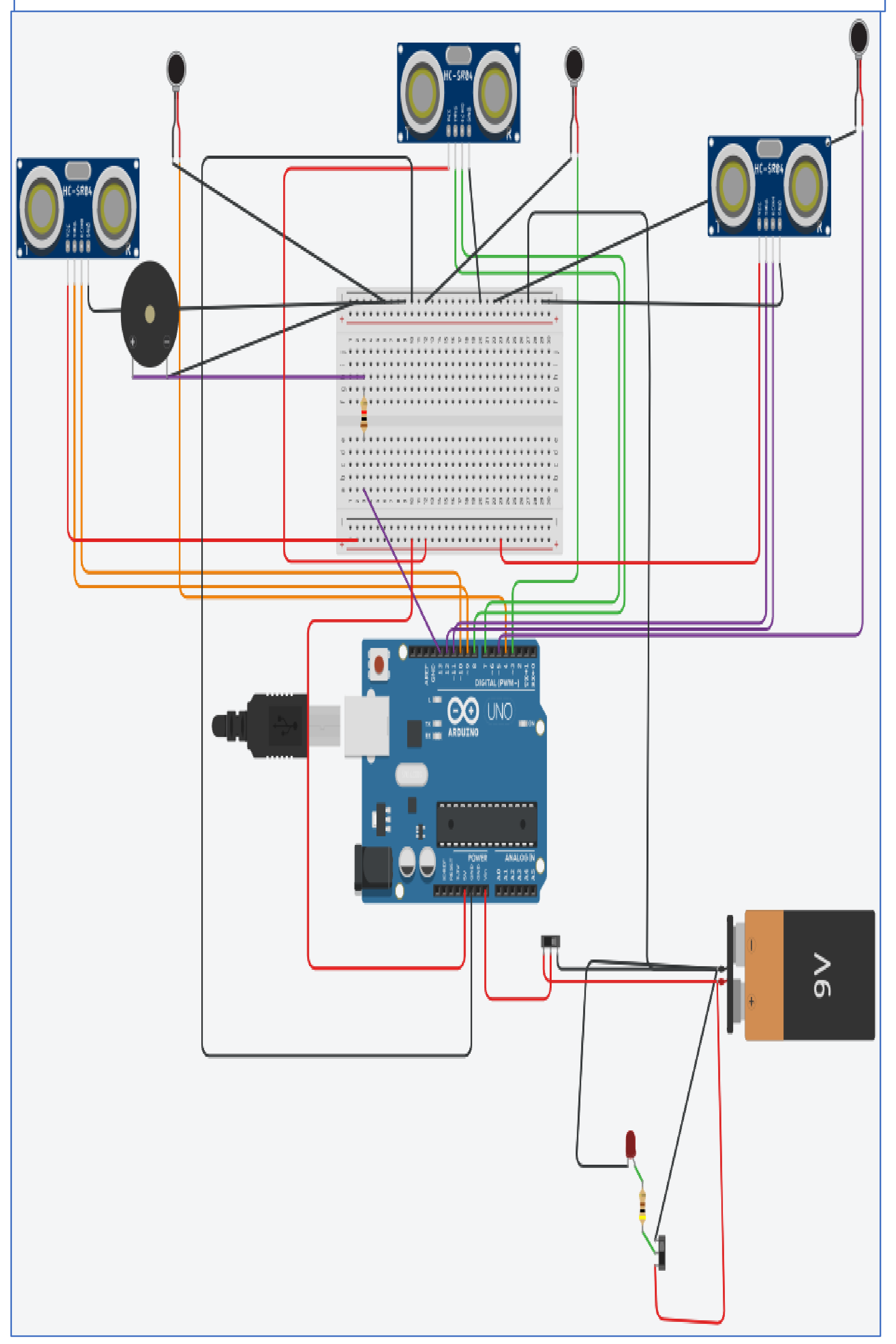
Evaluation & Future Improvements

- Identified opportunities for development, such as GPS integration, voice feedback, and AI-based obstacle identification.

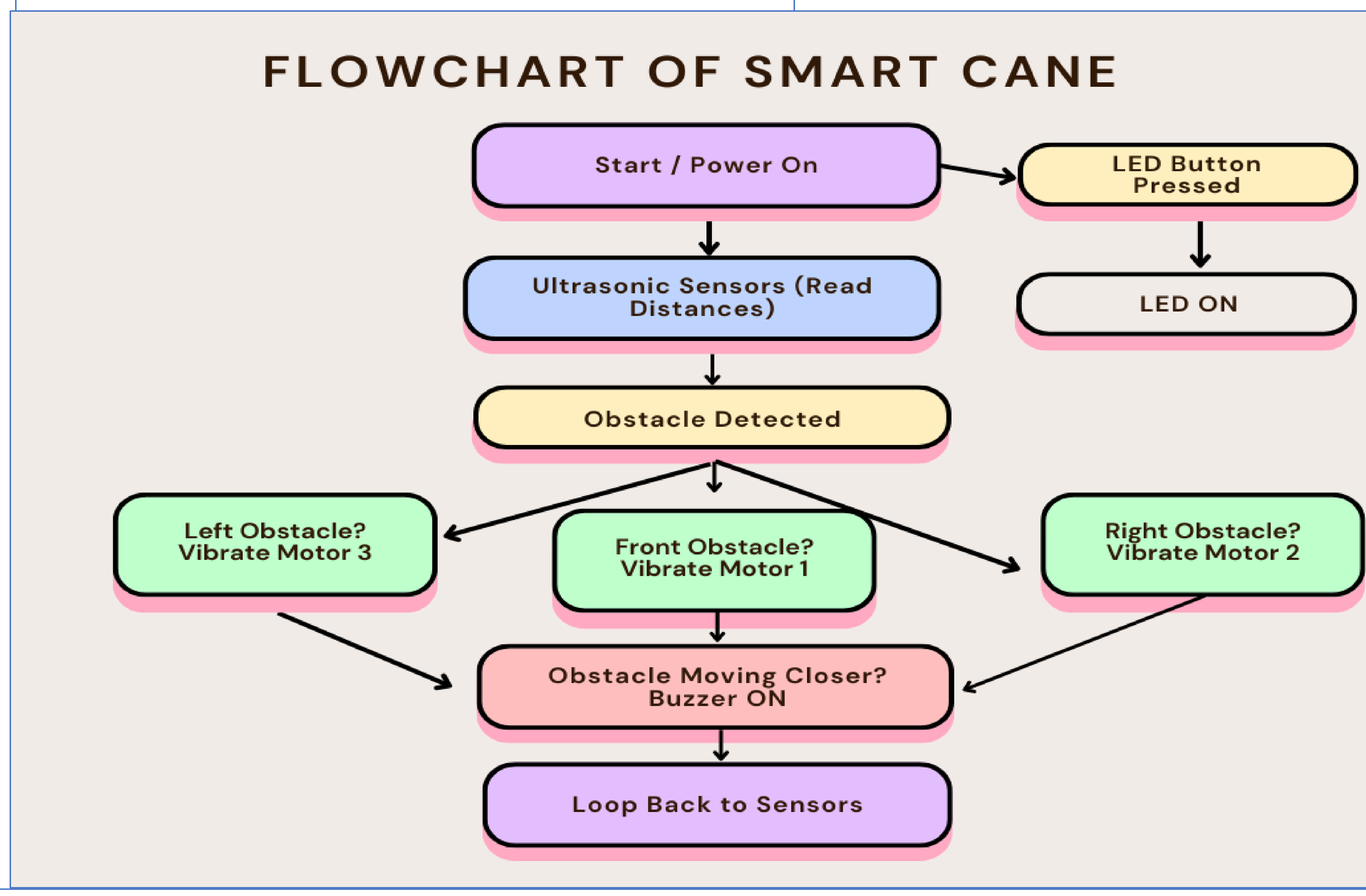
Schematic Diagram



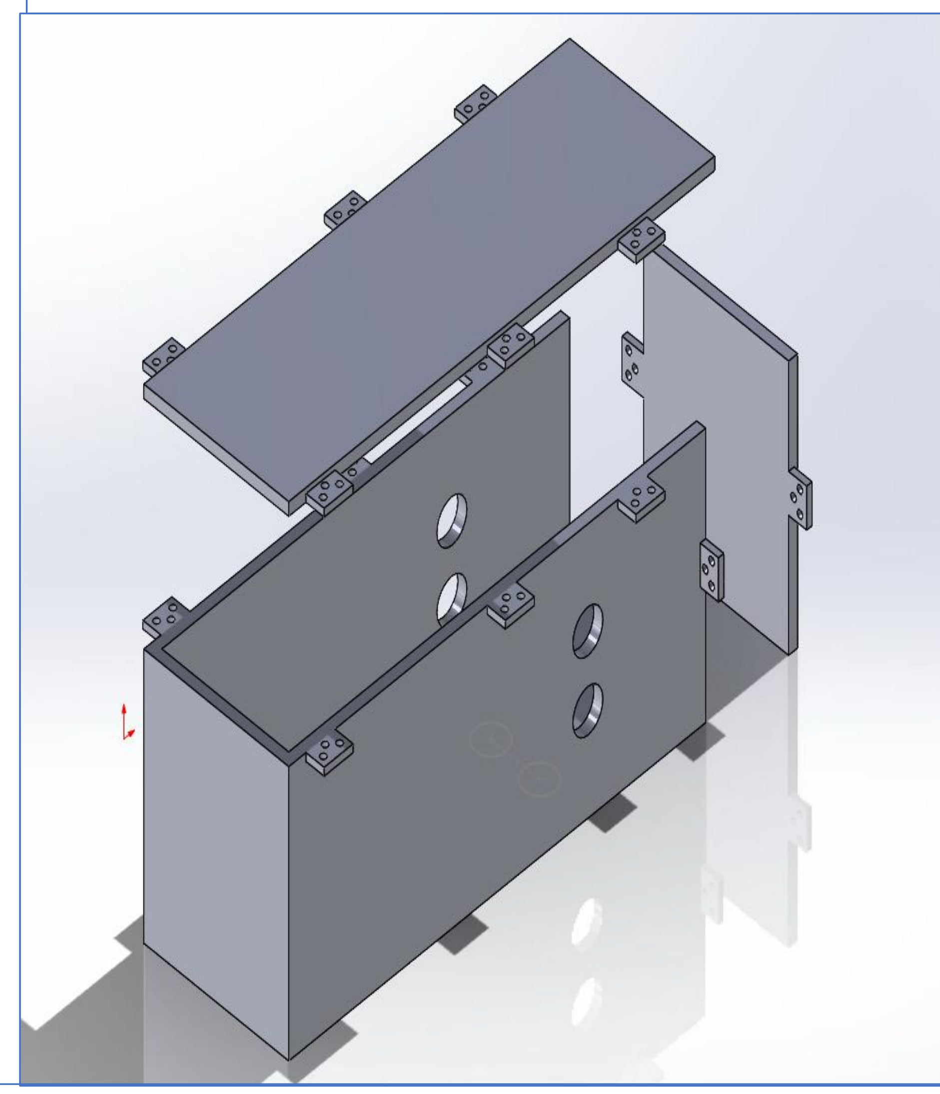
Circuit

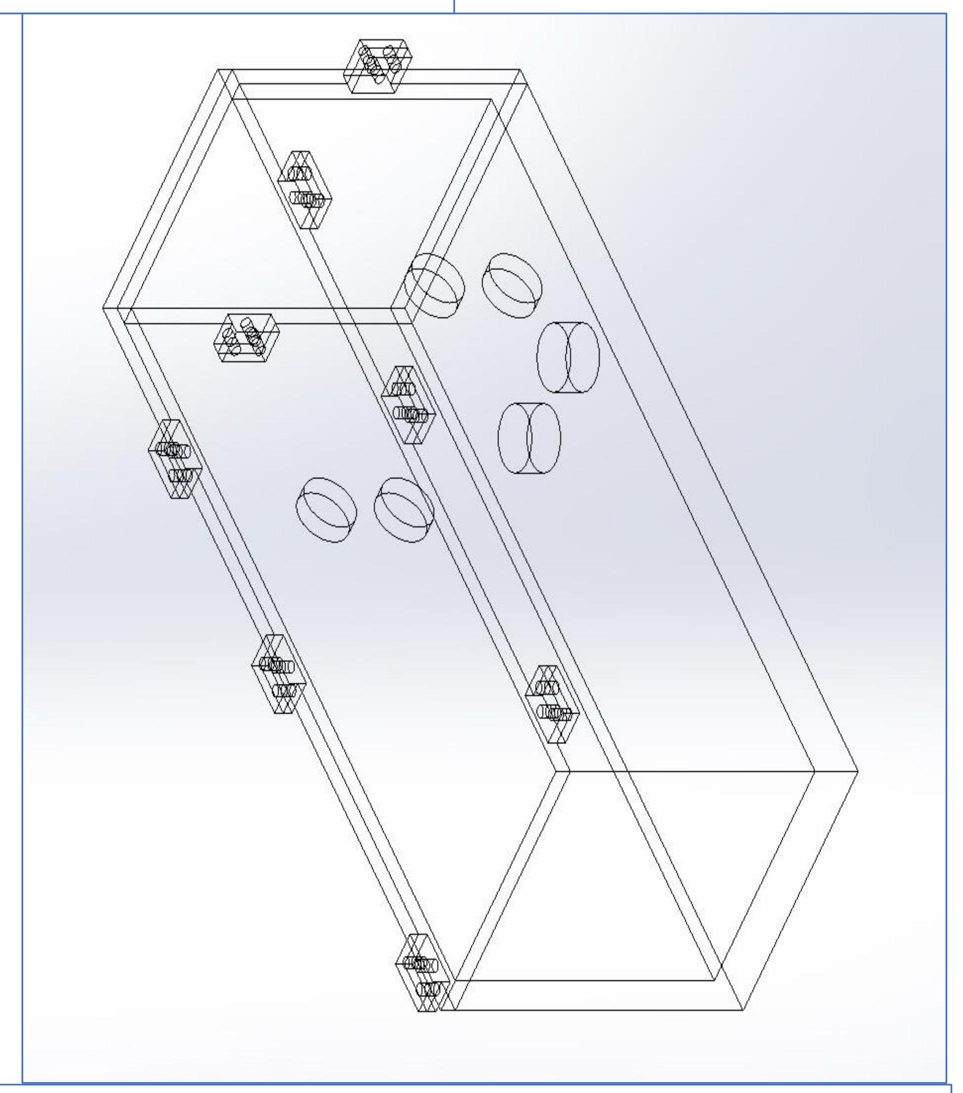


Flowchart



SolidWorks Design





Conclusion

The smart cane designed for visually impaired people successfully combines ultrasonic sensors and vibration motors to detect and notify users to impediments in front, to the left, and to the right. Through SolidWorks design, circuit development, and real-world testing, the cane proved to be a dependable and cost-effective assistive device that improves user awareness and movement. The system accomplished its primary goals, proving the efficacy of merging embedded systems and ergonomic design. The testing phase, which included self-trials while blindfolded, verified the device's operation and response. Overall, the research demonstrates how engineering may directly contribute to accessibility, with future enhancements potentially integrating GPS navigation, speech output, or wireless networking to assist the visually handicapped.