Report on Smart Cane for Visually Challenged People

Introduction

The Smart Cane project aims to provide a navigational tool for visually challenged individuals. Leveraging a combination of hardware and software components, the Smart Cane enhances the user's ability to navigate through various environments with greater independence and safety.

Implemented Functionalities

1. Navigation on Junctions

The Smart Cane utilizes the RC522 RFID Module for navigation on junctions. This technology allows the cane to identify and navigate through intersections, providing the user with enhanced spatial awareness.

2. Path Tracker

Path tracking is achieved through the use of IR sensors and an 8-inch path. Three IR sensors are strategically placed on the cane - two on either side and one at the front. These sensors not only help maintain alignment but also provide feedback on deviations from the intended path.

3. Obstacle Detection

The Smart Cane employs an Ultrasonic Sensor (HC-SR04) for obstacle detection. The sensor is configured to detect obstacles within the range of 10 to 50 cm, emitting a series of buzzes from

a buzzer to alert the user. A second Ultrasonic Sensor could be implemented for detecting overhead obstacles in the range of 40 to 100 cm.

4. Voice Command Instructions

Voice commands are integrated into the system, facilitated by a speaker module. This feature allows the user to receive instructions and navigate the environment through audio cues.

Hardware Used

- Arduino UNO
- Memory unit
- UltraSonic Sensor (HC-SR04)
- IR Sensors (3 sensors)
- Buzzer
- RC522 RFID Sensor and Passive Tags
- Speaker (audio module)

Software and Libraries

The Smart Cane utilizes several libraries for effective functionality:

SPI: For communication between the MFRC522 RFID module and Arduino.
MFRC522: A module used to read RFID tags.
SoftwareSerial: For communication between the Audio module and Arduino.
DFRobot DFPlayer Mini: Audio module for playing pre-recorded instructions.
NewPing: Used for IR sensor communication.
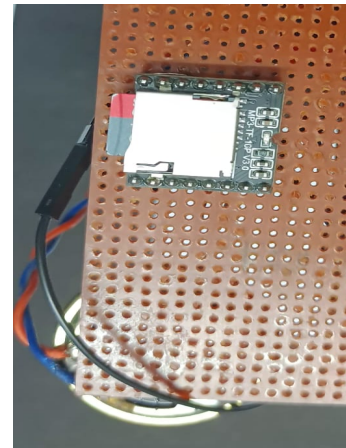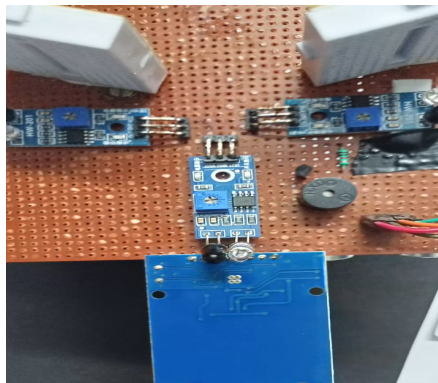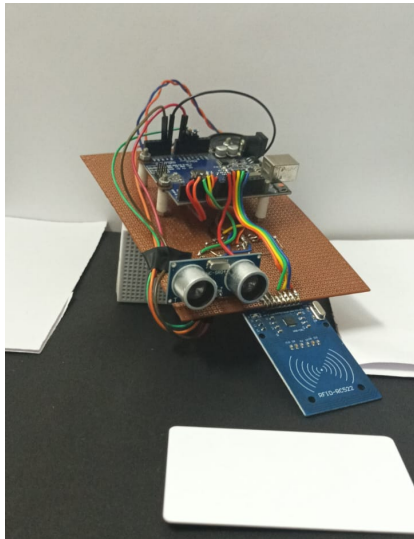
Challenges and Solutions

Bluetooth Sensor Implementation

Initially, the project aimed to execute audio responses through a handheld device using a Bluetooth sensor. However, due to challenges, the strategy was shifted to relay commands stored in the memory unit through an external speaker.

Obstacle Detection

The Ultrasonic Sensor successfully detects obstacles within a specified range, with the buzzer providing distinct feedback. To differentiate between RFID tag detection and Ultrasonic obstacles, a unique pattern of buzzes was implemented.

Project Hardware Snapshots

Conclusion

The Smart Cane project demonstrates a comprehensive solution for visually challenged individuals, integrating advanced technologies for efficient navigation and obstacle detection. While overcoming challenges in Bluetooth sensor implementation, the current configuration effectively employs RFID, IR, and Ultrasonic sensors, providing valuable feedback to the user.