An IOT Navigating Device for Blind People

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***Abstract*- Blindness involves the loss of vision. Mobility and independence have long been challenges for blind and visually impaired people. This project proposes BlinDar, a smart Electronic Travel Aid (ETA) to improve their lives. Equipped with Internet of Things technology, BlinDar aims to help the visually impaired navigate indoor and outdoor spaces freely. This highly efficient, reliable, fast-responding, lightweight, low-power, and cost-effective device uses ultrasonic sensors to detect obstacles and potholes within 2 meters. GPS and an ESP32 Wi-Fi module share the user's location with the cloud. An MQ2 gas sensor detects fires along the path, while an RF transmitter/receiver helps locate a misplaced walking stick. The Arduino Mega2560 microcontroller, with its 54 digital I/O pins, provides easy interfacing between all components.**
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KeyWords: Blindness, Smart Stick, BlinDar, GPS, ESP8266, Internet of Things, RF Tx/Rx, MQ2.

I.INTRODUCTION

According to a 2014 report from the World Health Organization (WHO), 285 million people worldwide were visually impaired, including 39 million who were blind and 246 million who had low vision [1]. With advancements in modern technology, various electronic travel aids (ETAs) have become available to assist the mobility of the visually impaired and blind [7]. These devices use sensors that alert the user about potential dangers

through sounds or vibrations. The introduction of such electronic traveling aids (ETAs) has increased safety and self-confidence among the blind. Some visual aid devices include the K-Sonar [2], Ultra Cane [3], Palm Sonar [4], I Sonic cane [6], Laser Cane [5], and Virtual Eye (using image processing). However, these devices tend to be expensive, difficult to use, and not very user-friendly - for example, the Laser Cane and Virtual Eye aids are very costly and not user-friendly. This paper proposes a new ETA called "BlinDar" aimed at improving the lives of the blind by enabling self-navigation without dependence on others. With BlinDar, blind individuals will be able to lead more normal lives. Additionally, their family members can track their location at any time. BlinDar utilizes IoT technology and provides a cost-effective, efficient, and user-friendly solution. The main component is an advanced blind stick integrated with an Arduino Mega2560 microcontroller.

The proposed system has several features:

- It is an inexpensive smart navigation stick, costing no more than $135.
- The obstacle sensors respond quickly to objects within 4 meters.

- Lightweight components are integrated into the stick for user-friendliness and low power consumption.
- The overall circuit design is straightforward, using basic C/C++/Java to program the microcontroller.
- To address potential issues hearing the audible alert in noisy areas, a smart wristband is included.
- A vibrator on the wristband discreetly alerts the user to obstacles through different vibration intensities.
- An RF transmitter/receiver helps locate a misplaced stick by activating the stick's buzzer when a button on the wristband is pressed.
- A GPS module shares the user's location to the cloud every 20 ms.
- An MQ2 gas sensor detects fires along the path or at home.

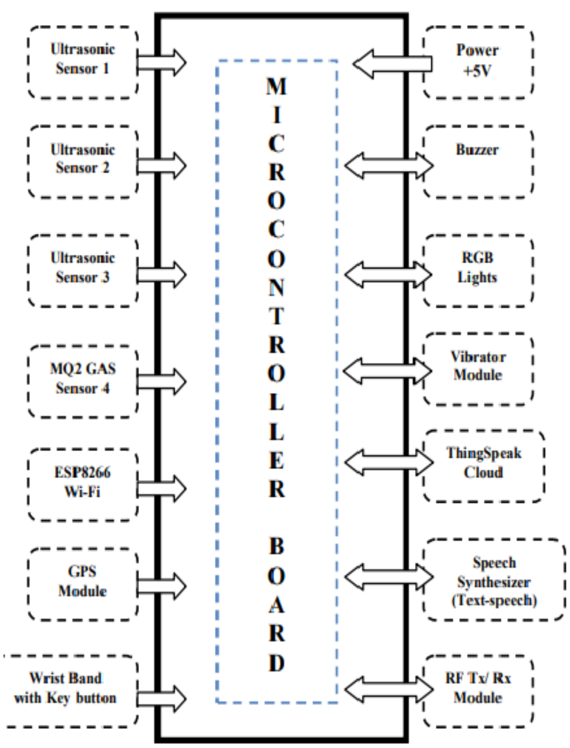


Fig.1.1 Block Diagram of BlinDar

The motivation behind advocating for a dynamic scope for BlinDar stems from the constant evolution of technology and the endless potential for advancements that could significantly enhance BlinDar's capabilities and effectiveness. Specifically, embracing ongoing development allows BlinDar to incorporate breakthroughs in areas like sensor technology, AI, and human-computer interaction, tailor the technology to users' changing needs through continuous feedback, adapt solutions to emerging challenges faced by the blind community, and maximize its impact by remaining at the forefront of innovation. A dynamic scope ensures BlinDar can leverage technological progress to provide optimal assistance to blind individuals.

II. SCOPE OF THE WORK

To maximize its potential as an "Invisible Eye" that empowers blind users, the scope of BlinDar should remain flexible, welcoming ongoing advances in sensor technology, AI, human-computer interaction, and user feedback. This dynamic approach will allow BlinDar to continuously evolve, enhancing its capabilities to support the independence and wellbeing of blind individuals with ever-greater effectiveness**.** Integration with IoT and addition of WIFI, automatic alerts about user location to family and emergency services through text messages or mail.

III. PROPOSED TOPOLOGY

Creating a flowchart for the operation of the BlinDar smart stick involves breaking down its functionality into sequential steps. Here's a basic flowchart outlining the operation of the BlinDar smart stick:

1. **Start**:
   - The BlinDar smart stick is activated by the user.
2. **Initialization**:
   - The smart stick initializes its sensors and systems.
3. **Sensing Environment**:
   - The smart stick begins to sense the environment using its built-in sensors, such as LiDAR, radar, or ultrasonic sensors.
4. **Obstacle Detection**:
   - The smart stick detects obstacles or objects in the user's path.
5. **Object Recognition**:
   - If an obstacle is detected, the smart stick identifies the type of object (e.g., wall, curb, person) using object recognition algorithms.
6. **Feedback to User**:
   - The smart stick provides feedback to the user about the detected obstacles through various modalities, such as auditory signals, vibrations, or haptic feedback.
7. **Navigation Assistance**:
   - Based on the detected obstacles and the user's intended direction, the smart stick provides navigation assistance, guiding the user around obstacles and towards their destination.
8. **Environmental Feedback**:
   - The smart stick continuously provides feedback to the user about changes in the environment, such as approaching intersections, changes in terrain, or the presence of stairs.
9. **User Interaction**:
   - The user can interact with the smart stick through input devices, such as buttons or voice commands, to request specific information or adjust settings.
10. **Adaptive Response**:
    - The smart stick adapts its response based on user input and changes in the environment, providing personalized assistance tailored to the user's needs and preferences.
11. **End**:
    - The operation of the BlinDar smart stick ends when the user deactivates it or when the task is completed.

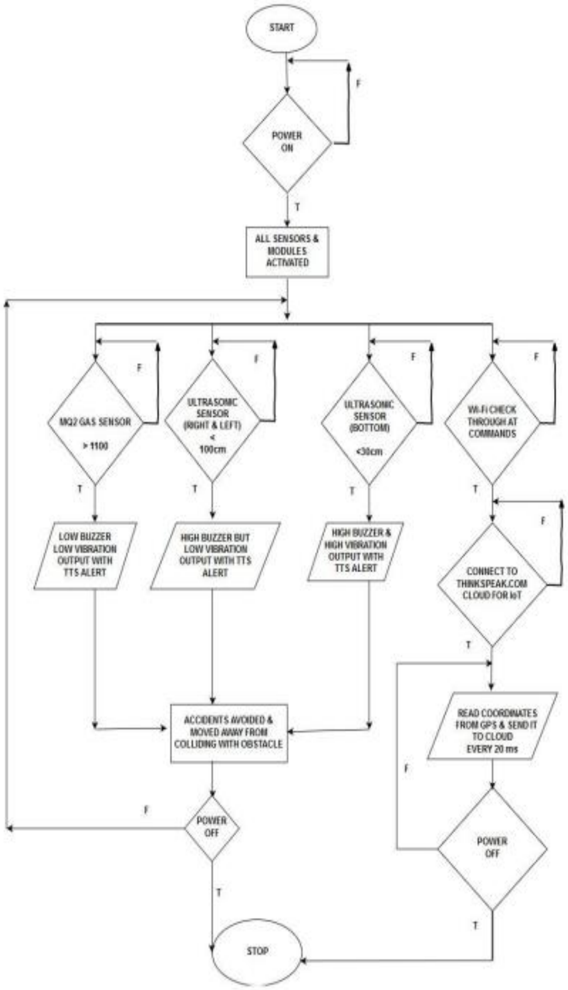
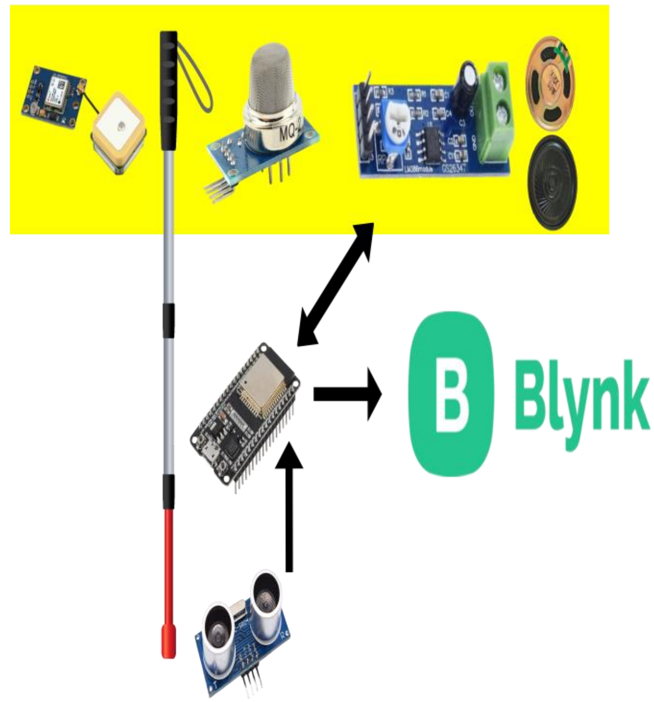


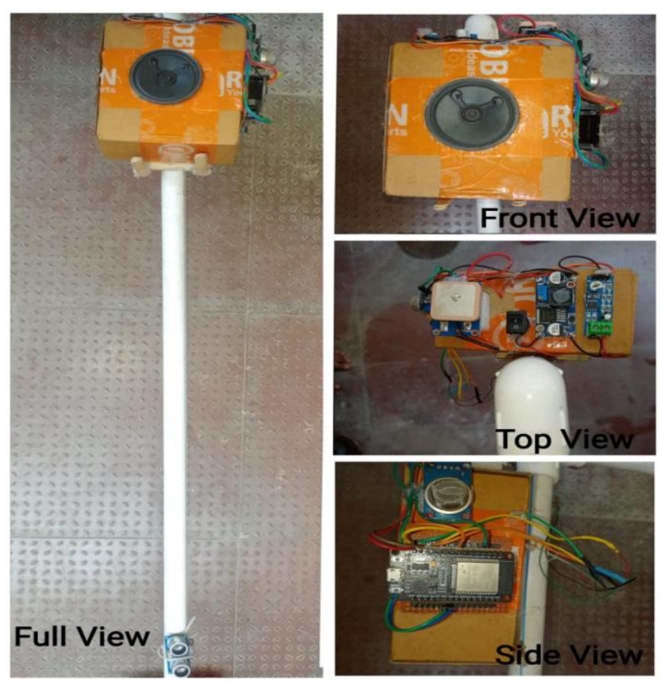
Fig3.1 Flowchart of the operation of the BlinDar smart stick

This flowchart provides a simplified overview of the operation of an LM386 audio amplifier module connected to a speaker. The LM386 is a versatile and widely used audio amplifier chip, commonly found in small audio amplification applications such as portable radios, intercoms, and guitar amplifiers. It offers a straightforward amplification solution with minimal external components required for operation.

After individual testing, the integration of sensors and modules was done successfully to make the final prototype. The microcontroller was programmed successfully for all sensors and modules using the Arduino IDE environment software. Fig.8 shows the final prototype.

IV. HARDWARE IMPLEMENTATION





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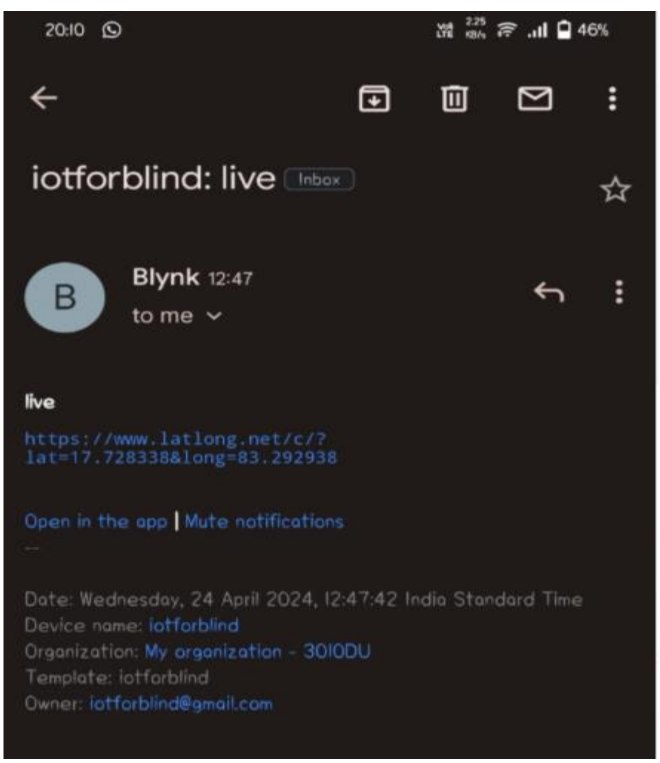
RESULT:



V CONCLUSION

The BlinDar smart stick aims to improve the independence and confidence of the visually impaired by leveraging IoT technology. This prototype uses sensors and components to help users safely navigate their environment. By addressing key challenges faced by the blind community, BlinDar provides functionality like obstacle detection and navigation assistance. The multipurpose design is adaptable, easy to use, and gives users greater access to their surroundings. With innovations like BlinDar, the visually impaired can overcome barriers and lead more fulfilling lives. We conducted research to understand the needs of the blind in India. Drawing insights from this, we designed an intelligent walking stick that enables greater mobility and autonomy through technology. The components chosen allow real-time sensing and feedback to assist navigation. BlinDar represents a step toward more inclusive, empowering products that promote dignity and independence. Integration with IoT and addition of WIFI, automatic alerts about user location to family and emergency services through text messages or mail.

FUTURE SCOPE

The Internet of Things (IoT) is a very promising technique. It is expounded as the network of real or virtual entities embedded with electronics, sensors and software's with network connectivity which enables these entities to collect and exchange data, thus providing connectivity at anytime. In a country like India, where the numbers of potholes are more in number than the actual obstacles, there is an immense need of smart guiding stick like BlinDar. The scientists and researchers are working upon various technologies to eliminate the environmental, social and navigational problems faced by the blind and visually impaired people. The blind needs a device which is more smart, multipurpose, user friendly and cost effective. The BlinDar is a great choice and most suitable alternative to white canes and other ETA's.

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