International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 09 Issue: 04 | April - 2025 SJIF Rating: 8.586 ISSN: 2582-3930

Research a Smart Assistive Device for Visually Impaired Using IOT

Mr. Pratik Bharaskar, Mr. Mayur Mhaiske, Miss.Swarupa Bhokare, Miss.Prajasi Sonone, Mr. Harshal Bhele and
Prof. A. B. Parandekar
Department of Information Technology
Sipna College of Engineering andTechnology, Amaravati, India

ABSTRACT—*Visually impaired individuals face significant challenges in navigating their surroundings safely and independently. Traditional mobility aids such as canes provide limited assistance and lack real-time hazard detection. This paper presents a Smart Assistive Device for the Visually Impaired using IoT, designed to enhance mobility, safety, and emergency response. The system integrates two ultrasonic sensors—one for depth detection and another for obstacle avoidance—providing immediate feedback through a vibrating motor. A rain sensor detects moisture levels, warning users of wet surfaces. The device also includes a GPS module for real-time location tracking and a GSM module to send emergency SMS alerts. A panic button allows users to instantly send their location to predefined contacts in distress situations. The system is built around an Arduino Nano, ensuring efficient processing and communication. This assistive technology enhances the independence of visually impaired individuals by offering real-time alerts and automated emergency assistance. Future improvements may include AI-based object recognition, voice assistance, and machine learning algorithms for adaptive navigation. This innovation contributes to improving accessibility, safety, and overall quality of life for visually impaired users.*

KEYWORDS- Smart Assistive Device, Visually Impaired, IoT, Ultrasonic Sensors, GPS, GSM, Panic Button, Rain Sensor, Vibrating Feedback.

I. INTRODUCTION

The primary goal of this paper is to outline a smart stick to extend the portability of a visually impaired person. Around 80% information human beings receive from the environment via sight. A lot of people who lost their eyesight or are suffering from blindness or partial blindness, have to go through severe hardship. Even many children are born with blindness. They have a long life ahead but they will have to be dependent on others. Mobility of the people who are visually impaired is restricted to recognize their surroundings due to their incapability. Their life can be significantly improved and their hardship could be reduced if mobility can be improved by reducing their dependency on others. This plays an important role in coming up with this decision. Visual Impairment: The term "blindness" has a broad spectrum of visual disability from when one's eyesight is impaired enough to interfere with daily activities up to total blindness. Physiological or neurological causes create a state of lacking visual perception. Each person's experience of blindness is unique and it has many causes which affect eyesight differently.

Fig 1 : Smart Cane

Blindness is commonly stated as the state of being totally sightless in both eyes. A completely blind individual is not capable of seeing at all. The word blindness is commonly used as a relative term for signifying visual impairment or low vision which means that even with the help of eyeglasses, contact lenses, medicine or surgery, a person would not be able to see well.

PROBLEMS STATEMENT

Visually impaired individuals encounter numerous challenges in their daily lives, particularly in navigating unfamiliar environments safely and independently. Conventional mobility aids such as white canes, guide dogs, and human assistance provide some level of support but come with significant limitations. White canes, while widely used, can only detect obstacles within a limited radius and do not provide real-time feedback on potential hazards beyond their reach. Guide dogs require extensive training, involve high maintenance costs, and may not always be accessible to individuals in need. Human assistance, though helpful, compromises personal independence and is not always available.

The lack of advanced assistive solutions results in a high risk of accidents, difficulty in detecting moving obstacles, and a general sense of dependency among visually impaired individuals. Additionally, traditional mobility aids do not incorporate emergency communication features, leaving

individuals vulnerable in critical situations. This highlights the urgent need for an intelligent, technology-driven solution to improve mobility, safety, and independence for visually impaired individuals.

II. LITERATURE REVIEW

Dr. C K Gomathy, this research aims to assess students' knowledge of the Ge loT topic covered by the Internet of Things. IOT initiatives that address design, development, and other requirements are relevant to our field of study. The Smart Stick Assistant for Visually Impaired People Using Al Image Recognition is the paper I've chosen to work on as a result. A blind assistance app called "The Smart Stick Assistant for Visually Challenged People Using All Image Recognition" basically came from the conventional white or blue cane and improved into the present day technology. It's a paper to improve accessibility for blind individuals so they may receive assistance when travelling. A contemporary automation of utilizing cutting-edge technological components, such as the Blynk app and ESP shield, would lessen the challenges faced by the community of visually impaired persons in getting better responses from their surroundings.[1].

Prof. Poonam Pawar, Person(s) with vision impairment find it challenging to communicate and perceive my surroundings. For someone who is visually impaired, moving around might be difficult because it can be difficult to tell where he is and how to get from one area to another. The development of an intelligent and smart stick to help and an alert system to warn visually impaired people about obstacles and provide information about their whereabouts has taken decades of research. In this essay, we'll talk about developing a smart kit system to help the blind. The smart gear is provided as people struggle to recognize the world and obstacles in front of them while walking. The apparatus is intended to function as an artificial eyesight and the visually impaired person through beeps which is assigned to a particular action. The designed system consists of hardware and software .part; hardware detects the slippery area, potholes on the road or path where the user is walking and the objects that comes in contact with the stick through ultrasonic sensor, infrared sensor and water sensor; software uses various algorithms to processes images for face recognition, to detect the text through image processing.[2]

N.Loganathan, When travelling from one spot to another, a blind person finds it challenging to identify the presence of any impediments in their path, and it is quite challenging to locate the stick's exact location if it has been misplaced. Therefore, the smart stick is presented as a suggested remedy to assist the visually impaired in their day-to-day living without the assistance of others. Using an ultrasonic sensor in the blind stick, we suggested a solution for the blind in this research. He is able to detect impediments at a distance of four meter6s, while infrared technology is utilized to detect closer obstacles in front of blind persons. In this way, the radio frequency transmitter and receiver enable the user to precisely locate the smart stick using a buzzer. When an obstacle is recognised, the smart stick's vibration motor, which is housed there, activates and vibrates. The Arduino UNO serves as the controller in this suggested manner. The branch is capable of detecting every challenge in front of the user. The user-friendly,[3]

quick-response, and extremely low power consumption of the smart stick lighter weight, and it is simple for the user to grip and fold.[3]

Priyanka Abhang, People who are blind or partially sighted have difficulty moving securely from one location to another. They find it more and more difficult to complete simple activities without substantially relying on others. Our suggested system seeks to offer a simple solution to this problem. In this system, we employ infrared sensors to help detect raised surfaces like staircases and ultrasonic sensors to help detect obstructions. Additionally, we employ ISD1820 to provide speech warnings in the event that a barrier is encountered. The user can send panic messages to the predefined emergency contacts by using facilities for a panic button. The message informs the emergency contact of the user's GPS coordinates. Our smart blind stick seeks to offer a cheap, effective, quick, and light alternative.[4]

Rajath V, this report will present a n order to help the visually challenged people, we design smart sticks. One of the many problems that people have little control over is blindness. It steals away from a person's life the intense visual beauty of the world. However, as they must overcome countless obstacles in order to carry out even the most basic duties in their daily lives, missing out on the beauty of nature becomes one of their least concerning problems. One of their biggest issues is transportation, whether it be using the roads, railroads, or other public spaces. It is known as the "Smart Stick." It is a tool that directs the user by detecting obstructions in the user's line of sight. With the aid of numerous mounted sensors, it will identify all obstructions in the way.[5]

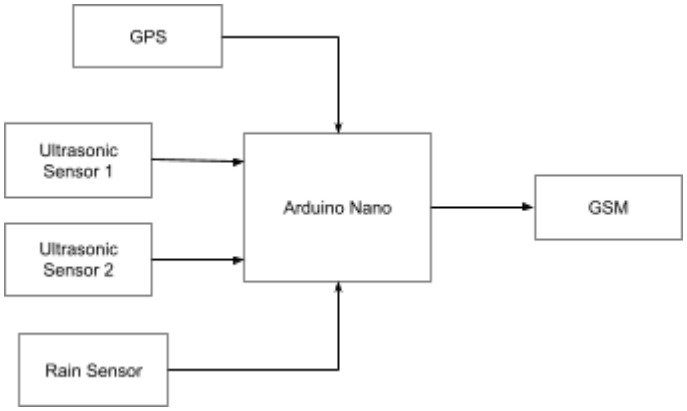
Vanitha Charitha, the proposed system consists of Arduino Nano, in which Jumper wires are used to link these parts to the Arduino's digital and analogue pins. When using the suggested approach, an input voltage of It has the following characteristics: 9V/12V. It can check for a setting with a range of obstacles of varied sizes and appropriate vibratory and auditory alarms are raised. It can be recognized. Surfaces that are moist or wet might warn the user. And it is able to communicate the user's location to friends via SMS can be used in the event of an emergency or crisis RF remote control-based locator when lost. An Arduinobased algorithm checks for input from each of the sensors.[6]

T. S Aravinth, when a blind person gripping this as they cross the street walking cane When a barrier is present, it is being photographed with a camera and that picture is sent to the object identification microcontroller that issues a warning of that item through the ear pad. Raspbian is a walking stick inserted at which the Pins are used to interconnect an ultrasonic sensor. The camera should be attached at the same time. where both should face in Raspberry Pi the same way on the highway. Moreover, the device features a connection between the RF receiver and the walking stick. When a blind person presses button 1 on the RF transmitter, a beep sound emanating from their walking stick will be heard, allowing them to locate their walking stick in case they misplace it or it falls. In a similar vein, pressing button 2 will cause it to instantly read our present position. Each command is transmitted by depressing a button on the RF transmitter that they are holding.[7]

III. METHODOLOGY

The proposed smart assistive device integrates IoT and to enhance mobility and safety for visually impaired individuals. The device employs ultrasonic sensors for depth perception and obstacle detection, triggering a vibrator for immediate tactile feedback. An Arduino Nano is used as a microcontroller. A GSM module sends emergency SMS alerts, while GPS ensures real-time location tracking. A panic button facilitates distress communication, transmitting the user's location to caregivers. Additionally, a rain sensor detects moisture, providing early warnings about wet surfaces. The system is developed using embedded hardware and IoT-based real-time communication to ensure efficiency, accuracy, and user-friendliness.

❖ BLOCK DIAGRAM



Ultrasonic Sensor 1 (Depth Detection) – This sensor measures the depth of any terrain or steps ahead, helping visually impaired users navigate elevation changes. The data is processed by the Arduino, which provides feedback to the user.

Ultrasonic Sensor 2 (Obstacle Detection) – This sensor detects obstacles in the user's path and triggers a vibrating motor as a tactile alert, warning the user of an obstruction.

Rain Sensor (Moisture Detection) – It detects wet or slippery surfaces, ensuring users are alerted to hazardous conditions through vibration or an audio signal.

GPS Module (Location Tracking) – Continuously tracks the real-time location of the user. If an emergency occurs, this module sends the user's coordinates via SMS.

GSM Module (SMS Alert System) – Facilitates emergency communication. When the panic button is pressed, it sends an SMS containing the user's real-time location to predefined contacts, ensuring quick assistance.

Panic Button (Emergency Alert) – When activated, it triggers the GSM module to send a distress message along with GPS location details, alerting caregivers or emergency services.

❖ FLOW CHART

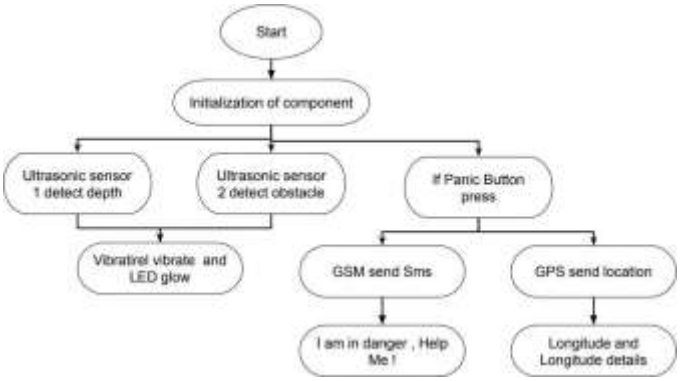


Fig (2) shows the Flowchart of the paper

❖ CIRCUIT DIAGRAM

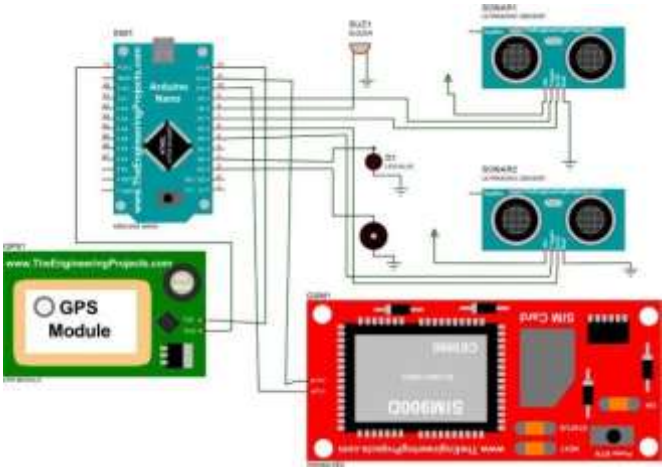


Fig (3) Shows the Circuit Diagram of paper

❖ WORKING

Power ON & Initialization

- The system is powered on, and all sensors, GSM, GPS, and the microcontroller (Arduino/ESP32) initialize.

Ultrasonic Sensor for Depth Measurement

- The first ultrasonic sensor continuously measures depth (e.g., well, pit, or water level).
- If the depth exceeds a critical limit, an alert can be triggered.

Ultrasonic Sensor for Obstacle Detection

- The second ultrasonic sensor detects obstacles in the surroundings.
- If an obstacle is detected within a predefined distance, the **vibrator motor activates** to alert the user.

GPS Module for Location Tracking

- The GPS module continuously fetches the current location coordinates (latitude & longitude).
- The location data is stored and used when sending alerts.

GSM Module for SMS Alerts

- The GSM module is set up to send alert messages when triggered.

Panic Button Operation

- If the user presses the panic button, the system immediately:
  - Fetches the **current location** from the GPS module.
  - Sends an **SMS alert** with location details to pre-configured emergency contacts using the GSM module.

Moisture Detection using Rain Sensor

- The rain sensor monitors moisture levels.
- If rainfall or excessive moisture is detected, the system can activate an alert or trigger another action.

Continuous Monitoring & Alerts

- The system continuously monitors all parameters.
- If any critical condition is met (obstacle detection, panic button press, excessive depth, rain detection), the respective alert is triggered.

IV. SYSTEM REQUIREMENT

HARDWARE REQUIREMENT

- Arduino Nano
- Ultrasonic Sensor
- GSM
- GPS
- Button
- Rain Sensor

SOFTWARE REQUIREMENT

- Arduino IDE
- Proteus

V. EXPERIMENTAL SETUP & RESULT

Fig 4 (a) shows the Top View of system

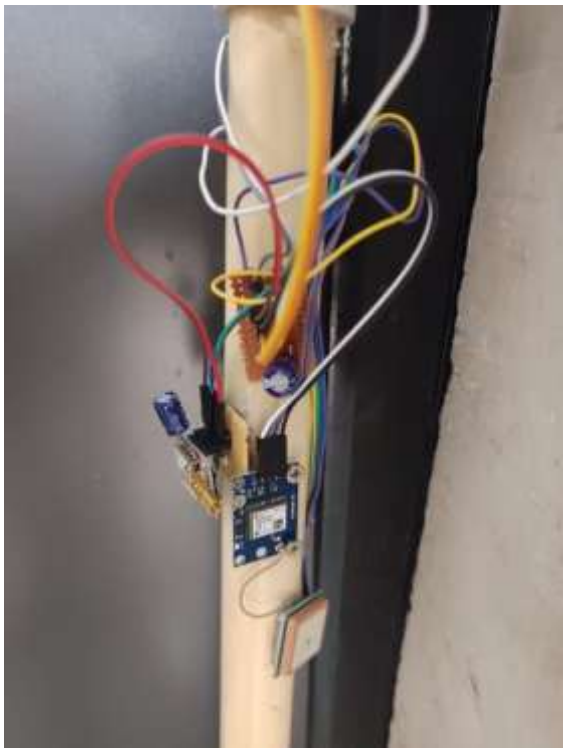


Fig 4(b) shows the Side View of System

RESULT

The paper successfully integrates multiple sensors and communication modules to enhance safety and real-time monitoring. The ultrasonic sensors effectively measure depth and detect obstacles, triggering the vibrator motor for immediate user alert. The GPS module accurately fetches location coordinates, displaying longitude and latitude in real-time, while the GSM module successfully sends an emergency SMS with the message: "I AM IN DANGER, Help Me!" along with the location details.
The panic button functions efficiently, ensuring instant alerts during emergencies. Additionally, the rain sensor accurately detects moisture, adding an extra layer of environmental awareness. The system operates reliably, demonstrating its potential for real-world safety applications.

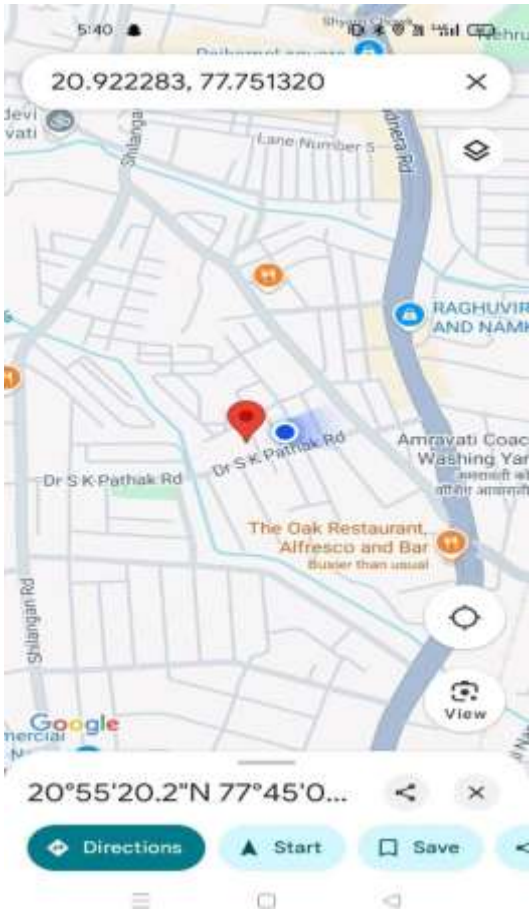


Fig 6.3 shows the GPS input

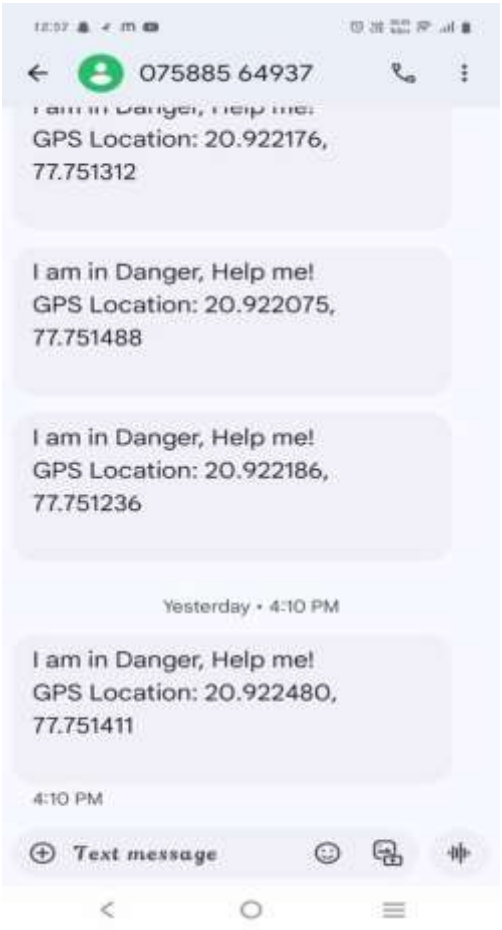


Fig shows the GSM output

VI. CONCLUSION

The smart assistive device offers a comprehensive solution for visually impaired individuals, integrating multiple sensing and communication technologies to improve navigation, safety, and emergency response. By providing real-time alerts and location tracking, it significantly enhances the independence of users. Future enhancements may include -based voice assistance for object recognition, machine learning algorithms for adaptive navigation, and integration with smart city infrastructure to further improve accessibility and user experience.

VII. REFERENCE

[1] Dr. C K Gomathy, Ms. Chitta Sonika,"The Smart Stick Assistant For Visually Challenged People Using AI Image Recognition". International Research journal of Engineering and Technology (IRJET) -2021.

[2] Prof. Poonam Pawar, Rajeshwari Bhirud, Karan Shinde, Snehal Gawade, Reshma Gholpa, "Smart Blind Kit for

Visually Impaired People": International Research journal of Engineering and Technology (IRJET) -2020.

[3] N.Loganathan, K.Lakshmi, N.Chandrasekaran, S.R.Cibisakaravarthi,"Smart Stick for Blind People": International Conference on Advanced Computing & Communication Systems(ICACCS)– 2020.

[4] Priyanka Abhang, Shambhavi Rege, Shrishti Kaushik, Shriya Akella, Manish Parmar, "A Smart Voice-Enabled Blind Stick with An Emergency Trigger": (IEEE)-2020

[5] Rajath V, Swetha Shekarappa G, Senbagavalli M, "GPS Based Smart Stick for the Blind and Visually Impaired People": International Research journal of Engineering and Technology (IRJET) – 2020.

[6] Vanitha Charitha, U.Sairam, "Multi-Functional Blind Stick for Visually Impaired People"(IEEE)– 2020.

[7] T. S Aravinth, "Wi-Fi and Bluetooth based Smart Stick for Guiding Blind People": (IEEE)-2020.

[8] Bhushan Chaudhari, Priyanka Dorugade, Hrushikesh Konde, Rehan Kondkari, Prof. Deepti Lawand, "Smart Stick Image Processing": International Research journal

[9] Akhlaqur Rahman,A.S.M Mehedi Hasan Shuvo,Kh. Fatema Nur Malia, Mahmudul Hasan Nahid,Md. Milan Mia,
A.T.M. Manfaat Zayeem, "An Efficient Smart Cane Based Navigation System for Visually Impaired People": IEEE - 2019.

[10] Srinidhi Srinivasan, Rajesh M, "Smart Walking Stick": Proceedings of the Third International Conference on Electronics and Technology Trends Informatics (ICOEI)-2019.

[11] Osama Bader AL-Barrm "3D Ultrasonic Stick for Blind" International Journal of Latest Trends in Engineering and Technology (IJLTET)

[12] B.Mohan Sitaramaiah, M.Naganaik "ELECTRONIC GUIDE CANE WITH ULTRASONIC EYES FOR VISUALLY IMPAIRED" International Journal of Advanced Technology in Engineering and Science Volume No.03, Issue No. 01, January 2015

[13] F. van der Heijden, P.P.L. Regtien, "Wearable navigation assistance - a tool for the blind"
MEASUREMENT SCIENCE REVIEW, Volume 5, Section 2, (2005)

[14] Ankit Agarwal, Deepak Kumar, Abhishek Bhardwaj "Ultrasonic Stick for Blind" : International Journal Of Engineering and Computer Science (ISSN)-2015

[15] Srirama Divya, B.Navya, P.Suma Manasa and S.Chitra "Ultrasonic and Voice Based Walking Stick for The Blind ": International Journal of Advanced Research in Science,
Communication and Technology (IJARSCT)-2022

[16] Sung Jae Kang, Young Ho, Kim and In Hyuk Moon, "Development Of An Intelligent Guide-Stick For The Blind": IEEE International Conference on Robotics & Automation-2001.