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Mobile Communication Device for the Visually Challenged People

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Abstract – Blind people face numerous obstacles on a daily basis. Blind people must rely on others to carry out their daily activities. Communication is an essential part of everyone's life. Nowadays, long distance communication is made easy by electronic devices. The usage of mobile phones is rapidly increasing. Vast amount of technological growth is happening in this recent era. Despite all these advances in the communication field, the visually impaired people have less access to these technologies. In this paper, we are going to present a solution for blind stick navigation with app notification. This study describes the design, development, and testing of an IoT-enabled smart stick that can identify and alert users to potential hazards so they can travel outside. Energy efficiency, portability, stability, and ease of use access, and robust features are all guaranteed by the entire design.

Keywords – Smart Stick, Embedded Systems, Android App, IOT.

I. INTRODUCTION:

Blind people confront several challenges in their daily life, from reading a book to crossing the street. There are many resources available to help people deal with their problems, yet they are insufficient. No matter whether a person can see or not, their ability to see is the most valuable asset they may own. Being blind makes it harder for a person to examine a situation the way a sighted person can. Even simple tasks like traveling from one place to another without falling or bumping into barriers are difficult for persons who are blind or visually impaired every day. To optimize their utility and advantages, research has been done on how to make white canes more technologically oriented.Utilizing several navigation techniques, mobility aid for those with visual impairment was improved. The purpose of this study is to develop a service that enables blind people to use their smartphone to shop freely and without help from others. The programme,

which uses RFID technology as its foundation, provides a relatively affordable answer to this issue.The expense would be the cost of an RFID tag for store owners.The Internet of Things (IoT), which enables and uses a number of available sensors like the ultrasound, water sensor, and GPS/GSM sensor, is the basis for the suggested design for the smart stick. It has two modes in which an ultrasonic sensor is used to find the obstruction and notify the user of its location using vibration motors. On the other hand, the second module carries out the obstacle detection and recognition while also providing voice feedback. These modes can be changed depending on the user's priorities. To prevent falling, a water sensor is used to find water puddles or moist surfaces. Additionally, GPS/GSM is used to determine the user's precise location, including latitude and longitude.Last but not least, the user can push the panic button on the smart stick to summon an emergency response in an emergency. The bespoke design of an adjustable stick for visually impaired people of varying heights, as well as the use of waterproof sensors and a waterproof control box, make the suggested smart stick novel and durable against harsh situations. As an added convenience for the user, a special water sensor has been created with clever positioning for accurate detection of the puddles, vibration motors to assist the user past the obstacle, and headphones to play the appropriate audio message for warning about the obstacle's location. The sensors are now in position. For the user's convenience, the sensors have been positioned so as not to change the typical cane's grip.

II. LITERATURE REVIEW:

[1] The Smart Stick For Blind People: uses an ultrasonic sensor to identify obstacles at a four-meter distance, and it also uses infrared technology to understand the challenges faced by the blind. The user can locate the smart stick using the buzzer with the aid of the receiver and transmitter in this way. Vibrations are produced when the stick's vibration motor is activated. The Arduino Uno is used to control the system. The technology is capable of understanding any issue that the user is having. The user can fold the smart stick, which is highly convenient, simple to use, responsive, power-efficient, light, and portable. [2] Infrared Sensor-Based Smart Stick For Blind People: An infrared sensor-based smart stick for blind people has been examined in this research. It is a practical, user-friendly, lightweight, highly responsive, and extremely power-efficient smart stick. where an infrared sensor picks up any obstructions in the user's path. The gadget can identify obstructions up to two meters away. The instrument has

remarkable precision, and this stick can find all kinds of problems. [3] Assistive Stick For Visually Impaired Persons: The user receives accurate information about the distance and placement of obstacles by vibrations and audio in their ear from the smart stick, which can identify barriers of any height in front of them or to their slight side. The earphones and the stick are connected wirelessly through bluetooth. [4] Smart Blind Stick With Ultrasonic Sensors: The ultrasonic sensor module detects obstacles, and all alerts are supplied through buzzer. [5] Multiple Distance Sensor Based Smart Stick For Visually Impaired People: To prevent a person from falling, obstacles are detected by positioning the ultrasonic sensor at a 30-degree angle on a suitable blind stick and sensing the presence of a hole or staircase at a distance of about 30 cm in front of the blind person. The gadget is incredibly feature-rich and very useful. [6] A smart walking cane for blind people notifications:A smart walking cane that used infrared sensors to deliver advanced notifications was discussed in another study paper. The vibrating signal may alert the blind individual if the stick encounters any difficulties. However, the cane could only identify obstructions in the front and could not issue a warning when a threat existed. There was also a restriction for IR sensors. For instance, it was ineffective at accurately detecting far-off objects [15].

When tested, the majority of the studies on the blind stick had disappointing results. Additionally, the earlier findings were inconclusive on a fix for losing the stick and network failure. These shortcomings allowed us to redesign a bright blind stick that will be better at spotting obstacles. As a result, we have developed a defense against the stick losing. Our implementation was successful, and we have included a detailed description of the performances in the outcome section. has been a success, and we have thoroughly described the performances in the result section. Although a lot of research has been done on smart sticks, there aren't many IoT-enabled smart sticks with image processing. The implementation of a waterproof smart stick has not been identified in the literature, and neither has the physical design of the smart stick been given any thought for the user's comfort. It is unrealistic to expect smart sticks to employ image processing to recognise objects. Instead, the user is alerted to potential obstructions via a variety of difficult-to-remember buzzer and vibration motor combinations. To get around these restrictions, this study introduces a brand-new IoT-enabled smart stick for visually impaired people. We have thoroughly described the performances in the result section. Although a lot of research has been done on smart sticks. The implementation of a waterproof smart

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stick has not been identified in the literature, and neither has the physical design of the smart stick been given any thought for the user's comfort. It is unrealistic to expect smart sticks to employ image processing to recognise objects. Instead, the user is alerted to potential obstructions via a variety of difficult-to-remember buzzer and vibration motor combinations. The innovative IoT-enabled smart stick is presented in this study for the visually impaired to overcome these limitations.

III. METHODOLOGY:

To overcome certain limitations of existing devices, the proposed system had to attain some requirements, such as the components of the device had to choose low cost with better accuracy to make the system affordable and reliable. Here we can see the block diagram, hardware and software requirements.

I. Block Diagram:

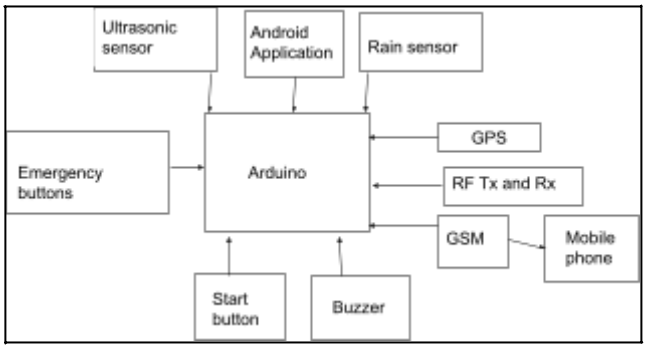

Fig. 1. Block Diagram

II. Hardware components & purpose:

1. Arduino:

It is used as a microcontroller in our project. Arduino is an open source microcontroller board.The microcontroller on the board is programmed using Arduino software. The boards are equipped with sets of digital and analog input/output (I/O) pins.

2. Ultrasonic sensor:

An ultrasonic sensor is a device that can measure the distance to an object by using sound waves .It measures distance by sending out a sound wave at a specific frequency and listening for that sound wave to bounce back. In our project, we are using this to find an obstacle on the path. The ultrasonic transmitter sends an ultrasonic wave this wave travels in air and when it gets object by any material it gets reflected back toward the sensor this reflected wave is observed by the ultrasonic receiver module.

3. Rain sensor:

Rain Sensor is used to detect water in the road .If the rain sensor senses the water the arduino sends the signal to buzzer to produce the beep sound and notify the blind person.

4. GPS Module:

GPS(Global positioning System)is a satellite navigation system used to determine the ground position of an object.GPS Module is used to find the

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exact location of the stick and will be sent to the guardian.

Working:

Satellite —> Antenna —-> GPS module

5.GSM Module:

GSM (Global system for mobile communication) is a digital mobile telephony system that is widely used all over the world. A GSM module requires a SIM (Subscriber's identity module) card to be operated and operated over a network range subscribed by the network operated. If the person is in an emergency situation, he will click the button. After that the location will automatically be sent to the guardian by using the GSM module.

Fig. 2. Location identification by GSM

6.RF Module:

This RF module is a combination of RF Transmitter and RF Receiver. It is used to find the missed stick by the user.

III. Software:

1. Blynk Application:

This application displays the latitude and longitude values when the victim will go out of the home. Using the application, the family member can trace and locate the blind person. The GPS module will send the latitude, longitude, and the blind person's speed to this Application in a critical situation. The application will help to find out the person immediately.

In our project, obstacle detection is delivered using this app by voice output. By using this, the visually impaired person can avoid the obstacle.

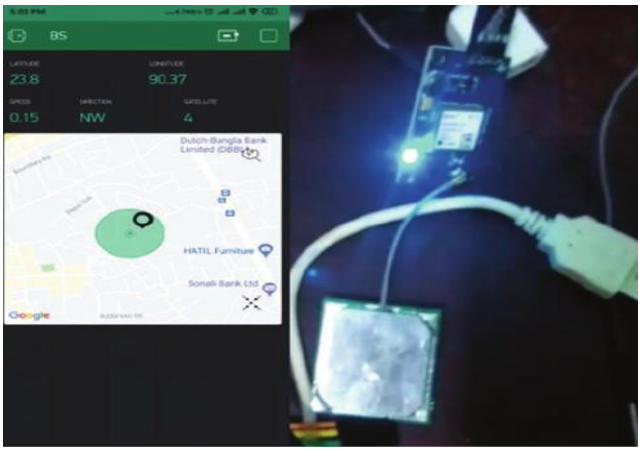

Fig. 3. Blynk application output

IV. PROPOSED WORK:

The Internet of Things is a rapidly evolving technology that digitally connects humans, machines, sensors, and everything else for the purpose of automating. If the obstacle is close the microcontroller sends a signal to sound a buzzer. It also detects and sounds a different buzzer if it detects

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water and alerts the blind.The system has one more advanced feature integrated to help the blind find their stick if they forget where they kept it. A wireless RF based remote is used for this purpose. Pressing the remote button sounds a buzzer on the stick which helps the blind person to find their stick.

The GPS module can trace the impaired people's current location. A caretaker can locate him through a mobile application. It makes him tension-free to move everywhere. The GSM module sends emergency messages to the family members if the impaired person faces any problem.

The obstruction identification module utilizes sonar and water level sensors to identify and recognize the type, location, and distance of obstacles from the blind person.The system generates outputs using an android app that provides a voice signal and a buzzer that creates sound. All specialties may fail if the stick gets lost. As a solution, an alarm system using a remote controller is introduced.

The controller has two emergency buttons called “A” and “B.” “A” is used to locate the stick while misplaced, and “B” is used to send a message to family members at the time of danger. The blind man can find his stick by pressing the emergency remote controller button. All the sensors, GPS, and GSM modules are connected to an Arduino and attached with a stick. This is our overall work of the project.

I. Circuit diagram:

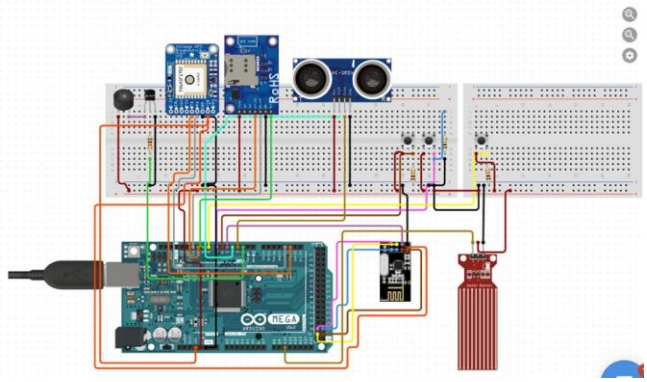

Fig. 4. Circuit Diagram of Smart Blind Stick

II. Application Workflow:

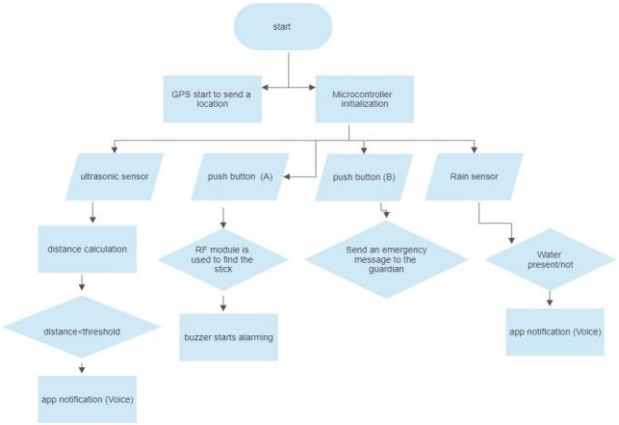

Fig. 5. Flow chart of application

V RESULT:

An internet connection is essential for the stick to work smartly. A caretaker can trace the blind person via the Blynk application when the GPS module is connected to the internet. First, the client must put a SIM card into the SIM900 module to use the stick. When the internet connection is established, the GPS gets

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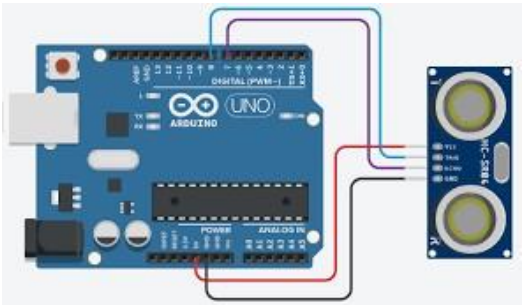
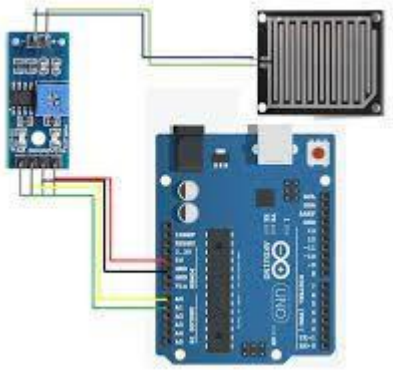
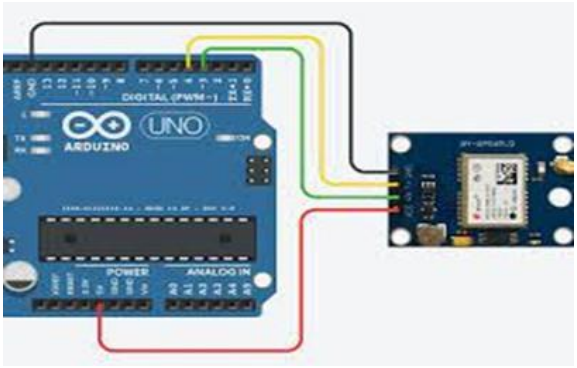
connected to the satellites to find the stick. When the blind man starts his journey to his destination, the intelligent stick guides him to find the path avoiding obstacles and danger. His location is traced every second, and his family member can trace him using the Blynk application. This will be our individual connections and desired outputs.



(a)



(b)



(c)

Fig 6,7,8. Arduino connections with different sensors

(a) -> Ultrasonic sensor connection model. It has a mobile app voice output for obstacle detection.

(b) -> Rain sensor connection model. It has a mobile app voice output for detecting the presence of water.

(c) -> GPS connection model. For location tracking purposes.

I.Experimental setup of Smart Blind Stick:

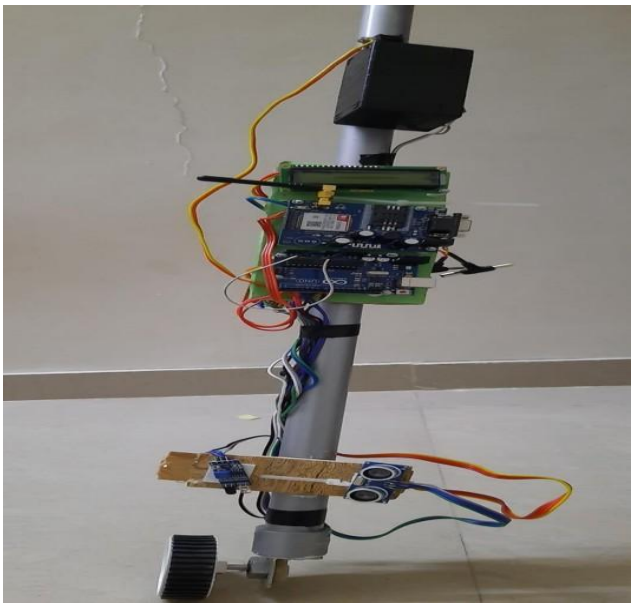


Fig. 9. Implementation of Smart Blind Stick

VI. CONCLUSION:

Today, the majority of our daily tasks are carried out using mobile apps on our smartphones. However, support is needed for those who have vision impairment to use mobile and tablet devices to access these mobile apps. Numerous mobile apps

for people with vision impairments have been created by Google and Android. The article focuses on the accessibility of mobile apps for blind users offered by the Android and iOS platforms. SmartStick" is more successful and intelligent. Due to their constant need for an intelligent stick, those who are weaker will benefit from the device's mechanical layout, which will allow them to move with confidence. The main goal is to promise and provide a stress-free lifestyle comparable to that of regular people. With the use of the Blynk app and GPS, impaired people can be located. By pushing the remote button, a blind person can send a text message to his carer if he runs into any difficulties. If he encounters hurdles, voice messages will guide him. If the blind man loses the stick, all other features are useless. An alarm is set using an IoT-based smart blind stick connected to a remote controller as a fix. This warning aids in locating the misplaced stick. Many people who use this visually challenged stick will lead happy and successful lives. While both obstacle detection and recognition are valuable in their own right, obstacle detection and recognition offers more accessibility features and the first has a longer battery life. The system runs continuously so that the visually impaired person can get updates on the obstacles in their path at any time. As a result, the visually impaired can comfortably carry out their everyday duties with the help of this intelligent stick and travel freely without worrying about getting lost or running into anything or someone. If a blind person runs into any difficulties, he can use the remote to send a text message to his carer. If he encounters hurdles, voice messages will guide him. If the blind man loses the stick, all other features are useless. An alarm is set via the Internet of Things-based smart If a blind person runs into any difficulties, he can use the remote to send a text message to his carer. If he encounters hurdles, voice messages will guide him. If the blind man loses the stick, all other features are useless. An alarm is set using an IoT-based smart blind stick connected to a remote controller as a fix. This warning aids in locating the misplaced stick. There are a lot of people who will use this stick, who is blind, will lead a happy and successful life. The second mode includes additional accessibility features, but the first has a longer battery life. The system runs continuously so that the visually impaired person can get updates on the obstacles in their path at any time. As a result, the visually impaired can comfortably carry out their everyday duties with the help of this intelligent stick and travel freely without worrying about getting lost or running into anything or someone.

VII. FUTURE SCOPE:

Nothing is flawless, thus even if the proposed design has many characteristics, it could still use certain changes that could be made in a later research.

For example:

Worldwide live tracking is possible without the need of an IoT platform.

1. Utilizing the most recent MEMS-based sensors, which are known for their low power consumption while keeping performance standards, can further optimise battery usage.
2. Adding new obstacles to the list of those that can be detected and identified without using "Second Mode with Detection and Recognition."
3. Detection and Identification of fast-moving vehicles with speed greater than 30 km/h.

It is possible to perform additional research on other polymers, metals, and composites to improve the stick's weight to strength ratio.

4. It is necessary to add more useful features to the app by incorporating and syncing the appropriate AI, ML, and DNN approaches.Therefore, utilizing the most recent technology, an intelligent stick with a variety of capabilities and room for future development was created and tested for the blind.

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