



# Assistive New Gen Smart Blind Stick Using React

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**Abstract.** Nowadays, with more traffic and a rise in the number of vehicle users, the visually impaired people find it difficult to travel around due to safety concerns. Moving even to locations that are accessible by foot becomes challenging. This paper provides a smart blind stick integrated with IoT that will make blind people's daily activities safer and more seamless and a React application for the guardian to track the location of the blind person. A sophisticated blind stick system that uses an ultrasonic sensor to detect objects before the blind stick comes into contact with them within a given range, and that signals impediments with a specific type of beep. Attaching a vibrator to the stick's handle to inform the user of the presence of water, this is done using a shorting system to detect the presence of water. The blind person can press a red button to send an alert message with geographical location to the guardian with the help of GSM and GPS through SMS. Panic alarm is used to gain the attention of the public when the blind person needs any help. A location tracking application developed using React integrated with GPS to obtain real time location with an interactive user interface for checking on the blind person while traveling.

**Keywords:** GPS · GSM · Photosensor · SMS · Ultrasonic Sensor · React

## 1 Introduction

Visually impaired people face problems such as communication, orientation and access to information in their daily lives. Due to this blind people do not live like other people. To make blind people's lives easier, an assistive new gen smart blind stick using react that can detect obstacles and allow blind people to travel without worry is developed. Alerts will inform users and reduce the crash rate. The system introduces the concept of technology assistance for visually impaired in private and public spaces. The device includes ultrasonic sensors, water sensors and buzzer. Haptic feedback provides users with tactile sensations (such as vibration or tapping) to share information. The React-based mobile app serves as the real time location monitoring system used by the guardian.

### 1.1 Internet of Things (IoT)

The IoT enables any object to send and receive data by being connected to the internet. This network of connections enables efficiency, automation, and data-driven decision-making in a number of industries, including smart homes, transportation, and healthcare. IoT devices, which can be anything from basic sensors to intricate machinery, increase productivity and convenience but can give rise to privacy and security problems. IoT is redefining how we engage with technology and the world around us by collecting and analyzing enormous volumes of data.[1].

### 1.2 React.js

React.js is a powerful JavaScript library for creating user interfaces for IoT-based navigation systems. By integrating React with IoT devices such as smart canes or GPS-enabled wearables, developers can create intuitive and responsive user interfaces. These interfaces facilitate real-time use, providing clear and easily accessible information to users who are visually impaired or have navigation problems. React allows navigation data to be dynamically generated, providing instructions, alerts, and contextual information to ensure users reach their destination efficiently and safely. Integration of React.js with IoT technology improves user experience and makes navigation more intuitive and efficient.[2].

### 1.3 Global Positioning System (GPS)

GPS technology uses a network of satellites to communicate positioning data, allowing for extremely accurate tracking and guiding of blind people. With its many applications, including helping the visually impaired move around, the GPS has revolutionized location-based services and navigation. For blind persons to be safe, GPS tracking is necessary. The option for caregivers, family members, or support services to remotely monitor their locations adds an additional layer of security. In an emergency, it is feasible to act fast and provide assistance thanks to technology.[3].

## 2 Related Work

This research paper seeks to define Internet of Things that will consider the image of time, freedom and certainty. The smart plan is equipped with obstacle detection, Global Positioning System, stair and tunnel detection, water detection and Global Telecommunication System (GSM) for fast operation every day. The obstacle recognition system uses ultrasonic sensors and water level sensors to distinguish problems, thereby indirectly detecting problems and identifying problem patterns. Arduino ATmega328 is used to inform people's bodies about discomfort and send notifications using headphones and buzzers [1].

Sensitive user data collection and processing techniques and functions are frequently included in mobile apps. React offers a dependable and dynamic user interface. It mentions that creating react-based applications requires a familiarity of JavaScript. It highlights the essential justifications for creating these kinds of applications.[2]. This article develops a conceptual model of the blind that uses sensor technology to help the blind stay alert and mobile. The tracking of the user's location is done by using GPS and the GSM module is used to notify the user's location to their parents or guardians [3].

The purpose of this research is to develop an IoT based stick that will perceive opportunity, independence, and assurance. An obstacle identification module that is the ultrasonic sensor, a global positioning system (GPS), water detection, pit and flight of stairs detection, and a global system for mobile communication (GSM) are all planned features of the proposed smart stick [1].

In wide beam angle ultrasonic sensors provide a wide range of relevant information. The main disadvantage of infrared sensors is their nonlinear response. So, a large change in output voltage does not mean a large change in range. The main function of the system is to provide clear information and awareness about the environment. With the help of electric blind canes, people's travel speed can increase by more than 1520% [4].

This article presents the application of an ultrasonic sensor-based rod for the visually impaired. Ultrasonic sensor module HC-SR04 is used to detect objects in the blind people's pathway and triggers the buzzer to alert the blind person. The visually impaired people can use this cane for safety. The proposed system was implemented using PIC microcontroller 16F877A. It can detect objects between 5 and 35 cm [5].

According to the journal, the suggested system is a superior option and, of course, responds faster because it is less expensive, dependable, portable, and energyefficient. Because the system only has sensors and jumpers, it is lighter overall. Expanding the ultrasonic sensor's range will improve the system's accuracy. The integration with GPS is the future development that is mentioned [6].

The blind stick's ability to identify items in front of it is the only feature in the system. The user's stick has an ultrasonic sensor attached to it. The ultrasonic sensor and Arduino Mega attached to the stick attempt to identify any obstacles in its path as the user advances the stick. The receiver's output changes when the sensor detects an obstacle, and the microcontroller is able to detect this change because the receiver's output serves as an input [7].

The article describes a low-cost 3D ultrasound blind stick that will assist blind individuals in becoming more independent. A warning sound will emit when an issue is found. An SMS system is also included with the stick. In an emergency, visually challenged individuals can utilize the SMS system to send texts to numbers stored in the microcontroller. The audio broadcast's programming was finished by this system [8].

The article details the planning and creation of a smart blind stick that can help those who are blind or visually impaired. An SMS system is included with the blind stick. In an emergency, visually challenged individuals can utilize the SMS system to send texts to numbers stored in the microcontroller. It suggests a cheap blind stick and provides creative applications for the visually impaired [9].

The goal of the project is to assist the blind by developing object detection and intelligent voice-based navigation systems. This article focuses on fresh approaches and tactics that offer practical means of boosting independence and movement in individuals with visual impairments [10].

The “Handheld Smart Stick” is a unique assistive technology that can help those who are blind or visually impaired, according to the research. With the help of this new technology, which offers people direction and assistance in their immediate surroundings, their mobility and freedom will be enhanced. The qualities and capabilities of this smart stick, which will help the visually challenged community, are examined in this article.[11].

The modern technology offers object identification and real-time navigation with the goal of further enhancing mobility and safety. The beneficial effect of this smart cane on blind people’s daily life is highlighted as the development and its positive aspects are discussed [12].

According to research, there are new gloves that can serve as a “third eye” for people who are blind or visually challenged. This article addresses the creation and possible applications of this innovative technology to give visually impaired people movement and independence [13].

The article’s study focuses on developing voice-recognition smart canes to aid the blind in their daily activities. This article addresses the development and application of this assistive technology and emphasizes its advantages for maintaining the safety and mobility of those with visual impairments [14].

The goal of the project is to create a smart cane that uses GPS to improve vision for those who are blind or visually challenged. It also contains sensors to help in navigation. This article covers the new technology’s development process, features, benefits, cost-effectiveness, enhanced mobility, and safety for the blind [15]. The design and optimization of rods with optical sensors is detailed in the journal. The purpose of this innovative cane is to improve blind people’s vision through gaps and other obstructions. The design, operation, and optimization of these assistive devices—which could improve the mobility and safety of the blind—are addressed in this study [16].

This paper describes the development of a new smart blind stick based on Arduino that is intended to assist the blind. Technology facilitates safety and mobility by giving instantaneous direction and guidance. The creation and use of this remarkable assistive technology, which offers priceless assistance to those who are blind or visually impaired [17].

### **3 Existing System**

The blind stick contains water, ultrasonic, and infrared sensors to aid in obstacle detection. Obstacles may be identified using an ultrasonic sensor up to three meters distant. A GPS module can be used to find and navigate the blind stick. Through GSM modules, individuals with vision impairments can phone emergency services in an emergency or convey important messages to their caregivers [1].

One significant drawback of existing location tracking technology is its limited ability to get real-time location. The smart blind stick with sensors and GPS is a great attempt, but it is not without its shortcomings. The absence of real-time location monitoring significantly impacts the safety and efficacy of navigation for individuals with visual impairments. The ability of the guardian to make informed decisions may be hampered by the inability to give them quick and current location information.

The absence of panic alarm makes it difficult for the blind person to intimate other that they need help immediately. Not every essential feature is included in a single blind stick.

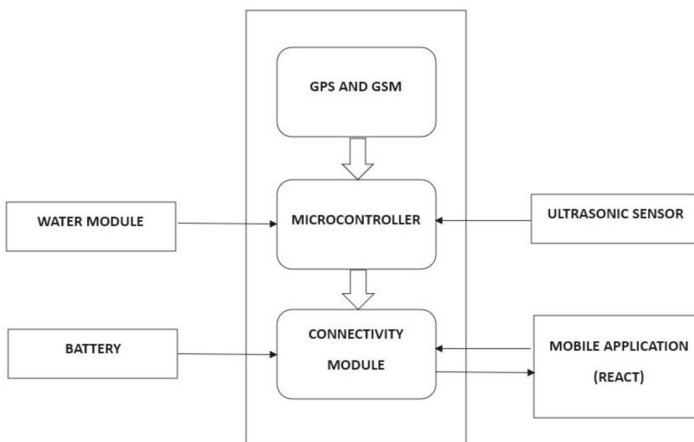
## 4 Proposed Work

### 4.1 Overview

To dodge the risks faced by blind people we incorporate the technology with the regular blind stick. The concept of IoT has contributed in developing new and unique devices for simplifying each and every task. The uses of the currently available smart blind sticks, which use ultrasonic and water sensors to aid the blind navigate, are still slightly restricted. Although these technologies are useful, they often don't provide reliable guidance or sufficient security precautions.

The introduced smart blind stick (see Fig. 1) is a thorough solution with all required functions. The development of the newly added panic alarm, combines a button and buzzer, visually impaired individuals can now take use of a user-friendly emergency warning system. With this creative function, users only need to press the button multiple times to make the buzzer loud and noticeable, thus drawing attention to themselves and asking for assistance. This emergency notification system comes in quite helpful since it can help you in numerous scenarios where the blind person needs help immediately.

GSM and GPS are integrated into the React-based location monitoring application to track blind people in real time while they travel. Guardians can ensure safety by



**Fig. 1.** System Architecture

monitoring their route through an interactive user interface. The blind person's latitude and longitude are accessible to the Guardian.

The blind stick includes a red button that can be used to send an SMS alert to the Guardian saying, "Help Me" with the current location. All the user needs to do is press the button when needed. The blind person can send an SMS to their guardian informing them of their current location, and also the guardian can use the React application to track the blind person at any moment.

The ultrasonic sensor, which is used to detect items within 60 cm and alerts the blind person with a buzzer when it does, is one of the other extra features. The vibrator at the handle activates when the water module detects the presence of water.

## Methodology

*Ultrasonic Sensor.* It uses sound waves that are inaudible to humans to measure distance by measuring the amount of time that passes before the sound stops affecting an item.

- i. The Arduino activates the sensor for measuring distance via sending the Trig pin a short pulse.
- ii. Following that, the ultrasonic sensor transmits sound waves that bounce back to the sensor from an object.
- iii. The length of time it takes for the waves to return, or the echo duration, is determined by the sensor.
- iv. The distance is calculated by the Arduino using the formula:

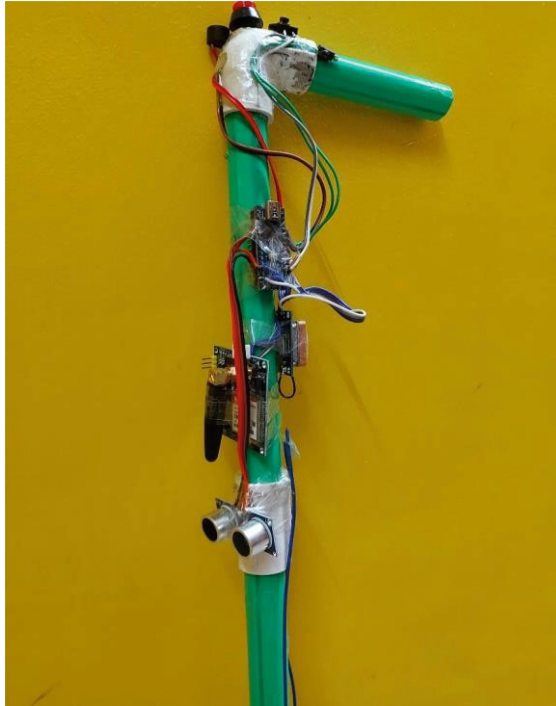
$$\text{distance} = (\text{duration} * \text{speed of sound}) / 2 \quad (1)$$

### *React And GPS*

- i. To Configure the Arduino, plug the Arduino board to your GPS module. Considering GPS modules normally communicate by means of UART (serial communication), join the Arduino's RX pin to the GPS module's TX pin and vice versa.
- ii. Give the Arduino and GPS module the right amount of electrical power.
- iii. To read and deliver GPS data over serial communication, upload a basic Arduino program.
- iv. Install node.js to set up the backend, followed by creating a directory and a file called server.js containing the backend code.
- v. Launch the React app after setting it up.

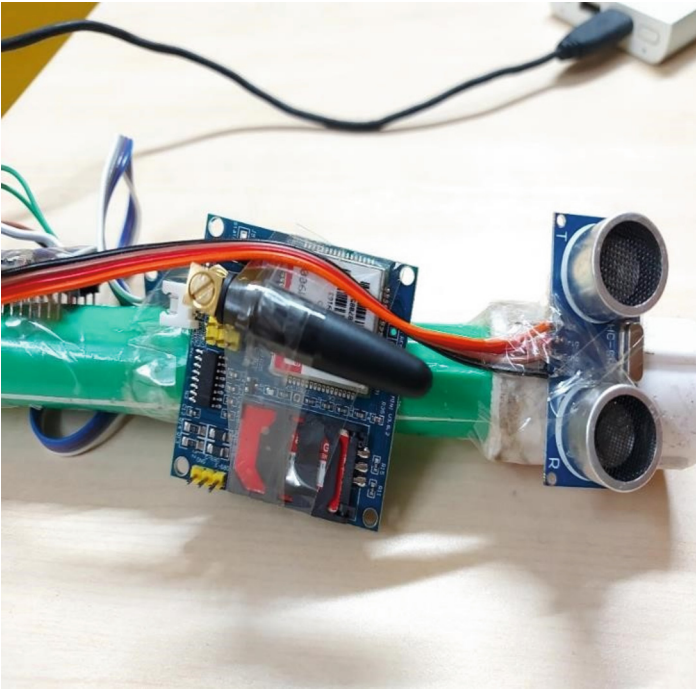
## 5 Result and Discussion

The purpose of the smart blind stick is to help people with vision impairments navigate their environment effectively and safely. It offers a complete solution for the user's demands by combining a number of sensors and technologies (see Fig. 2).



**Fig. 2.** Smart Blind Stick

To identify obstructions in the user's route, an ultrasonic sensor is employed (see Fig. 3). The system detects the time it takes for high-frequency sound waves to bounce back after it releases them, enabling it to calculate the distance to surrounding objects. Then, the user receives feedback from this data in the form of audio alarms that assist in preventing collisions. One safety feature that can identify the existence of water such as puddles or damp surfaces and warn the user of potential risks is the water sensor (see Fig. 4).

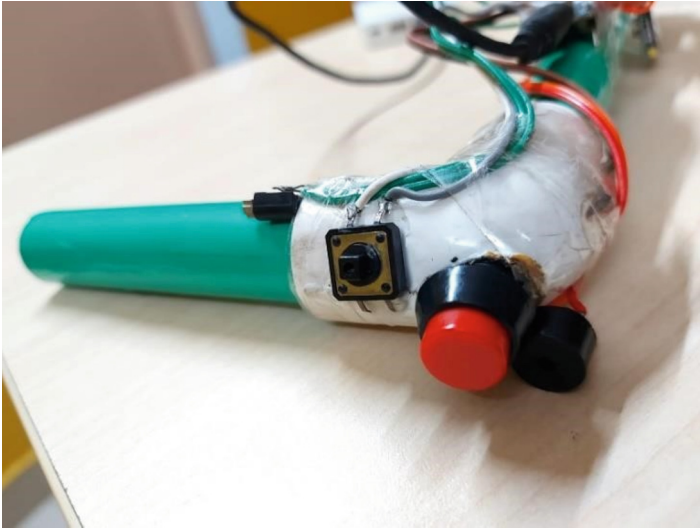


**Fig. 3.** GSM and Ultrasonic Sensor

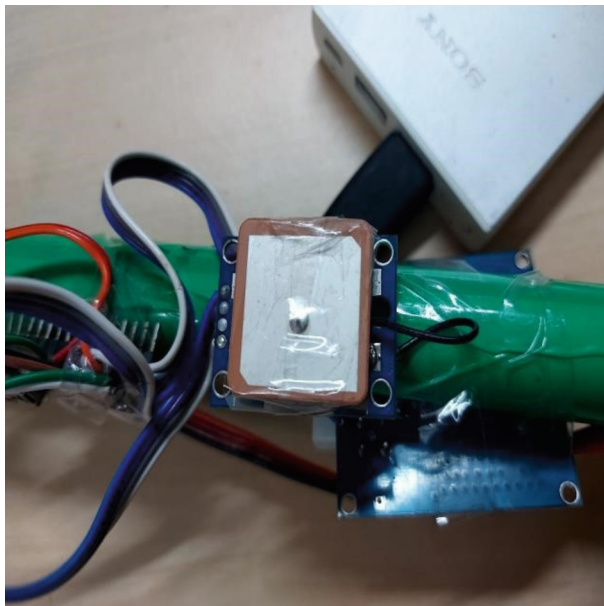


**Fig. 4.** Water Module

There is a significant safety element that the user might trigger in an emergency is the panic alarm (see Fig. 5). When the keeps pressing the button, it makes a loud noise to draw attention and provide prompt aid for the user.

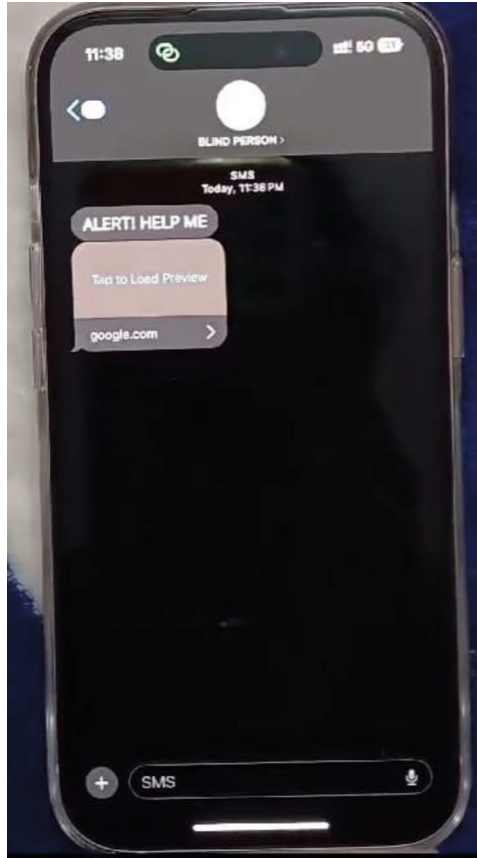


**Fig. 5.** Vibrator, Panic alarm, Red button to send SMS, Buzzer (Color figure online)



**Fig. 6.** GPS

A key component is that the blind person can press the red button to send alert message with their current location through SMS. The current location is obtained using GPS (see Fig. 6). If they require assistance, they can discretely and promptly alert their guardian. The application will open Google Maps immediately and provide the guardian the precise location of the blind stick in real-time when they click on the current location obtained through SMS (see Fig. 7).



**Fig. 7.** Alert message sent by the blind person

The React application contains a “Get Coordinates” button. When the guardian clicks this button, the application displays the current latitude and longitude coordinates, together with the real-time location of the blind stick, on the screen (see Fig. 8). The obtained data can be updated by clicking on the button again.

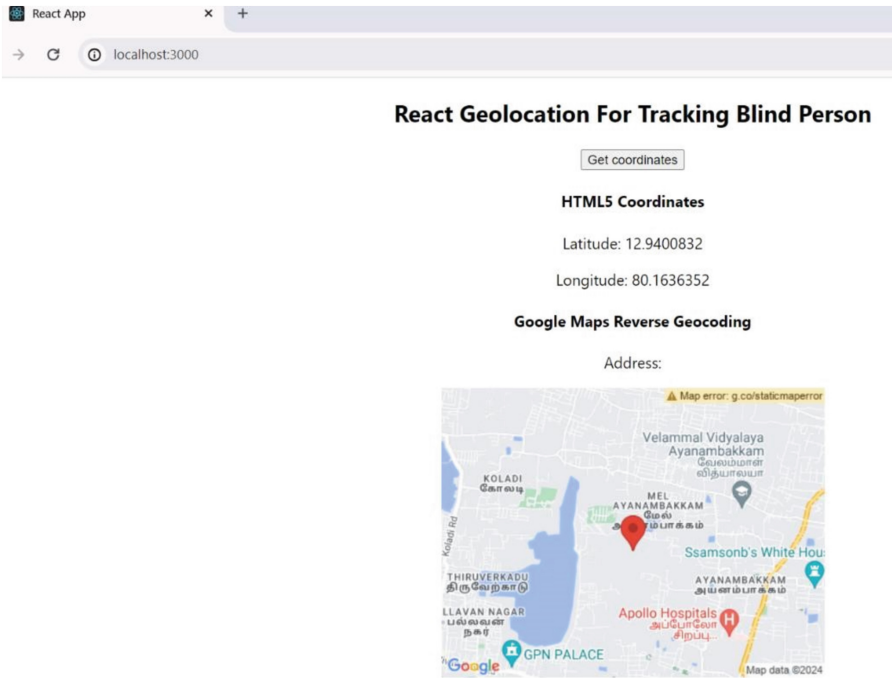


Fig. 8. React Application

## 6 Conclusion

The development of a new generation of smart canes powered by React and IoT marks a major advancement in assistive technology and is profoundly impacting the lives of the blind. React's model-based approach helps customize user interactions based on user needs in terms of user experience and performance. Integrated IoT improves device performance by enabling data storage and connectivity to a network of sensors and devices. This gives users important information about the environment, finds obstacles, and uses GPS to operate effectively, giving them freedom and confidence. This not only prevents accidents but also improves geographic awareness and makes navigation easier. From a social perspective, these new technologies can improve the independence, self-confidence, and social relations of visually impaired people and provide many opportunities for employment and participation in society. Ultimately, the Smart Cane represents a game-changer that allows blind people to live safer, more independent lives through technology.

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