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IntelliCane - A multi-functional stick for blind using IoT

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Abstract: *Although people's lives have been significantly enhanced by the quickly changing field of technology, issues still exist, especially for the blind and visually handicapped who find it difficult to carry out daily tasks. We offer the Smart Stick, a cutting-edge remedy that goes beyond the limitations of conventional blind sticks, to solve this problem. The Smart Stick is a reliable companion for individuals with visual impairments that makes use of cutting-edge technologies to guarantee secure navigation and improved connectivity. This device, which is mounted on a white cane, has been fitted with ultrasonic sensors, water detection sensors, a MEMS sensor for fall detection, and a GPS system to give the user a comprehensive view of their surroundings. Obstacles are recognized by the ultrasonic sensors, puddles are identified by the water sensors, and falls are monitored by the MEMS sensor. The device interfaces smoothly with a smartphone, making use of the Arduino IDE and Blynk IoT software for circuit design and prototyping. In the event of an irregularity, such as an impediment or a fall, the system sends notifications to selected guardians or parents via the Blynk IoT App, providing immediate updates on the user's position. This holistic approach not only promotes the safety of visually impaired individuals during mobility, but also enables better communication and support systems, encouraging a healthier and easier living for those with visual impairments.*

Keywords: *IoT, GPS, Object detection, Moisture detection, Fall detection, Alerts, cutting-edge technologies, IDE and Blynk IoT software.*

I. INTRODUCTION

According to the ancient philosopher and scientist Aristotle, our awareness of the outside world is based on five sensory organs, one of which is vision. Visually impaired individuals are either completely blind or have a problem with visual

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awareness. Around 2.2 billion people have near or far vision impairments. Adults with visual impairment have a substantial impact on their quality of life. Adults with visual impairment have lower labor-force participation and productivity rates, as well as higher levels of anxiety and sadness. Older persons are more prone to falling due to eyesight issues. Similarly, people may have trouble walking and carrying out daily tasks, as well as feeling socially isolated. Compared to other disabilities, visually impaired people suffer the most dangers and difficulties. Eyesight is one of our most important senses, accounting for around 80% of what we feel or perceive. When other senses, such as hearing and smell, fail, our eyes are the most effective defense against danger. As a result, persons who have visual perception issues must rely upon their aural or tactile senses for vision. Increasing the number of people with visual disabilities attracts the attention of researchers to develop numerous breakthroughs in the field of assistive technology, expecting that these innovations can help visually challenged individuals perform their activities in regular day-to-day life, Vision is the most important part of human physiology since it conveys 83% of the information we get from our surroundings. According to World Health Organization (WHO) data from 2011, there are 285 billion people worldwide with visual impairments, with 39 billion blind and 246 billion having impaired vision. Walking canes, often known as white canes, sticks, or guide dogs, are the oldest and most common mobility aids for people with vision impairment. The most prominent disadvantages of these aids are the necessary skills and training period, the range of motion, and the limited information provided. The rapid growth of contemporary technology, both in hardware and software, has provided the possibility of intelligent navigation capabilities. Blind persons now use a white stick to guide their movements and walks. Here, we create a device that functions as a blind stick while being more efficient and useful than the regular form. This will assist blind people on their walks by sounding an alarm whenever an obstruction is identified within the designated distance. The concept is based on a theoretical model and a system concept that would provide blind people with a smart electronic help for sensing depth while navigating barriers, as well as stick vibration circuits to alert obstacle notifications.

The term 'visual impairment' (VI) refers to poor vision that cannot be corrected by surgery, medicin, or refractive lenses or spectacles. As a result, it causes cognitive

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visual system anomalies such as persistent vision loss, a narrower visual field, lesser contrast sensitivity, higher glare susceptibility, and decreased ability to do daily activities such as reading and writing. People who have a horizontal vision field of less than or equal to 20 degrees with both eyes open (normal vision field is 180 degrees horizontally) or a visual acuity of 6/60 according to the Snellen chart are considered blind. Various limits exist, preventing people from performing even routine tasks that vary from person to person. Among the infirmities, the visually handicapped have the most hazards and challenges. One of the most difficult challenges that visually impaired people have is getting from one area to another. Sightless people cannot go about their daily activities, such as going down the street, visiting friends or family, or performing other tasks. They must be attentive at all times to avoid accidents like colliding with barriers and slipping on the ground. When using a standard blind stick, blind people have difficulty identifying obstacles or stairs. Blind travelers must rely on alternative guides such as blind canes, human knowledge, trained canines, and so on. Developing countries account for approximately 90% of the world's visually handicapped population. There is no safety.

Fig.1 Person helping to blind

II. LITERATURE SURVEY

They've introduced a blind stick that has an ultrasonic sensor and a potentiometer. This project will employ ultrasonic sensors to detect obstructions with ultrasonic waves. After detection, the sensor sends the data to the Arduino Uno. The Arduino UNO then assesses the input to determine whether the obstruction is close enough. Nothing happens unless the barrier completes the circuit.If an object approaches the sensor, an alarm will sound. The suggested smart blind stick has an ultrasonic sensor. When an object enters the range of the ultrasonic sensor, it is detected and a buzzer sound is emitted to inform the user to the situation. The project shows how to make an ultrasonic blind walking stick with an Arduino.Their work includes developing sticks that sense obstructions. They used two approaches to convey information to the blind. They incorporated a vibration motor within the stick's hand and a buzzer to alert the user

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to an impediment. They created smart sticks for blind people for a variety of reasons, including the fact that they let the blind feel more free because they are not encircled by wires like a belt. Second, it is easy to use because to its familiarity and low cost. Third, he must be able to distinguish barriers on the ground (this is not achievable with glasses), as he wanders both indoors and outside, encountering obstacles such as puddles.

The smart walking stick helps blind individuals explore and work more effortlessly and pleasantly. Normal sticks cannot identify obstructions, making them ineffective for vision impaired people. Because the blind individual cannot distinguish what types of things or objects are in front of them. The person cannot determine the size of the thing or his or her distance from it. Blind persons have difficulty moving around. A smart walking stick recognizes an object by employing an ultrasonic sensor to determine the distance between the object and the user.

III. PROPOSED SYSTEM

Getting around, whether indoors or outdoors, is one of the most difficult tasks for the visually impaired. Furthermore, the poor state of the roads makes walking outside even more difficult for them.They must remain vigilant at all times to avoid dangerous situations such as colliding with stationary or moving obstacles, or slipping on damp terrain. They may also be distressed and wish to send an alarm message to their relatives or friends about their whereabouts. The issues that blind individuals face can be solved with the use of technology. To offer a medium between the blind and the environment, the suggested solution uses the Internet of Things (IoT) paradigm. Several sensors can be used. Obstacles, and damp terrains are all examples of abnormalities that can be detected. The smart blind stick prototype presented here is a simple, intelligent, and cost-effective smart blind stick with a variety of IoT sensors and modules. Also included in this solution is the ability to send a message to those who are concerned about the user's whereabouts. The IoT-based smart stick for blind persons is planned with impediment discovery module, water recognition, front obstacle detection, pit localization utilizing different sensors. GPS modules are used to make daily work easier. The GPS module can trace the impaired people when they get out of the home. A caretaker can locate him through a mobile application. It makes him tension-free to move everywhere. The module sends emergency messages to the family members if the impaired person faces any problem. The obstruction identification module utilizes sensors to

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identify and recognize the location, and distance of obstacles from the blind person.The system generates outputs using a buzzer that creates sound and a vibration motor.The proposed system also uses another sensor for the detection of fall i.e either the detecting the fall of stick or person and sends the information to the guardian through the app.The GPS (Global Positioning System) is a "constellation" of 31 evenly spaced satellites that circle the Earth and allow people with ground receivers to identify their geographic location. Location precision ranges from 100 to 10 meters for standard equipment and one meter for special military-approved equipment. GPS equipment is widely used in science and has recently become fairly affordable, allowing almost anyone to own a GPS receiver.

IV. FUNDAMENTALS OF IoT

The Internet of Things (IoT) is a network of physical devices, autos, appliances, and other items that use sensors, software, and network connectivity to collect and share data. These "smart objects" can include everything from small "smart home" products like smart thermostats to wearables like smartwatches and RFID-enabled apparel to huge industrial machines and transportation networks. Technologists envision entire "smart cities" built on IoT technologies.

IoT enables these smart devices to communicate with one another as well as other internet-enabled devices like as smartphones and gateways, resulting in a large network of interconnected devices capable of exchanging data and executing a variety of functions autonomously. This could include monitoring environmental conditions in agriculture.

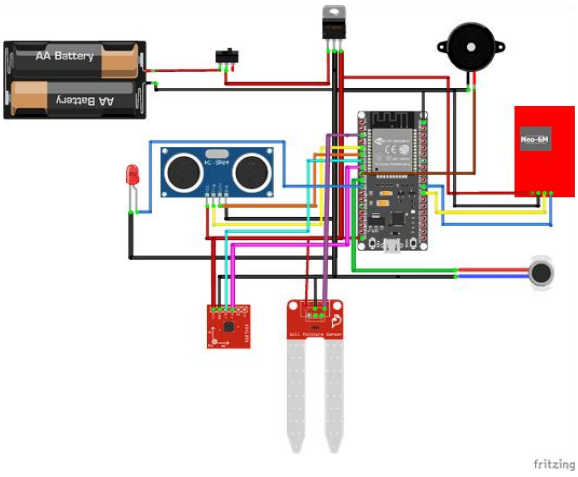

Fig.1 System Architecture

The project is intended to be developed as tool or aid that will help blind people in moving or travelling .the dependency on others is reduced and these people can become more self-reliant.

This built around ESP32 controller. The user moves the stick in the forward direction to detect obstacles using ultrasonic sensor and Moisture sensor in a conjunction. These sensors are mounted on the stick of the blind person. If any object present in the path the sensor detects the

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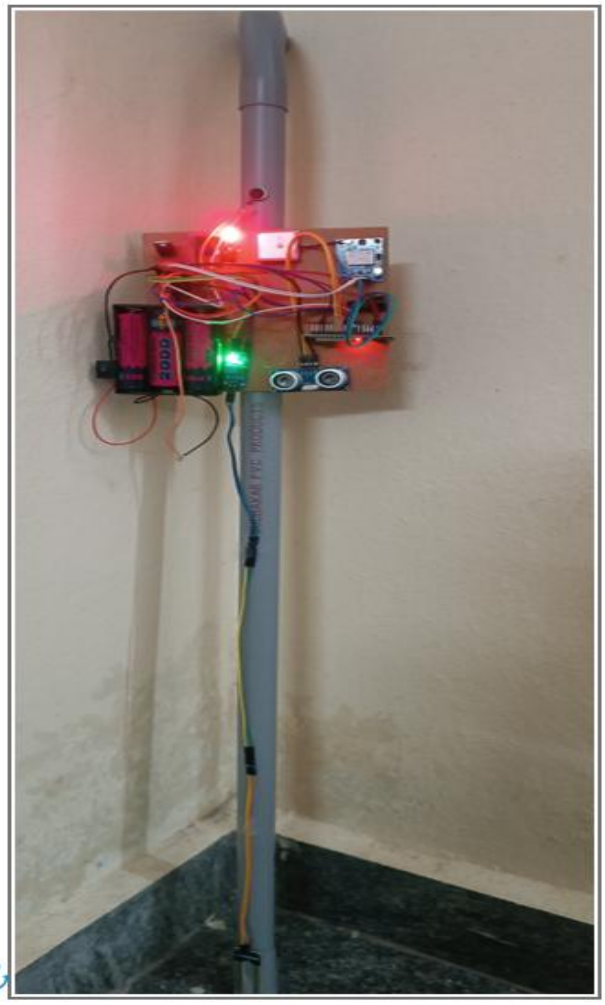
obstacle then the receiver triggers and this change will be detected by the micro controller since the output of the receiver is given as input to the micro controller. Thus the micro controller ESP32 immediately alerts the buzzer and soon it receives the output from any of the sensors. The entire controlling unit will be fixed to the hand stick. Then the user can change the direction to avoid any kind issues or obstacles.



Block diagram

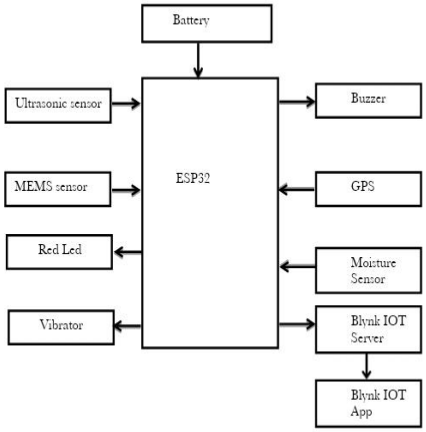
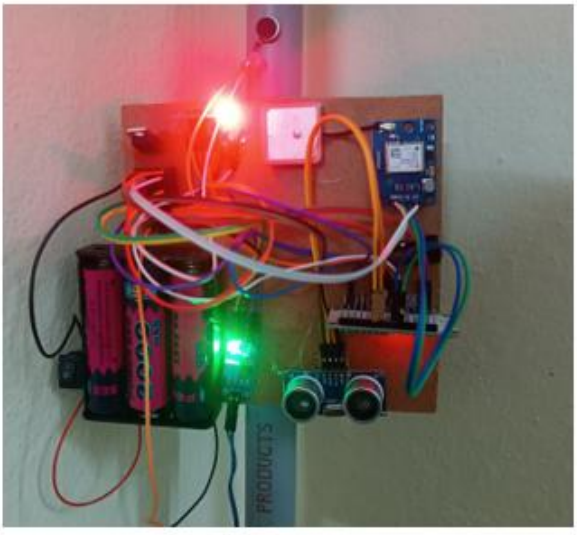


Fig.2 Bock diagram



V. RESULTS

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VI. CONCLUSION

This project is well-prepared and is running in accordance with our initial specifications and requirements (including all hardware and software). Because of its creative character and design, the idea of carrying out this project is novel, and the possibilities are endless.

The smart blind stick lays the groundwork for the next generation of assistive devices designed to keep the visually impaired safer. It is both efficient and inexpensive. It performs well at identifying obstructions ahead of the user and detecting water pits. This system offers a low-cost, trustworthy, portable, low-power, and long-lasting navigation solution with a noticeable fast response time. The system is hard-wired with sensors and other components, although it. One of the project's future goals is to increase the system's capabilities by adding landmarks as saved destinations. Developing a location and velocity algorithm that will enable other navigation approaches, such as dead reckoning, to be accurately used. And to use the internet route to retrieve a route from Google Maps, allowing the blind person to get to destinations not in the database. This is included into the cane to provide the blind a sense of safety. This endeavor can be improved by including wireless LAN connections that support GPS.

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