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SMART BLIND STICK FOR VISUALLY IMAPIRED

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ABSTRACT-

Travelling alone presents a significant challenge for people who are blind or visually impaired. Although efforts have been made to provide innovative solutions for the blind, these solutions' shortcomings mean that the issues facing those who are visually impaired remain unresolved. The project puts forth an original idea for a smart blind stick with a face recognition system for visually impaired individuals to aid blind people in daily navigation and in identifying those around them. The project is focused on creating a smart blind stick that can help the blind by employing several sensors attached to the stick. The designed stick can identify hazards including stairs, water, vibration, and fire and alert the blind person to them via both haptic and audible feedback. The Stick also has a help me button that will instantly notify the family of a blind person if that person needs assistance and a GPS modem that can track their location in real time. The blind stick has a camera installed on it that will be used to take pictures of obstacles as they are encountered, identify the type of barrier using deep learning and object identification, and inform the blind person via aural feedback. The suggested solution connects to a cloud server using IOT protocols and a web app for Android.

Keywords: Visually impaired, Deep learning, Haptic, IOT, Obstacle, fire, water, Stair case, Location, help, Android, Web application etc.

Introduction

Since 83% of the information that humans receive from their surroundings comes via sight, vision is the most crucial component of human physiology. According to World Health Organisation (WHO) figures from 2011, there are 285 million visually impaired people in the world, of whom 39 billion are blind and 246 have limited vision. The walking cane, commonly known as a white cane or stick, and guide dogs are the most conventional and established mobility aids for those with vision impairments. The most significant drawbacks of these devices are the required training and abilities, the range of motion, and the minimal amount of information provided. With the quick development of modern technology, both on the hardware and software fro created and planned to aid blind people in safely and independently navigating. nts, sophisticated navigation capabilities may be offered.

Fig 1: Model of Smart Blind Stick for visually impaired

Over 15 million of the estimated 37 million blind individuals in the world are from India. The presence of too many impediments can be troublesome even for those without visual impairments, but it is especially bad for those who are blind. People with visual impairments frequently require outside help, which may come in the form of trained canines, people, or specialised electronic gadgets that act as decision-support systems. Existing sensors can

detect and identify objects that suddenly appear on the floor, but there is also a significant risk from objects that are suddenly deep, obstacles that are higher than waist level, or staircases.

LITERATURE REVIEW

Smart Stick for Blind: Obstacle Detection, Artificial Vision, and Real-time Assistance via GPS was developed by Shruti Dambhare and Prof. A. Sakhare [1]. To provide smart electronic help for blind individuals, they presented a theoretical model and a system concept. The system's overall measurements are meant to include artificial vision and object detection as well as real-time GPS support. The system consists of auditory and vibratory feedback circuits, proximity sensors, ultrasonic sensors, a GPS module, stereo cameras, and a dual feedback system. The total system's goal is to offer blind people a low-cost, effective navigation tool that gives them the impression of artificial vision by supplying details about the environment and the static and moving things nearby.

The 3D Ultrasonic Stick for the Blind was created by Osama Bader Al-Barrm and Jeen Vinouth [2]. Ultrasonic sensors are used in the design and development of a portable stick that helps the blind avoid potential hazards. These three scanning sensors, a microprocessor, a buzzer, and a DC vibration motor make up the device. When an obstruction is detected, the alarm and vibration motor are triggered. The stick also includes a GPS and SMS messaging system. Using a stick, a blind person can use a GPS system to communicate his location to his family. In an emergency, the blind can use the SMS system to send SMS messages to the saved phone numbers on the microcontroller. This system's buzzer, GSM modem, vibration motor, and GPS modem have all been successfully programmed. The system's performance is simulated on a computer using Proteous software and the Easy Pic kit.

Deepak Kumar, Abhishek Bhardwaj, and Ankit Agarwal Ultrasonic Stick for Blindness was created by [3]. A compact, user-friendly tool has been created that uses cameras and ultrasonic sensors to detect obstructions in the way. Three separate directions can be scanned by ultrasonic sensors (at 180 degrees). In the surroundings, a camera can be employed as an alternate tool.
Smart White Cane: An Elegant and Economical Walking Aid was created by Rahul Chaudhari, Shalaka Laddha, Surabhi Rajandekar, and Rohit Sheth [4]. The purpose of the stick's design was to maintain a structurally similar object that was thin, lightweight, and simple to use while also alerting the user to potential risks in his route. The ultrasonic sensors on the smart white cane are positioned such that they can detect low-lying, knee-level, and even above-the-waist impediments such as pits, potholes, downfalls, staircases (up and down), and obstacles above the waist. Pre-recorded auditory messages and haptic feedback in the form of vibrations inform the user of the situation. The likelihood that the user may hurt themselves will be greatly reduced as a result.
An electronic walking stick for blinds was created by Shashank Chaurasia and K.V.N. Kavitha. They assert that although blind people have sharp haptic perception, they have significant difficulties using white canes to navigate stairs or the roadway. The electronic walking stick will benefit the blind person by giving them a more practical means of transportation and specifically They are responsible for providing the blind and disabled population with services and knowledge.
An Intelligent Walking Stick for the Blind was created by Kher Chaitrali S., Dabhade Yogita A., Kadam Snehal K., Dhamdhere Swati D., and Deshpande Aarti V. They suggested a navigation tool for the blind that uses infrared sensors, RFID, and Android devices to provide speech output for obstacle prevention and navigation. The proposed device is used to guide those who are blind or partially sighted. With the use of this tool, blind individuals can travel with the same comfort and assurance as sighted people. The gadget contains infrared proximity sensors. Both public buildings and blind people's walking sticks have RFID tags embedded.

PROPOSED METHODOLOGY

The project entails the creation of many components. The various modules that were created for this project are listed below:

1.The Blind stick Module:

The project's main component is this. The blind stick hardware is designed in this module. As part of the hardware development process, several sensors are interfaced to the controller and then programmed to produce the desired results. The sensors that are interfaced are the vibration, fire, obstacle, water, and stairs sensors.

2. The object recognition module:

The object recognition system is developed at this phase. The camera's interface with the NPU is what the module consists of. The deep learning-based object identification system, which is installed on the NPU chip, uses audio feedback to alert the blind person to the sort of barriers in front of them. The ESP32 microcontroller and NPU are connected via the serial communication protocol.

3. The Emergency Help Module :

The creation of an emergency support system is the focus of the emergency aid module. Both the front ends of web applications and Android devices receive help notifications from the emergency support system. The blind individual taps the emergency help button whenever they are in need. This button will send a message to the cloud and send SMS messages to the blind person's relatives so that they can receive emergency assistance.

4. The SMS module:

Has been created that will send SMS messages to the registered numbers of a blind person's relatives.

Components used in the project:

1. Flame Sensor: This tiny flame sensor infrared receiver module ignition source detection module is Arduino compatible and may be used to find flames or light sources with wavelengths between 760 and 1100 nm. It can also be used to find lighter flames at a distance of 80 cm.
The test distance increases as the flame size increases. It is extremely sensitive to the flame spectrum and has a detection angle of 60.
It generates a single-channel output signal at the D0 terminal for processing by a switching system or an alarm system, for example. With the aid of the blue potentiometer located on the board, the sensitivity can be changed.

Fig 1 flame sensor

2. Ultrasonic sonar sensor: Extremely close-range (2 cm) to far-reaching (4M) detection and ranging are offered by ultrasonic distance sensors. The sensor offers highly accurate, precise, and consistent non-contact distance measurements from roughly 2 cm to 4 m. Any microcontroller can simply be interfaced with it.

fig . 2 ultrasonic sensor

3.Water Sensor : In order to quantify droplet or water volume and gauge the water level, this water level sensor module contains a series of parallel exposed traces. The output of the analogue signal is precisely proportional to the water level, making water level monitoring very simple. Both the analogue input pins on the Arduino and the ADC can be directly linked to read the output analogue values.

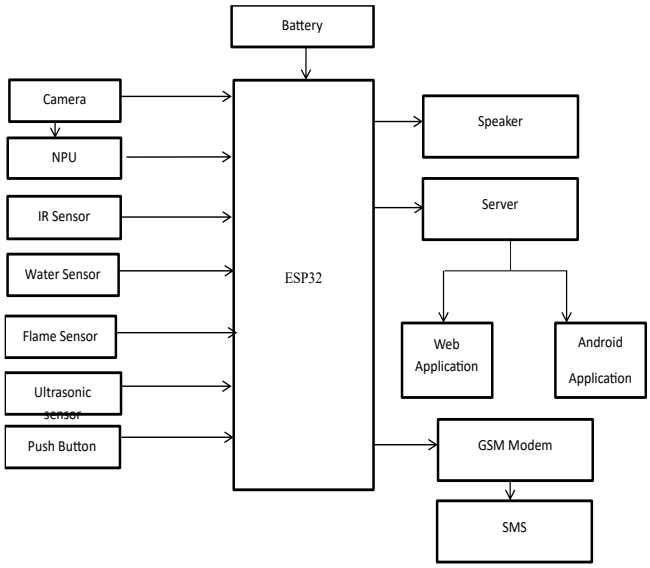
Fig .3 flame sensor

WORKING PRINCIPLE

As can be seen in the architecture diagram up top, the project uses speech recognition and object detection to improve accessibility. The system's processing core, which is interfaced with the camera, is made up of an AI NPU and an ESP32. The camera takes pictures near the developed blind stick and uses object detection and deep learning to assess the type of barrier in front of the blind person. system has the most recent information on the area around the car.

The blind stick is interfaced to the GPS. The specially designed stick is wired with many sensors to assist the blind person in perceiving various items in daily life. The newly created blind stick is capable of detecting various obstacles, including stairs, water, fire, and vibration.

BLOCK DIAGRAM



Different, as shown above both provide important information to security personnel. The high-resolution visuals captured during the day allow for clear identification of targets using Normal Camera compared to IR visuals captured. Images captured during dim light conditions can pose challenges for visual detection and recognition. While the infrared visuals captured at night provide an added layer of detection for potential security. IR camera provides accurate and High-resolution images during night condition as compared to Normal camera. By using both day and night visuals, intelligent night surveillance drones can provide 24/7 coverage of the designated area, improving the effectiveness of security operations.

CONCLUSION

Blind people have the ability to detect objects up to 70 centimetres distant and can receive feedback in the form of vibration and sound. It's important to note that the study's main goal, which was to design and release a smart walking stick for the blind, was entirely accomplished at this time. The Smart Stick serves as a foundation for the next wave of assistive technology that will enable blind people to securely navigate both interior and outdoor spaces.

It is both powerful and efficient. It does a good job at detecting obstructions in the user's path within a three-metre range. This system offers low-cost, dependable, lightweight, low-power, and robust navigation with a noticeably quick response time.

FUTURE SCOPE

The stick's GPS functionality can aid the blind in better navigating. The intelligent blind stick can be trained to recognise more items, allowing the blind person to roam around in different neighbourhoods with a higher level of safety.

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