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Smart Blind Stick with Multiple Functions for Visually Impaired People

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Abstract—Moving from one location to another, whether indoors or outside, is one of the most significant issues that the blind and visually impaired encounter. Moreover, they have an even harder time steering outside due to the unfavourable road conditions. They must remain vigilant at all times to prevent mishaps such as stumbling down damp ground, climbing or descending stairs, and colliding with stationary or moving objects. Additionally, they occasionally experience distress and may wish to notify friends or family about their whereabouts. Technology is frequently used as a solution to these issues facing the blind. The Internet of Things (IoT) concept is used in the suggested solution to act as a conduit between the blind and their surroundings. A number of sensors can be employed to identify anomalies such as moist terrains, barriers, and staircases. This concept might be a straightforward, clever, and reasonably priced smart blind stick with a variety of IoT modules and sensors. Additionally, this system offers a means of informing the interested parties of the user's location. In addition to the aforementioned, a software programme is designed to help the blind person's friends and acquaintances adjust the stick's settings, such as adding or removing phone numbers to which alert messages are sent. Bringing the stick inside by mistake can potentially be a serious problem. This issue is also handled by this solution.

INTRODUCTION

Nearly 285 million individuals worldwide suffer from some form of visual impairment; of them, 86 percent have impaired vision and 14 percent are blind, according to the World Health Organisation. One of the most vital senses for human survival is vision. Being able to see around you aids with blending in. People without vision think that other people or things are more like a basic walking cane. When in familiar environments, such as a home's interior, they learn the site's directions and any impediments ahead of them and adjust their navigation accordingly. But blind people shouldn't always trust their memories to guide them from one location to another. particularly once they're outside. It is necessary to have a tool, such as a stick, that can help blind individuals with their daily lives because they are not always offered assistance by others. The primary attributes that will make the stick beneficial for all individuals with vision impairments are its effectiveness and affordability. The blind's path is obstructed by objects such as people, cars, stones outdoors, and stairs, walls, and furniture indoors. The blind stick that was designed uses a speaker on the stick to produce a verbal alarm that informs the user of various impediments. Additionally, the stick can sense damp and wet surfaces and raise a vibrating alert to alert the user. A visually challenged person cannot properly use a mobile device to send a distress message to someone who drops him off at an unfamiliar area. The blind person's acquaintances will receive a message via an easy-to-use button on the stick. The purpose of the software application is to allow acquaintances to add, edit, or remove phone numbers. With the help of the supplier, who has admin ability to change the phone numbers, the user can also find out the numbers. A remote control with a button that, when pressed, causes the stick to buzz is supplied to assist the user in the event that a stick is lost.

The goal of this suggested methodology is to provide visually impaired people with a smart blind stick. For those with visual impairments, physical development is a test since it can be difficult for them to identify obstacles when they arise and they are not prepared to go from one area to the next. Their families provide them with mobility and direction. Their adaptability prevents them from interacting with people and participating in social activities.

Previously, different frameworks are restricted in their structure and lack a strong understanding of any visual observation. Over the years, analysts have developed a perceptive and cunning stick to provide information about their region and to assist and warn physically vulnerable individuals about potential hazards. Individuals without vision may find it challenging to interact with their surroundings. When a blind person is facing a barrier, it might be quite difficult for them to recognise it until the stick actually touches it. They will attempt the tap approach with a regular stick, tapping the ground continually to locate the closest optical, but this will not work. This is

the cause of their reliance on close relatives or friends. This methodology can help solve the issue at hand. The idea behind this technology is to give blind persons an intelligent electronic assistance in both public and private settings. The ultrasonic apparatus is comprised of The suggested sensors include an Arduino, a vibrator, a water sensor, a radio frequency transmitter and receiver, GPS, GSM, and a buzzer. This suggested system uses two different kinds of ultrasonic sensors: a proximity sensor is used to detect obstacles that are closer to the stick, and an ultrasonic wave sensor is used to detect obstacles that are farther away. Once the obstruction is within the sensor's field of view, the sound intensity is adjusted in accordance with the distance's magnitude, which is directly proportionate to the sound's intensity. The ability of a smart walking stick to identify impediments may make it easier for the blind to go around without assistance. By keeping the user vigilant, the beep messages will significantly lower the number of accidents. An RF transmitter and receiver are included in this suggested system. In certain circumstances, if a blind person trips and falls, the stick will detach from the user at a specific distance. The user will then carry an RF receiver with him in the shape of a button. The stick beeps when the user presses the button that they are seeing. The blind person can locate the stick with ease because they have good hearing. This function is only available to those who are blind.

It's challenging to find the water and digs on the surface of regular blind sticks. This device is made up of a water detector that can find water both below the surface and in the ground. This technique's unique feature allows the user to notify their relatives in case they run into any difficulties or feel uneasy. In addition to the alert message, the user's current location (latitudes and longitudes) is also provided to their family members. The GSM and GPS modules that are implemented within the stick are used to do this. After receiving the latitudes and longitudes, the relative will use Google Maps to determine the user's current location. Many professionals who are specifically trained to show people with visual impairments how to safely, confidently, and independently navigate their homes and the network are stationed in visually impaired schools. These professionals can also assist in convincing people to take specific courses that they will use frequently, such as the one that goes from one's house to a comfort store. Gaining familiarity with a website or course can greatly simplify the process of properly exploring for a visually impaired person. This gadget is specifically designed to benefit the blind. This gadget is portable and light in weight. But because of its inherent size, its range is constrained. It provides the person with the most basic travel assistance. Without assistance from others, the visually impaired person can freely walk from one location to the next. The fundamental goal of the framework is to provide visually impaired individuals with an efficient means of assistance that gives them a sense of vision by providing information about their surroundings and things in the area.

LITERATURESURVEY

Vehicle tracking system was invented in 2014 by Thiyagarajan Manihatty Bojan and Umamaheshwaran Raman Kumar. Fleet management, asset tracking, surveillance, recovering stolen vehicles, and many other uses have made great use of it. Vehicle tracking systems are being replaced by a new wave of technology thanks to advancements in Internet of Things (IoT) and ubiquitous computing. These developments also include the availability of affordable hardware building blocks. We introduce VER-TIGUO (VEhiculaR TrackInG Using Opensource approach), an accurate, reliable, adaptable, affordable, and rich vehicular tracking system based on GPS, GSM, and GPRS technology. Our vehicle monitoring system infrastructure is open sourced, meaning that researchers are free to examine, experiment with, and add more features, unlike typical COTS (Commercial Of The Shelf) systems that are restricted and limited to smartphones and PCs. Utilising our expertise with open-source hardware platforms, the hardware (HW) is developed. Through an SMS on standard GSM-based feature phones or an internet interface on smartphones and PCs, the software (SW) infrastructure can follow the cars. Any mobile phone that is connected to a GSM network can use this application. In this work, we present our prototype, system architecture, and field trial results. Iwan Ulrich and Johann Borenstein may have created the innovative GuideCane in 2010 to help blind or visually impaired people go over barriers and other dangers swiftly and safely. The GuideCane is a lightweight device that the user moves ahead. The inbuilt computer in the GuideCane uses its ultrasonic sensors to identify obstacles and determines the best course of travel to steer the device and its user around them. The steering motion produces a very perceptible force within the handle, enabling the user to navigate effortlessly and without exerting any conscious effort on their part.

In 2010, Jack M. Loobis and Reginald G. Golledge conducted research on navigation systems for the blind.The study we are presenting here is part of our endeavour to create a blind navigation system. Our ultimate objective is to create a self-contained, transportable system that will enable people with vision impairments to navigate both familiar and foreign surroundings without the assistance of guides. Since the system is currently in place, its functional components are as follows: (1) a module that determines the traveler's position and orientation in space; (2) a Geographic data system that includes software for route planning and information retrieval from the database, as well as an extensive database of our test site; and (3) an interface. The experiment discussed here focuses on the navigation system's ability to direct a traveller along a predetermined route. We assess guidance performance in relation to four distinct display modes: three that involve verbal cues, one that uses spatialized sound from a virtual acoustic display, and

instructions via a voice-activated display. In terms of user preferences and guidance performance, the virtual display option performed the best. Professor L. Kay describes the design of an air sonar system that replaces a binaural display and helps the blind perceive their surroundings. Several human perception data constraints are examined, along with the impact they have on device specifications. The explanation of inherent constraints in terms of technology development and performance for the binaural assistance is provided. The article outlined expectations for the man-machine system in a mobility scenario and included evaluation methods for man-machine systems in order to gauge machine performance. Yoram Koren, Johann Borenstien, and Sharga Shoval provided auditing guidance with Navebelt in 2012. A key similarity between a blind traveller navigating a foreign environment and a mobile robot navigating a cluttered one is that both have the kinematic capacity to conduct the motion, but they are both connected to a sensory system to identify and avoid impediments. The use of a mobile robot obstacle avoidance system as a guide system for blind and visually impaired individuals is described in this research.

PROPOSED SYSTEM

The following modules make up the suggested system concept; they are connected to the Arduino digital and analogue pins via jumper wires and are designed to monitor the environment and respond appropriately.The suggested system runs on 9 or 12 volts. It is capable of scanning the environment for different sized barriers and sounding the relevant vibration and audio alerts. It can notify the user when it detects moist or wet surfaces. In an emergency or other situation, it may also broadcast the user's location to others via SMS. If the user misplaces it, it can also be found using an RF remote control.

FLOW CHART

Two ultrasonic sensors are used by the algorithm to detect obstacles: one is positioned near the bottom of the stick, while the other is positioned two-thirds of the way up from the bottom. This configuration can identify barriers of different sizes and shapes. The speaker module or vibration motor is used to play back the appropriate prerecorded audio response or vibration pattern to the user after processing the input from these sensors and identifying the type of barrier using the logic in the "Table 1" below. 2. To facilitate the recognition of stairs and other tiny impediments on the ground, an infrared sensor is installed at the bottom of the stick. 3. The moisture sensor operates in a straightforward manner. After scanning the surface, it produces a boolean result, which the algorithm uses to trigger a vibrating alert.

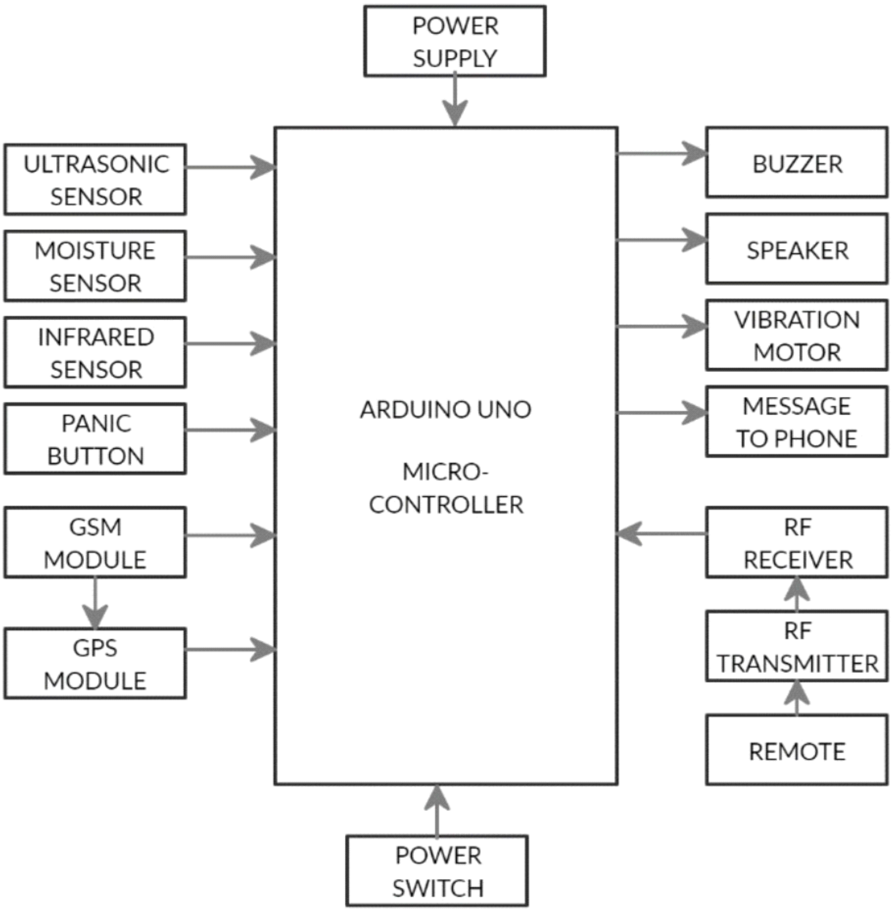

Fig. 1. Block diagram of proposed system.

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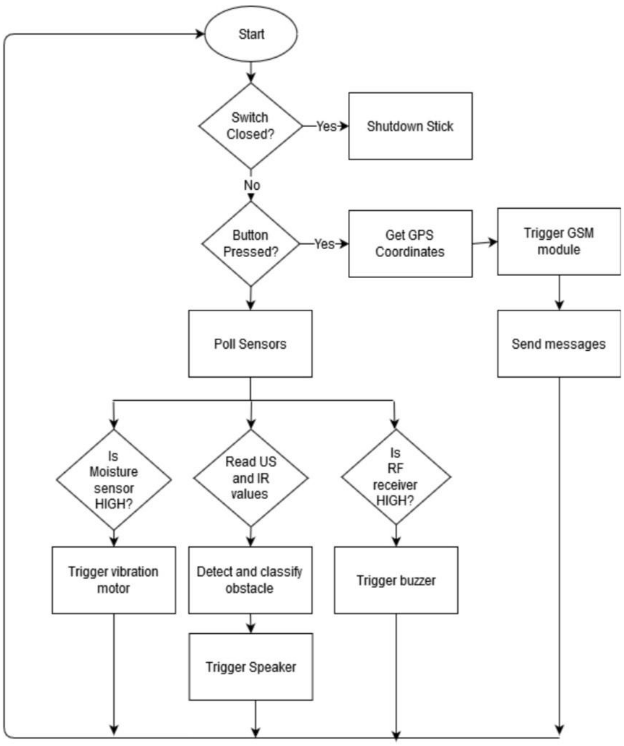

to the user using the vibration motor mounted at the top end of the stick. 4. On detecting a button press from the user the GPS module is polled for the user's coordinates. These coordinates are formatted as a google maps link i.e "http://maps.google.com/maps?q=loc:¡latitude¿,¡longi tude¿". Then the link is prepended with an appropriate message such as "I'm in danger please find me here" and this processed mes- sage is sent to the User's caretakers using the GSM module.

5. Also the algorithm keeps polling the RF receiver mounted on the stick for RF signal, from an RF transmitter mounted on a simple remote controller. This remote controller also has a simple push button along with the RF transmitter, which when pressed transmits aRF Signal via the RF transmitter on

TABLE I. CLASSIFICATION OF OBSTACLES BASED ON SENSOR READINGS

Type of obstacle	Type of alert	Sensors (Proximity and Distance readings)		
		IR Sensor	Ultrasonic- 1	Ultrasonic- 2
Stairs	Voice1	HIGH	< 20 cm	>50cm & <100cm
Small Obstacles	Voice2	HIGH / LOW	< 100 cm	>400 cm
Large Obstacles	Voice2	HIGH / LOW	< 100 cm	>150cm & <200cm

the remote, which can be detected by the RF receiver on the blind stick (see Fig. 16). The algorithm, upon receiving the signal, raises a buzzer alert for a few seconds thus helping the user to locate it

- FUTURE ENHANCEMENT

It can be used in real time safety system. It can be implement the hole circuit into smallmodule later. all about our research we take care about one problem that is visual disability. To make a solution we did this low cost project. We believe that this project will spread all around society and convert disable to able. This is our hope, to consider this stick as smart eye for the visual impairments

CONCLUSION

The blind stick described in this paper can help the person with visual impairments navigate across various obstacles and terrains. In the event of an emergency or distress, the stick can also notify the user's carers of their whereabouts. Moreover, an RF remote control can be used to find the stick. This can be improved even more by including tiny, highly effective sensors, which will improve the design and take up less space on the stick. A small number of adjustments to the sensor angle placement can be made to make them always point straight rather than at a fixed angle by making them adjust to the angle of the stick with respect to the ground. It can also be improved by utilising a superior material, such carbon fibre, for the stick's body, which will make it more flexible and lightweight.

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