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INTELLIGENT WALKING STICK FOR VISUALLY IMPAIRED PEOPLE USING WIRELESS SENSOR NETWORK

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ABSTRACT:

This paper is about providing a compatible solution for visually impaired people and helps them to walk independently and confidently. The hardware elements included are Raspberry pi microcontroller, obstacle detecting sensors, GPS module, speakers and other connecting components. That data is then processed and required instructions are given to the blind person. r decision making. Thus, we were motivated to develop a smart white cane to overcome these limitations. We accomplished this goal by adding ultrasonic sensors at specific positions to the cane that provided information about the environment to the user by activating the buzzer sound. We proposed low cost and light weight system designed with microcontroller that processes signal and alerts the visually impaired person over any obstacle, water or dark areas through beeping sounds. The system consists of obstacle and moisture detection sensors for receiving, processing and sending signals to the alarm system which finally alerts the user for prompt action. The system was designed, programmed using C language and tested for accuracy and checked by the visually impaired person. Our device can detect obstacles within the distance of about 2m from the user.

Keywords: GSM, GPS, IR sensor, ARDUINO controller, vibration sensor.

1. INTRODUCTION:

A concept to provide a smart electronic stick for the visually impaired. Provides features like object detection, real time assistance via global positioning system. The system is intended to provide artificial vision and object detection, real time assistance via GPS by making use of Raspberry Pi. The system consists of ultrasonic sensors, GPS module, and the feedback is received through audio, along with a voice output for directions. The proposed solution is a moderate budget navigational aid for the visually impaired. In addition, the system is incorporated with a GPS module that receives the latitude and longitude of the stick's location and sends it to the Guardian of the user. Thus, a mobile application (APP) was created that helps guardians to track contact immediately in any emergency situation. In this system we are using the Ultrasonic sensor, GPS receiver, Buzzer Voice synthesizer, speaker or headphone and Arduino The aim of the overall system is to provide a low cost and efficient navigation and obstacle detection aid for blind which gives a sense of artificial vision by providing information about the environmental scenario of static and dynamic objects around them, so that they can walk independently. Recently, much research effort have been focused on the design of Electronic Travel Aids (ETA) to aid the successful and free navigation of the blind. Also, high-end technological solutions have been introduced recently to help blind persons navigate independently. Another reason why ultrasonic is prevalent is that the technology is reasonably cheap. Moreover, ultrasound emitters and detectors are portable components that can be carried

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without the need for complex circuit. RF module will help the person to find the stick wherever it is placed. Whenever the user wants to locate it, such a person will press a button on remote control and buzzer will ring, then the person can get the idea of where the stick is placed.

MAIN OBJECTIVE OF THE PROJECT:

The main objective is to provide voice based assistance to blind people. In this technology controlled world, where people strive to live independently, this project proposes an ultrasonic stick for blind people to help them gain personal independence. Since this is economical and not bulky, one can make use of it easily.

2. LITERATURE SURVEY:

S.Gangwar (2011) designed a smart stick for blind which can give early warning of an obstacle using Infrared (IR) sensors[8]. After identifying the obstacles, the stick alerts the visually impaired people using vibration signals. However the smart stick focused only for obstacle detection but it is not assisting for emergency purposes needed by the blind. And also the IR sensors are not really efficient enough because it can detect only the nearest obstacle in short distance.

S.Chew (2012) proposed the smart white cane, called Blind spot that combines GPS technology, social networking and ultrasonic sensors to help visually impaired people to navigate public spaces. The GPS detects the location of the obstacle and alerts the blind to avoid them hitting the obstacle using ultra-sonic sensors. But GPS did not show the efficiency in tracing the location of the obstacles since ultra-sonic tells the distance of the obstacle [9].

Benjamin etal (2011) had developed a smart stick using laser sensors to detect the obstacles and down curbs [10]. Obstacle detection was signalized by a high pitch "BEEP" using a microphone. The design of the laser cane is very simple and intuitive. The stick can only detect obstacle, but cannot provide cognitive and psychological support. There exists only beep sound that triggers any obstacle and there is no any assistance to direct them. Central Michigan University (2009) developed an electronic cane for blind people that would provide contextual information on the environment around the user. They used RFID chips which are implanted into street signs, store fronts, similar locations, and the cane reads those and feeds the information back to the user [11]. The device also features an ultrasound sensor to help to detect objects ahead of the cane tip. The Smart Cane, which has an ultrasonic sensor mounted on it, is paired with a messenger style bag that is worn across the shoulder. A speaker located on the bag strap voice alerts when an obstacle is detected and also directs the user to move in different direction.

Mohd Helmyabd Wahab and Amirul A. Talibetal (2011) developed a cane could communicate with users through voice alert and vibration signal) [12]. Ultrasonic sensors are used to detect obstacle in front, since ultrasonic sensors are good in detecting obstacle in few meters range and this information will be sent in the form of voice signal. This voice signal is send via speaker to the user. Here blind people might find it difficult in travelling without any emergency alert rather than having only ultrasonic sensors.

Alejandro R. Garcia Ramirez and Renato Fonseca Livramento da Silvaetal (2012) designed an assistive technology device called the electronic long cane to serve as a mobility aid for blind and visually impaired people [13].The author implements

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the cane with an ergonomic design and an embedded electronic system, which fits inside the handle of a traditional long cane. The system was designed using haptic sensors to detect obstacles above the waistline. It works in such a way when an obstacle is detected; the cane vibrates or makes a sound. However this system only detects obstacle above the waistline.

Joao José, Miguel Farrajota, Joao M.F. Rodrigues (2011) designed a smart stick prototype. It was small in size, cheap and easily wearable navigation aid. This blind stick functions by addressing the global navigation for guiding the user to some destiny and local navigation for negotiating paths, sidewalks and corridors, even with avoidance of static as well as moving obstacles)[14]. Rather than that, they invented a stereo camera worn at chest height, a portable computer in a shoulder-strapped pouch or pocket and only one earphone or small speaker. The system is inconspicuous, and with no hindrance while walking with the cane. Also it does not block normal sound in the surroundings.

3. PROPOSED SYSTEM:

Based on the drawbacks identified in the existing works, we propose a Smart aid electronic stick for blind with enhancements which really shows the safety for blind people in streets. We use GPS and GSM system and also ultrasonic sensors with Bluetooth earpiece in designing the electronic stick. Main aim of the paper is to show a combination of these devices which communicates each other to provide enhanced security and safety for blind people. The combination of GPS and GSM technologies might give an extra aid for the blinds. Whenever there is any emergency, the blind people need to press the trigger button which activates the GPS and GSM. GPS identifies the location of the blind person immediately and is sent to GSM in the form of coordinates. An alert message will be sent along with the exact location of the blind person to the receiver. For further aid, ultrasonic sensors with voice recognization are also used to detect obstacle. This gives information on the distance range of the obstacle moving across them. Finally for security purpose, thumb print scanner is used which activates the stick when the particular blind people access using their thumb prints. Thus this stick might not be misused by others except the authorized users.

4. RESULTS EXPLANATION

From the survey, we analyze that, there are certain areas can be enhanced in order to have a reliable and efficient blind stick for visually impaired people with better safety precaution during their travel. There are several problems that have been identified in previous section. For an example using IR sensors for obstacle detection is not really good enough due to the range of detection which is short compare to other proximity sensors. This type of sensors detects only the nearest objects such as, walls, chairs, parked vehicles etc. This might lead to accidents when there are vehicles that travel in a high speed. This work shows the inefficiency of the stick design. Hence this electronic stick is not really assisting the blind people during the emergency situations

The concept of the proposed system originated due to a brief see to a blind enterprise. It comes to be seen that the human beings had been furnished education to walk with a stick along a taken care of path every day with a person to manual each of them. The beginning of the mission changed into marked via the conversations held with the blind individuals in the faculty

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and additionally their organization. The records gathered became a sign of the facts in addition to miseries of their each day lifestyles. The visual handicap made them incapable of doing any type of smooth obligations in my opinion. This laid us to study at the already contemporary enhancements and additionally perform literary works observe.

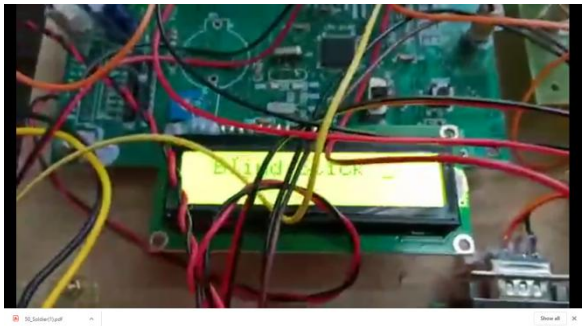

Fig.4.2. Hardware Kit Implementation.

Location formation using GPS and GSM module

When a blind or elderly character is out of domestic for stroll or for one-of-a-kind component, if his/her health comes to be instantly inadequate i.e. If he feels that it's far hard for him to get to domestic once more, he can intimate certainly one of his household concerning this. There is an alert switch supplied on the stick, this transfer while pressed sends out the coordinate of preserve on with a pre stored mobile number, i.e. "+91 **********" the use of GSM thing with SMS. The GENERAL PRACTITIONER module computes the range and longitude of the location of the patron.

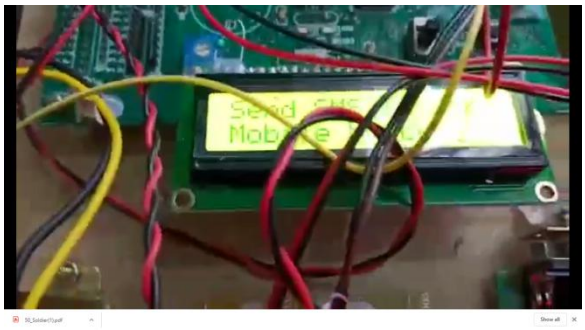

Fig.4.2. Mobile number registration

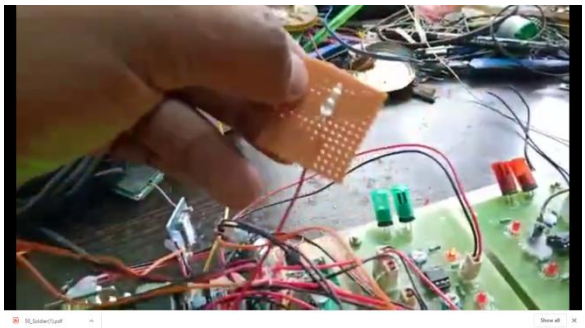

Fig.4.2.Vibration sensor indication.

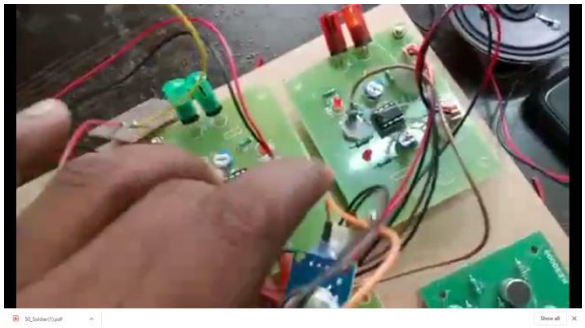

Fig.4.2. 3D IR sensor.

Fig.4.3.Speaker output image.

Significance of the System

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The number one advantage of the system is that it aids the blind human beings in both indoors and out of doors, care-free navigation. The gadgets positioned in the stick makes it relaxed and simple to deal with. The smart stick aids in locating obstacles positioned at a distance before the user. The machine appropriates for each indoor and outdoor atmosphere. The data concerning limitations is offered with voice alerts, eliminates the hassle of comprehending resonance patterns which turned into made use of in earlier systems. The machine is a slight budget plan cell navigational useful resource for the aesthetically broken.

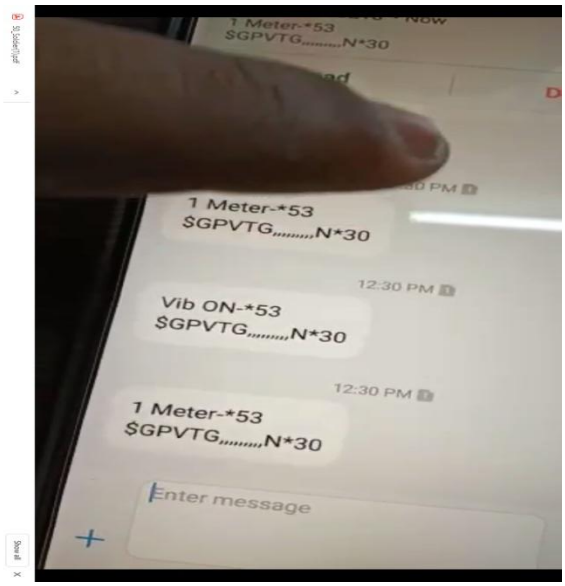

Fig.4.4. Output results at vibration detected time.

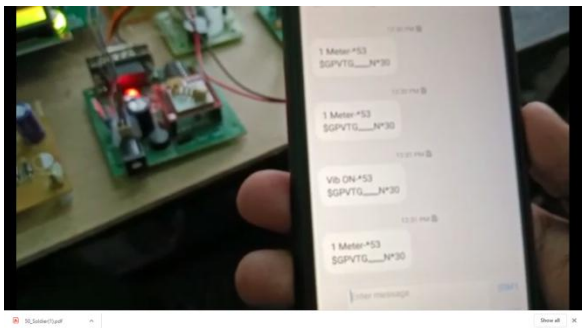

Fig.4.5.1st IR sensor detected time we get 1 meter distance detected.

5. CONCLUSION:

The proposed gadget tries to cast off the failings in the preceding device. It intends to address the troubles encountered thru the blind humans in their each day existence. The device moreover takes measures to assure their safety. The mission intended the blueprint and also designs of a wiser concept of DEEP FINDING OUT 3-D SMART STROLLING STICK for blind and moreover disables human beings. This blind help tool can be made a fresh length of valuable help similarly to gives a feel of artificial vision in addition to committed obstacle and hollow discovery circuitry. This fee powerful and mild weight tool can be designed to take of sample of a classic in addition to transportable tool, which can be unconditionally mounted on a commonplace white taking walks stick or blind stick. The meant aggregate of numerous functioning sub-structures makes a time stressful gadget that continues track of the environmental scenario of constant and colorful gadgets further to materials crucial feedback forming navigation greater correct, comfortable in addition to relaxed. It may be furthermore stepped forward through the use of VLSI modern-day-day era to create the PCB device. This makes the gadget furthermore more portable. Also, use of lively RFID tags will genuinely deliver the area information without delay to the PCB tool, when the clever stick remains in its variety.

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