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Intelligent Blind Stick with Location Tracker

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***Abstract*: The life of visually impaired is very difficult and different. They face many problems in their daily routine from moving one place to another place. During their daily chores there are most probable chances that they get hit by obstacles even get sever injured. In some cases, they even get lost somewhere, which eventually gets them in trouble. An intelligent or smart stick for visually impaired person can be able to detect the obstacles on their path and if they found themselves lost, using GPS & GSM the care tacker can track them easily.**

***Keywords*: Vision, Blind, Sensors, Arduino, Blind stick, Navigation, GPS, GSM.**

1. Introduction

It is well known that a blind person daily encounters many difficulties such as walking on the road, finding right path and taking a bus. Barriers may harm the blind when they are walking on the street. The "World Health Organization" presented important statistics related to blind people, 285 million people are virtually impaired, 39 million blind and 246 million having low vision 90% of the visually impaired population lives in developing countries. Some statistics extracted from studies conducted by the national federation of the blind with respect to blinds and education Blind people may find it easy to move within a small area such as a room but it is challenging to navigate outdoors. Blinds all over the world need some help navigating from one place to another. Many traditional techniques are used to guide a blind person. Some blind people prefer using guide dogs and others prefer a real person to guide them instead. People may not be available all the time to help the blind. Hence, it is required to have a system that will help blind people navigate their way without the need of a guiding person or a pet. Another problem is to detect objects on the blind person's walking path. Blind people usually hold a white stick to make sure nothing obstructs the path.

2. Literature Survey

Paper [1] "Smart Blind Walking Stick with Integrated Sensor" By Premarajan Akhil, Ramdas Akshara, Raju Athira, Srinivasan Padmanaban Kamalesh Kumar (2022). This paper describes even though technology is advancing rapidly today, there is no affordable device available for people with visual impairments. Blind people have difficulty performing their daily activities, so a Smart Blind Stick was designed to help them move and perform their tasks more easily. However, when visually impaired people are walking on the road, they find it difficult to see obstacles along the way, which makes it very dangerous. A smart stick is one of the best ways to point around. This stick is equipped with infrared sensors to detect stair cases, and a pair of ultrasonic sensors to detect any other obstacles in front of the user, within a range of four meters. A water sensor is also used in the system, which detects water on the user's path. All found obstacles are alerted to the user through a buzzer. It is worth mentioning at this point that the purpose of this study, which is to design and use a clever and smart walking stick for visually impaired people, is fully realized. The Smart Stick serves as a basic platform for the next generation of assistive devices to help the visually impaired to navigate safely inside and outside.

Paper [2] "Smart Blind Stick Design and Implementation" By Amira. A. Elsonbaty (2021) The aim of this paper is allowing people to live healthier and simpler lives. Sightless people are unable to carry out their everyday activities, such as walking down the street, visiting friends or relatives, or doing some other mundane tasks. As a result, the smart stick is a stick that can assist a person in walking safely without fear of colliding with another person or solid objects is proposed as a solution to this major issue. It is a development of the traditional blind stick as it acts as a companion for the blind when walking by sending audio alerts to the blind via a headphone connected to the phone with obstacles (water/walls/stairs / muddy ground) and also enables him to make a phone call to ask for help.

Paper [3] "Design and Analysis of a Smart Blind Stick for Visual Impairment" By Zulkhairi Mohd Yusof, Md Masum Billah, Kush dairy Kadir (2018). This paper describes that for a long time, visually impaired person uses a white cane to guide their way when travel outside. The white cane has been useful for the blinds in improving their mobility but unfortunately the white cane has its limitation. One of the shortcomings of the white cane is that, it could only detect the obstacles that are within the contact ranges of the white cane. This problem sometimes could cause the blind person to be in trouble because of insufficient time to detect and warn new obstacles in front of the blind person.

Paper [4] "A Smart Stick for Assisting Blind People" By Ashraf Anwar, Sultan Aljahdali (2017). This paper describes that the smart stick comes as a proposed solution to enable

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visually impaired people to find difficulties in detecting obstacles and dangers in front of them during walking and to identify the world around. The system is designed to act like an artificial vision and alarm unit The system consists of five sensors: ultrasonic sensor, IR sensor, water sensor, fire sensor, and light (LDR) sensor, microcontroller (Arduino Uno R3) to receive the sensor signals and process them to short pulses to the Arduino pins where buzzers, vibrator and voice alarms are connected. GPS navigation in the Mobile can be used to guide the blind for new places and unfamiliar places. The blind man uses an earphone to listen to the navigation directions that are coming from the GPS and buzzer alarm to warn by sound. We seek in our project to provide a smart stick affordable and suitable for most blind people, and also it is light in weight. It can be made available to all segments of the society and their families who need them.

Paper [5] "Realtime local navigation for the blind: detection of lateral doors and sound interface". By M. Moreno, S. Shahrabadi, J.José, J.M.H. du Buf (2012). The main of this paper is developing a low-cost navigation aid which can be afforded by almost all blind persons: basically, the ultimate goal is to use only a mobile phone with a built-in camera. This aid complements the white cane, it is easily portable, and it is not a hindrance when walking with the cane. The system will have an easy and intuitive interface, yet providing assistance in local and global navigation in real time. In this paper we present the progress concerning local navigation. Path and obstacle detection just beyond the reach of the cane is now supplemented by detection of doors in corridors. This is necessary for localization, i.e., for developing a better impression of the environment and for finding a specific room. A sophisticated sound interface can assist the user for centering on paths like sidewalks and corridors, alerting to looming obstacles for avoiding them.

A. Problem Statement

Without vision it can be challenging for a visually impaired person to navigate through a room or a hallway without bumping into obstacles. Even with aid, such as walking stick, it can be sometimes inconvenient, uncomfortable, and perhaps inaccurate in avoiding obstacles.

B. Objective

The main objective is to help visually challenged people to navigate with ease using advance technology. 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.

3. Working Methodology

In this proposed system we are using a microcontroller Atmega328p, 12V battery, Dotted PCB, GSM module, GPS module, Switch, Vibrator motor, Buzzer, Ultrasonic sensor, Moisture sensor, Resistor and connecting wires.

We have Atmega328p microcontroller which controls whole model. It has both analog and digital pins. Each component is connected to the Atmega328p. It has 7805 pinout which acts as voltage regulator and convert the given input voltage to 5V. Atmega328p works on 5V.

The Ultrasonic sensor is used for obstacle detection. We have used HC-SR04 model. We have used 2 of them placed at the near top and near bottom place. It has 4 pins GND, V_{CC}, Trig, Echo. The Trig pin is connected to A4, A3 pin and Echo pin is connected to A5, A2 pin of microcontroller with VCC and GND connected to microcontroller's GND and VCC pin respectively. We have made 3 stages for detecting the obstacles which starts from less than 150cm to 100cm, 2nd stage starts from less than 100cm to 50cm and final stage at less than 50cm. If the obstacle is at 1st stage, then the person using the stick will get minimal vibration with beep sound from buzzer. If the obstacle is at 2nd stage, then the person receives moderate vibrations stronger compared to 1st stage with beep sound. If the obstacle is at 3rd stage, then person receives strong vibrations compared to other 2 states with beep sound. Overall, the person gets alerted regarding the obstacles on his\her path. So that they can stop and change their direction.

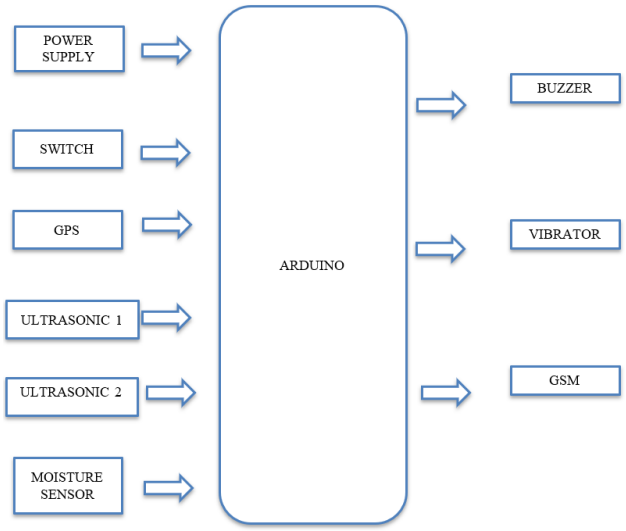

Fig. 1. Block diagram

The moisture sensor is connected to A1 pin of microcontroller. We have placed moisture sensor at the bottom of the stick to detect the moisture present on the road. If the stick detects moisture or water content on their path then person gets alerted through vibrations and beep sound so that they can change direction and reach their destination respectively.

We have used GPS Neo 6M to know the location of the person using it. We have used GSM SIM 900A for sending location to the registered emergency mobile number. Switch is used for emergency conditions so that the person using it can be tracked easily if they feel in danger or get lost. Upon pressing the switch, the current will be sent to the registered emergency mobile number. The buzzer and vibrator acts as output for all the components by vibrating and making beep sound to alert the user about the danger. The dotted PCB is used to reduce complexity connections and make it simpler one by taking common connections using it. Overall, the proposed blind stick ensures the safety of the user.

4. Conclusion

The proposed navigation aid has been developed in order to enhance the independent mobility of blind individuals. This system needs no additional huge device to be carried along and it also doesn't need any special training as the input output system is very simple. This system also focuses on most of the navigation problems faced by blind, within familiar indoors. Its application is widened to any new environment which makes it advantageous. The error in direction made by the user is made note of and suitable corrective steps are suggested. To conclude, we would like to say that engineering does not just stop at gaining knowledge and innovating, it ends when you are able to use that knowledge for the benefit of your fellow human beings. The solution developed is a moderate budget navigational aid for the visually impaired. However, minimizing cost leads to compromises in performance.

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