Ritika Kumari, 2024, 12:3
ISSN (Online): 2348-4098
ISSN (Print): 2395-4752

International Journal of Science, Engineering and Technology

An Open Access Journal

Smart Blind Stick for Handicap

Research Scholar Ritika Kumari, Research Scholar Rewa Pawar, Research Scholar Nikhil Kumar, Research Scholar Mohd.Shahfahad, Professor Shraddha Shrivastava

Department of Electronics & Communication Engineering
Lakshmi Narain College of Technology, Bhopal, Madhya Pradesh, India

Abstract- A smart stick concept is devised to provide a smart electronic aid for blind people . Blind and visually impaired find difficulties in detecting obstacles during walking in the street. The system is intended to provide artificial vision and object detection, real time assistance via making use of Arduino UNO. The main objective of our project is to provide a sound based assistance to blind people. While the user moves the stick in the forward direction, the ultrasonic sensor with

Keywords- Arduino Mega, Electronic Travel Aids, Smart Blind Stick, Microcontroller, Ultrasonic Sensor

I. INTRODUCTION

There are about 253 million people live with vision impairment, 36 million are blind and 217 million have moderate to severe vision impairment. 81% of people who are blind are aged 50 years and above (WHO estimation). The number of visually impaired people are expected to grow in the future due to various reasons. As a result, there is a need for a cost- effective system that can be used by blind people in order to walk easily and comfortably. It is necessary that a smart solution is proposed for the blind people so that they can use this in their daily life. This paper proposes the design and development of a smart stick in order to help the visually impaired people. Visually impaired individual have little or no opportunity of blind people to execute daily task and also limits their interaction with the surrounding world consequently affecting quality of life .. Utilizing this visually impaired stick, an individual can walk all the more unhesitatingly. This strolling stick is an option incontrast to the customary strolling stick. Here, Arduino UNO, ultrasonic sensor, IR sensor, voice playback module, LCD show, and voltage controller is utilized. Arduino is a microcontroller that can do every one of the estimations fastly and rapidly with incredible exactness. The ultrasonic sensor is utilized to distinguish the item toward the front of the individual by estimating the distance between the article and the stick. For left and right article recognition, IR Sensor is utilized which is exceptionally little in range. So, it detects a very close object. Using more ultrasonic sensors may create calculation problems. So, IR Sensor is Preferred. The voice playback module will help the visually impaired individual to arrive at the objective through the order or receiver.

Outwardly disabled individuals are individuals who think that it‟s hard to perceive the littlest detail with sound eyes. Those who have the visual acuteness of 6/60 or the horizontal range of the visual field with both eyes open have less than or equal to 20 degrees. These people are regarded as blind. A survey by WHO (World Health Organization) carried out in 2011 estimates that in the world, about 1% of the human population is visually impaired (around 7 million individuals) and 90% (around)63 million individuals) with low vision. The primary issue with daze individuals is the way to explore their approach to any place they need to go. Such individuals need help from others with great vision. As described by WHO, 10% of the visually impaired have no functional eyesight at all to help them move around without assistance and safely. This investigation proposes another method for

planning a shrewd stick to help outwardly disabled individuals that will give the route. The standard and old- fashioned courses help for individuals with visual shortcomings are the walking stick (similarly called white stick or stick) and guide canines which are depicted by various imperfections. The force of vision is perhaps the main piece of human physiology. Our eyes are the way into our environmental elements. Lamentably, approx 285 million individuals are assessed to be outwardly weakened around the world, of which 39 million are visually impaired, as indicated by a report distributed by the World Health Organization (WHO). 82% of visually impaired individuals are of the age of 50 or more. Besides, 90% of outwardly impeded individuals have a place with the agricultural nations. The most punctual type of route device for the visually impaired has been a mobile stick. In any case, the downsides of utilizing it are the absence of fundamental abilities, Cost, and preparing period. With the advances in innovation, it has gotten conceivable to plan and foster mechanical arrangements that can assist an outwardly disabled individual with exploring uninhibitedly. Different examination works have been completed for growing such a keen visually impaired stick.

The most basic deficiencies of these guides include: fundamental abilities and preparing stage, the scope of movement, and extremely irrelevant data imparted been conveyed. Our methodology changed this stick with some gadgets segments and sensors, the electronic helping gadgets are intended to address such issues. The ultrasonic sensors, water sensor, signal, and RF transmitter/Receiver are utilized to record data about the presence of snags out and about. The ultrasonic sensor can recognize any deterrent inside the distance scope of 2cm-450cm. Accordingly, at whatever point there is an obstruction in this reach it will caution the client. A water sensor is utilized to recognize if there is water in way of the client. Most visually impaired direction frameworks use ultrasound due to their resistance to the ecological clamor. With the fast advances of present-day innovation both in equipment and programming, it has gotten simpler to give a smart route framework to the outwardly disabled. As of late, much exploration exertion has been centered on the plan of Electronic Travel Aids (ETA) to help the effective and free route of the visually impaired. Additionally, top-of-the-line innovative arrangements have been acquainted as of late with assistance daze people explore autonomously. Another motivation behind why ultrasonic is predominant is that the innovation is sensibly modest. Additionally, ultrasound producers and finders are versatile segments that can be conveyed without the requirement for the complex circuit. RF module will assist the individual with discovering the stick at any placeit is kept.

II. RELATED WORK

The work in the paper [1-2] presents a plan and execution of an ultrasonic sensor-based strolling stick for an outwardly disabled individual. An ultrasonic sensor module, HC-SR04 is utilized for impediment discovery in the way of the visually impaired individual, and a ringer is utilized to make the individual cautious. The proposed framework is carried out utilizing PIC microcontroller 16F877A. Dazzle people can utilize this strolling stick for a safe route. It can identify impediments inside 5 to 35 cm scope of distance. Daze People utilizes whitesticks to help in obstruction identification and evasion in [3]. Guide canines can likewise be of restricted guide for discovering the way to a far- off area. So we will probably make a versatile, straightforward less expensive framework that will permit blind people groups to go through natural and new conditions without the guide of guides. A few direction frameworks have been produced for vision disabled individuals, however, these frameworks will in general be costly, likewise utilize a customer worker approach. This Navigation framework comprises of two unmistakable parts: detecting the prompt climate for daze individuals to travel (e.g., snags)and perils) and exploring too far off objections past the immediately perceptible environment. The paper depicted here zeroed in on the turn of events and assessment of a Navigation framework that utilizes GPS (the Global Positioning System), voice, and ultrasonic sensor for obstruction location. This paper [4] portrays the utilization of Arduino on an ultrasonic visually impaired strolling

stick. 30 million individuals are for all time visually impaired and 285 billion are outwardly hindered, as indicated by the WHO. When you consider them, you will realize very well that without the aid of others they can‟t walk to reach your destination one has to ask for directions. During their everyday lives, they need to confront more difficulties. The visually impaired handle is more secure for an individual to walk. The bar detects the thing before the individual and gives the purchaser a vibrational answer or on request.

To explore the commonness and reasons for visual disability and visual impairment in an example of Polish more established grown-ups. The study [5] was designed in a cross-sectional and observational manner. Information concerning the vision status was surveyed in 2214 eyes from 1107 subjects of European Caucasian beginning; the vast majority of whom live in the city of Lodz, in focal Poland. Visual impedance was characterized as distance visual sharpness <20/40 in the more regrettable Seeing Eye. The low vision was defined as best- corrected visual acuity (BCVA) <20/40 but >20/200 in better-seeing eye, and blindness was defined as BCVA ≤20/200 in both eyes (United States criteria). Visual impairment was found in 27.5% of subjects in the worse-seeing eye

In this paper [6], we introduced a smart electronic aid for the visually impaired. The smart cane provides a solution to the visually impaired that face complications in detecting obstacles and changes in the environment. The smart cane comprises three sensors: infrared sensor, ultrasonic sensor, and flame sensor. These sensors are implemented and programmed using a microcontroller (Arduino UNO R3). This stick can detect obstacles that lie in the range of about 2m from the user. This system aims to provide an affordable and reliable smart cane that would help the visually impaired to navigate freely.

In this work [7-8] the authors present the design and usability features of a low-cost knee-above obstacle detection system and report results from controlled field experiments. From the very beginning of human history, people are suffering from many disabilities. Among those, blindness is very common and unendurable. Science and technology always try to make human life easier. So the main purpose of this paper is based on abating the disabilities of blindness by constructing microcontroller-based automated hardware that can corroborate a blind to detect obstacles in front of him/her instantly

III. PROPOSED METHOD

The working behind this visually impaired stick is that it is utilized for a specific reason as a detecting gadget for visually impaired individuals. The circuit gives a 5V force supply to the circuit and keeps up with its yield of the force supply at a steady level. It is utilized broadly to recognize objects utilizing ultrasonic sensors. If any object is present, the ultrasonic sensor detects the object by measuring the distance between the object and the user and sends the data to the Arduino UNO [9-10]. To decide the distance of an item, compute the distance between conveying the message and getting back the sign. The block diagram for the proposed method is shown in Fig. 1 below.

***Distance=speed*time**

The speed of the sign going through air is 341m/s. The time is determined between conveying and getting back the message. Since the distance travel by the signal is double, it is divided by two i.e.

Distance=*Distance/2

It is placed at the right and left of the stick to detect the object. Since, it is especially little reached, it perceives the closer fights. Arduino measures with this information and computes with the order conditions. If any object is found nearer, it sends the command to the user through the speaker or microphone. The order is as of now put away in the voice playback module which sends a ready message to the client about the article.

Keen Sensors [11-12] are not simply a prevailing fashion; they are the rush of things to come. As more individuals understand the of these developments the field will develop without limits. This can be exhibited by the plan determined. It's

practical, cost-efficient, and extremely useful. If these qualities weren't sufficient to warrant examination concerning this field of study, these developments will likewise make the designer rich.This task is application- based as it has an application for daze individuals. It tends to be additionally improved to have more choice-taking abilities by utilizing changed sorts of sensors and hence could be utilized for various applications. It expects to tackle the issues looked at by the visually impaired individuals in their everyday life. The system also takes measures to ensure their safety.

The stick is distinguished by its low price and simple nature. When the wireless sensor detects an object or obstacle in its environment, it serves as an input or input to the esp8266 processor. The audio jack connected to the headphone then emits sound.

The lack of essential skills and preparation, as well as the limited range of motion and knowledge transmitted, are among the most serious shortcomings of these aids. Electronic assistive devices are intended to solve issues like these, and we used some electronics modules and sensors to adjust the cane. A buzzer, ultrasonic sensors, and a water sensor are all included. The blind person walking with an electronic stick. Two ultrasonic sensors are mounted on the stick having set.

The project proposed the design and architecture of a new concept of smart electronic guiding stick for blind people. the advantage of system lies in the fact that it can prove to be very low cost solution to millions of blind person worldwide.

The proposed combination of various working units makes a real time system that monitors position of the user And provides dual feedback making navigation more safe and secure. It can be further improved to have more decision taking capabilities by employing various types of sensors and thus could be used for different applications. It aims to solve the problems faced by the blind people in their daily life. The system also takes measures ensure their safety.

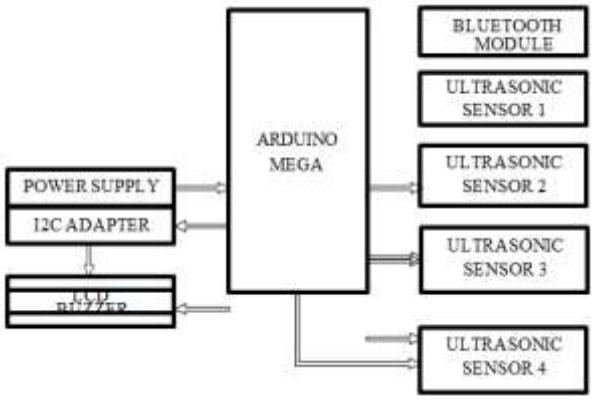

Figure 1: Block diagram of the proposed method

IV. SOFTWARE TOOLS

1. Arduino

Arduino [13-14] is open-source computer hardware and software company, project, and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices and interactive objects that can detect and control objects in the physical and computerized world. The task's items are circulated as open- source equipment and programming, which are authorized under the GNU Lesser General Public License (LGPL) or the GNU General Public License (GPL), allowing the assembling of Arduino sheets and programming dispersion by anybody. Arduino sheets are accessible monetarily in preassembled structure or as (DIY) packs.

2. Arduino IDE

A program for Arduino equipment might be written in any programming language with compilers that produce parallel machine code for the objective processor. Atmel gives an improvement climate to their 8-cycle AVR and 32-digit ARM Cortex-M-based microcontrollers: AVR Studio (more seasoned) and Atmel Studio (more up to date). The Arduino integrated development environment (IDE) [15] is a cross- platform application (for Windows, macOS, Linux) that is written in the programming language Java. It originated from the IDE for the languages Processing and Wiring. It incorporates a code manager with highlights, for example, text reordering, looking and supplanting text, programmed indenting, support coordinating, and punctuation featuring, and gives straightforward

single tick segments to total and move undertakings to an Arduino board. It's anything but a message region, a book console, a toolbar with catches for normal capacities, and a chain of importance of activity menus. The source code for the IDE is delivered under the GNU General Public License, variant 2.

Hardware Tools

- Arduino Mega
- Ultra Sonic Sensor–4 Quantity
- Bluetooth Module
- LCD with I2C adapter
- Buzzer

Arduino Mega

Figure 2: Arduino mega

The Arduino Mega is a microcontroller board dependent on the ATmega2560. It has 54 advanced information/yield pins (of which 14 can be used as PWM yields), 16 straightforward information sources, 4 UARTs (hardware consecutive ports), a 16 MHz pearl oscillator, a USB affiliation, a power jack, an ICSP header, and a reset button. The schematic of Arduino mega is shown in Fig. 2.

Reset Button

Very much like the first Nintendo, the Arduino has a reset button (10). Pushing it will briefly interface the reset pin to the ground and restart any code that is stacked on the Arduino. This can be exceptionally valuable if your code doesn't rehash, yet you need to test it on different occasions. Not at all like the first Nintendo in any case, doesn't blow on the Arduino typically fix any issues.

Power LED Indicator

Just underneath and to one side of "UNO" on your circuit board, there's a little LED close to the word „ON‟ (11). This LED should illuminate at whatever point you plug your Arduino into a force source. If this light doesn't turn on, there‟s a respectable chance something isn‟t right.

TX RX LEDs

TX is short for communication, RX is short forgotten. These markings show up a considerable amount in hardware to demonstrate the pins liable for sequential correspondence. For our situation, there are two puts on the Arduino UNO where TX and RX show up – once by computerized pins 0 and 1, and a second time straight away to the TX and RX indicator LEDs. These LEDs will give us some decent visual signs at whatever point our Arduino is getting or communicating information (like when we're stacking another program onto the board).

Main IC

The dark thing with every one of the metal legs is an IC or Integrated Circuit. Consider it the cerebrums of our Arduino. The fundamental IC on the Arduino is somewhat not quite the same as board type to board type, however, is ordinarily from the ATmega line of IC's from the ATMEL organization. This can be significant, as you may have to know the IC kind (alongside your board type) before stacking up another program from the Arduino programming. This data can typically be found recorded as a hard copy on the top side of the IC. If you need to find out about the distinction between different IC's, perusing the datasheets is regularly a smart thought.

Voltage Regulator

The voltage controller isn't something you can (or ought to) communicate with on the Arduino. Yet, it is possibly helpful to realize that it is there and what it's for. The voltage controller does precisely what it says – it controls the measure of voltage that is allowed into the Arduino board. Consider it a sort of watchman; it will dismiss an additional voltage that may hurt the circuit. It has its cutoff points, so don't connect your Arduino to anything more prominent than 20 volts.

Microcontroller in Arduino Mega

A microcontroller is a PC present in a solitary incorporated circuit that is committed to perform

one errand and execute one explicit application. It contains memory, programmable data/yield peripherals to a processor.

The Arduino Mega 2560 is a microcontroller board reliant upon the ATmega2560 (datasheet). It has 54 advanced info/yield pins (of which 14 can be utilized as PWM yields), 16 simple information sources, 4 UARTs (equipment sequential ports), a 16 MHz gem oscillator, a USB association, a force jack, an ICSP header, and a reset button. Arduino is neither a microcontroller nor a chip.

Ultrasonic Sensor

As the name indicates, ultrasonic sensors measure distance by using ultrasonic waves. The sensor head emits an ultrasonic wave and receives the wave reflected from the target. Ultrasonic Sensors measure the distance to the objective by estimating the time between the outflow and gathering. An optical sensor has a transmitter and beneficiary, while an ultrasonic sensor utilizes a solitary ultrasonic component for both discharge and gathering. In an intelligent model ultrasonic sensor, a solitary oscillator transmits and gets ultrasonic waves on the other hand. This empowers scaling down of the sensor head. Fig. 3 represent the structure of the Ultrasonic sensor [16-18].

Figure 3: Ultrasonic Sensor.

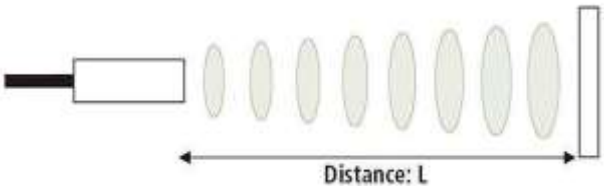

Figure 4: Measuring of distance with ultrasonic

The distance can be calculated with the following formula using Fig. 4:

Distance L = 1/2 × T × C

Where L is the distance, T is the time between the emission and reception, and C is the sonic speed. (The worth is increased by 1/2 since T is the ideal opportunity for proceed to bring distance back).

Buzzer

Figure 5: Buzzer

A buzzer is a little yet productive segment to add sound highlights to our undertaking/framework. It is minuscule and minimized 2-pin structure henceforth can be effortlessly utilized on a breadboard, Perf Board and surprisingly on PCBs which makes this a broadly utilized segment in most electronic applications shown in Fig. 5

V. EXPERIMENTAL RESULTS

Fig. 6 represents the proposed design of the blind stick with complete structure and a human holding the stick.

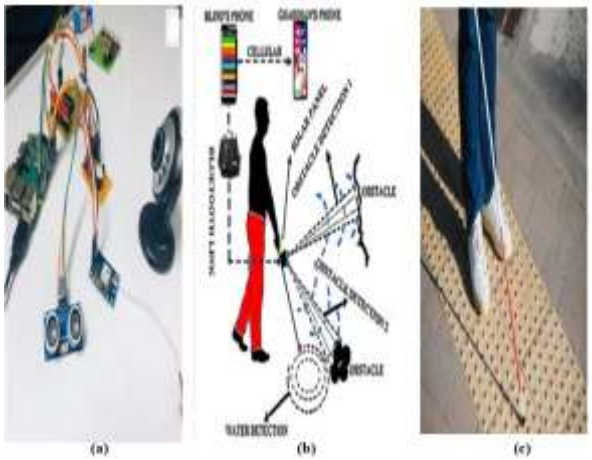

Figure 6: The proposed blind stick results a) Blind stick with complete equipment b) Proposal with a human c) Signal representation of the system.

VI. CONCLUSION

The project proposed the design and architecture of a new concept of Smart Electronic Guiding Stick for blind people. The blind stick proposed in this paper can aid the visually impaired user by helping him/her navigate through different terrains and obstacles. The advantage of the system lies in the fact that it can prove to be very low cost solution to millions of blind person worldwide.

The proposed combination of various working units makes a real-time system that monitors position of the user and provide dual feedback making navigation more safe and secure.

It can be further improved to have more decision taking capabilities by employing varied types of sensors and thus could be used for different applications. It aims to solve the problems faced by the blind people in their daily life. The system also takes measures to ensure their safety.

REFERENCES

1. International Journal of Scientific & Engineering Research, Volume 2, Issue12, December-2011, ISSN 2229-5518.
2. International Journal of Scientific and Research (IJSR)ISSN (Online):2319=7064.
3. "Smart Cane for Vissually Impaired Using Sensors and Arduino," 2016.
4. "Assistive Cane Using GPS and GSM Technology,"2017.
5. "Multi=Functional Smart Cane,"2018
6. M. H. Mahmud, R. Saha, and S. Islam (2013). Smart Walking Stick – An Electronic Approach to Assist Visually Disabled Persons, International Journal of Scientific and Engineering Research, 4(10), 111-114, Available at: https://www.ijser.org/researchpaper/Smart-walking-stick-an-electronic-approach-to-assist-visually disabled-persons.pdf.
7. A.Jose, G. George, M. R. Nair, M J. Shilpa and M. B. Mathai (2016). Voice-Enabled Smart Walking Stick for Visually Impaired, International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, 5, 80-85, Available at: https://www.ijareeie.com/upload/2016/ncreee/13_PID214.pdf.
8. R. Sheth, S. Rajandekar, S. Laddha and R. Chaudhari (2014). Smart White Cane – An Elegant and Economic Walking Aid, American Journal of Engineering Research, 3(10), 84-89, Available at: http://www.ajer.org/papers/v3(10)/L031084089.pdf.
9. C. S. Kher, Y. A. Dabhade, S. K. Kadam, S. D. Dhamdhere and A. V. Deshpande (2015). An Intelligent Walking Stick for the Blind, International Journal of Engineering Research and General Science, 3(1), 1057-1062, Available at: http://pnrsolution.org/Datacenter/Vol3/Issue1/138.pdf.
10. B. G. Roopashree, B. S. Patil and B. R. Shruthi (2015). Smart Electronic Stick for Visually Impaired, International Journal of Innovative Research in Science.