International Journal of Global Engineering (IJGE) E- ISSN: 2456-3099

VOL 2 ISSUE 4 (2018) PAGES 6 - 12

Received: 25/03/2018. Published: 05/04/2018

AN INTEGRATED STICK USING ULTRASONIC SENSORS POWERED BY ARDUINO FOR THE BLIND

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ABSTRACT

Blind stick is an innovative stick designed for visually disabled folks for improved navigation. We tend to here propose a complicated blind stick that enables blind folks to navigate with ease victimisation advanced technology. The blind stick is integrated with supersonic sensing element alongside light-weight and water sensing. Independence is that the building methodology in achieving dreams, goals and objectives in life. Visually impaired persons notice themselves difficult to travel out severally. There square measure countless visually impaired or blind folks during this world Health Organization square measure invariably in want of serving to hands. For several years the white cane became a well -known attribute to blind person's navigation and later efforts are created to boost the cane by adding remote sensing element. Blind folks have massive downside after they walk on the road or stairs victimisation white cane, however they need sharp exteroception sensitivity. The electronic walking stick can facilitate the visually handicapped person by providing a lot of convenient suggests that of life. The most aim of this project is to contribute our information and services to the folks of blind and disable society. The main aim of this project is to help the blind persons while not the human want. It's documented that the blind folks carry a hand stick to them whenever they have a support. Generally even after they use this stick, there's no guarantee that the blind persons square measure safe and secured in reaching their destinations.

Keywords: Supersonic sensing element microcontroller; GPS module

1. INTRODUCTION

Blind stick is associate innovative stick designed for visually disabled folks for improved navigation. We tend to here propose a complicated blind stick that enables blind folks to navigate with ease victimisation advanced technology[2]. The blind stick is integrated with supersonic detector beside lightweight and water sensing. Our planned project 1st uses supersonic sensors to observe obstacles ahead victimisation supersonic waves. On sensing obstacles the detector passes this knowledge to the microcontroller. The microcontroller then processes this knowledge and calculates if the obstacle is shut enough. If the obstacle isn't that shut the circuit will nothing[5]. If the obstacle is shut the microcontroller sends a symptom to sound a buzzer. It additionally detects and sounds a distinct buzzer if it detects water and alerts the blind. Another feature is that it permits the blind to observe if there's lightweight or darkness within the space. The system has another advanced feature integrated to assist the blind realize their stick if they forget wherever they unbroken it[7]. A wireless RF primarily based remote is employed for this purpose. Pressing

the remote button sounds a buzzer on the stick that helps the blind man to search out their stick. so this technique permits for obstacle detection yet as finding stick if misplaced by visually disabled folks. There are unit several steering systems for visually impaired travellers to navigate quickly and safely against obstacles and alternative hazards Janus-faced. Generally, a blind user carries a white cane or a steering dog as their quality aid. With the advances of recent technologies many various sorts of devices area unit on the market to support the quality of blind [9].

2. LITERATURE REVIEW

Chaurasia and Kavitha (2014) observed that Independence is that the building methodology in achieving dreams, goals and objectives in life. Visually impaired persons notice themselves difficult to travel out severally. There are countless visually impaired or blind individuals during this world. WHO are forever in want of serving to hands. For several years the white cane became a well known attribute to blind person's navigation and later efforts are created to enhance the cane by adding remote sensing element. Blind individuals have huge downside after they walk on the road or stairs victimisation white cane, however they need sharp exteroception sensitivity [10]. The electronic walking stick can facilitate the visually handicapped person by providing additional convenient means that of life. The most aim of this paper is to contribute our information and services to the individuals of blind and disable society. it's been ended that the system will be applied within the straight path, right angle path and also the incurved path. a minimum of 1m breadth is needed for the right management of the stick. The broad beam angle supersonic sensors modify wide selection obstacle data. Major downside of infrared sensors is their nonlinear response i.e. a giant modification in output voltage doesn't forever indicate a giant modification in varies. The most functions of this technique are the clear path indication and also the surroundings recognition. With the assistance of electronic walking stick blind, individuals will improve over 15-20% travel speed, cut back minor collision, don't lose their manner, and increase safety as compare to unaided equipments [10]. Future work includes installation of GPS system at the side of further sensors like accelerometers, PIR motion detector and digital compass that tell the precise location of the user.

Y. Q. Liu, Z. K. Gao, Z. J. Shao and G. Y. Liu (2017) examined that The intelligent devices taken to a convenient and trendy era, but the tendency to use a measuring system to calculate the quantity of steps. The blind folks even don't have the power to run severally. There's little question that they're longing for convenience and freedom, supported this, this text proposes associate in intelligent system that assists the blind in walking. The system consists of a crutch and a bracelet. The crutch will find the obstacles before with supersonic detectors that operating direction is controlled by stepper motors and angle sensor. The bracelet would vibrate once the obstacles ar detected to prompt the user [13]. Moreover, the Sensors on the bracelet will find a blind man's fall, if the blind cannot rise up in time, the bracelet would mechanically create a voice to passers-by for facilitate. The bracelet is provided with GPS and 4G terminals, therefore position and want of the blind are often each sent to his family. By testing, the system will acknowledge obstacles like pedestrians, trees, bricks so on. the correct setting to use is additionally known. it's been all over that intelligent system which might assist the blind to run, that consists of a cane and a wristband. The cane uses supersonic find or to detect the obstacle and generate a touch signal; a stepper motor is applied to stay the operating direction of detector forward. Once the blind accidentally fall, the detector on the wristband would feel the autumn, and if the blind lose consciousness and fail to urge up, the wristband would mechanically generate voice prompting passers-by for facilitate [13]. What's additional, the wristband is provided with GPS and a 4G terminal, which can unendingly pass the situation of the blind to his family. If the user desires his family to select him up, a corresponding button on the cane would meet his desires.

3. EXISITING SYSTEM:

Many robot technologies are applied to guide the blinds that geared toward raising their quality in terms of safety, to find obstacles on the bottom, uneven surfaces, holes, steps, and puddles.

4. DISADVANTAGES

- Major disadvantage of infrared sensors is their non-linear response i.e. an immense change in output voltage does not invariably indicate a big change in range.
- At least 1m width is obligatory for the appropriate management of the stick.

5. SYSTEM DESIGN

Proposed System Design

Fig.1 is one of the model proposed by Radhika. R. et.al. Our proposed project first uses ultrasonic sensors to sense obstacles ahead using ultrasonic waves. On sensing obstacles the sensor passes this data to the microcontroller. The microcontroller then processes this data and calculates if the obstacle is close enough[1]. If the obstacle is close the microcontroller sends a signal to sound a buzzer. It also detects and sounds a different buzzer if it detects objects and alerts the blind. One more feature is that it allows the blind to surveillance through GPS. The system has one more advanced feature integrated to help the blind find their stick if they forget where they kept it. Pressing the remote button sounds a buzzer on the stick which helps the blind person to find their stick as shown in the Fig.1.[3].

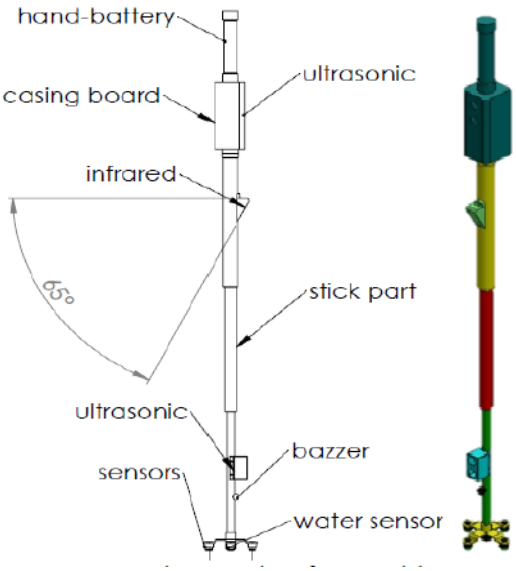

Fig. 1. Design of Smart Stick (Souce: Radhika R et.al.)

6. ADVANTAGES:

- With the help of electronic walking stick blind, people can improve more than 15-20% travel speed.
- Reduce minor collision.
- Do not lose their way.
- Increase safety as compare to unaided equipments.

Along with 10micro farad capacitor and 10 kilo ohm resistor. We have dedicated port number 3Rx pin to Ultrasonic range detector which gives distance approximation of obstacle [4].

7. WORKING MODEL DESIGN:

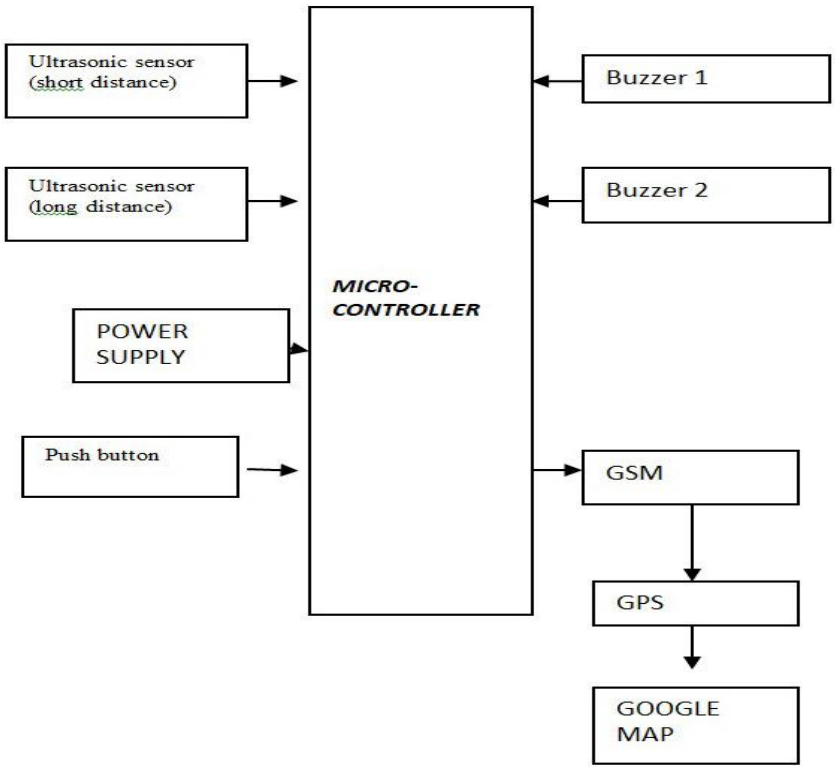

Fig.2. Working model design of the Smart Stick

8. ULTRASONIC SENSOR:

Ultrasonic sensing element:Within the projected system we tend to use a combine of inaudible sensor. Associate in Nursing higher one at a height of regarding ninety cm to observe higher obstacles and another sensing element at a height of regarding thirty cm to observe obstacles below knee level[6]. every ultasonic sensing element detects the obstacles during a vary of regarding two hundred - four hundred cm. the space of the obstacle is decided supported the delay between the emission of sound and also the arrival of Associate in Nursing echo. the space of the obstacle will be measured as, :

Distance = (time*speed of sound in air)/2 (1)

wherever, time is that the time length that the inaudible waves have cosmopolitan and Speed of sound in air is 340m/s. we tend to divide the merchandise of your time and speed by two as a result of the time is that the total time it took to achieve the obstacle and come.

9. BUZZER

A buzzer or beeper is an audiosignalling device, which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers and confirmation of user input such as a mouse click or keystroke.

A passive buzzer will not tweet if DC signals are used; instead, you need to use square waves whose frequency is between 2K and 5K to drive it[8]. If you use GPIO signals to drive it you need to pull the GPIO high first and then low to generate oscillation. The oscillation frequency is generated by the time in which GPIO signals turn from high to low. The buzzer will generate different sounds based on different frequencies.

10. GLOBAL SYSTEM FOR MOBILE COMMUNICATION – GSM

Global system for mobile communication (GSM) is a wide area wireless communications system that uses digital radio transmission to provide voice, data, and multimedia communication services[10]. A GSM system coordinates the communication between a mobile telephones (mobile stations), base stations (cell sites), and switching systems. Each GSM radio channel is 200 kHz wide channels that are further divided into frames that hold 8 time slots. GSM was originally named Groupe Special Mobile. The GSM system includes mobile telephones (mobile stations), radio towers (base stations), and interconnecting switching systems as shown in the Fig 3. [9].

This figure shows an overview of a GSM radio system. This diagram shows that the GSM system includes mobile communication devices that communicate through base stations (BS) and a mobile switching center (MSC) to connect to other mobile telephones, public telephones, or to the Internet. This diagram shows that the MSC connects to databases of customers. This example shows that the GSM system mobile devices can include mobile telephones or data communication devices such as laptop computers[11].

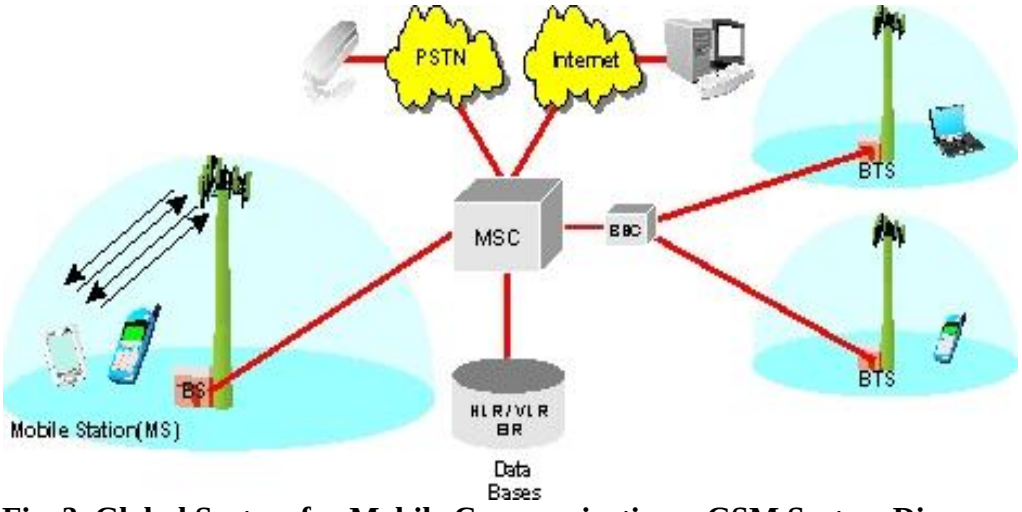

Fig. 3. Global System for Mobile Communication – GSM System Diagram

This diagram shows that the GSM system uses a single type of radio channel. Each radio channel in the GSM system has a frequency bandwidth of 200 kHz and a data transmission rate of approximately 270 kbps. This example shows that each radio communication channel is divided into 8 time slots (0 through 7). This diagram shows that a simultaneous two-way voice communication session requires at least one radio channel communicates from the base station to the mobile station (called the forward channel) and one channel communicates from the mobile station to the base station (called the reverse channel). This example also shows that some of the radio channel capacity is used to transfer voice (traffic) information and some of the radio channel capacity is used to transfer control messages.

A GSM Module is basically a GSM Modem (like SIM 900) connected to a PCB with different types of output taken from the board – say TTL Output (for Arduino, 8051 and other microcontrollers) and RS232 Output to interface directly with a PC (personal computer). The board will also have pins or provisions to attach mic and speaker, to take out +5V or other values of power and ground connections. These type of provisions vary with different modules.

Booting the GSM Module

1. Insert the SIM card to GSM module and lock it.
2. Connect the adapter to GSM module and turn it ON!

11. ARDUINO UNO

The Uno is a microcontroller board supported on the ATmega328P. It has 14 digital input/output pins of which 6 can be used as PWM outputs, 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button as shown in the Fig.4. It surrounds everything necessary to hold up the microcontroller; just connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. It can be tinkered with your UNO without worrying much about doing something wrong, most awful case scenario you can reinstate the chip for a few rupees and start over again[12].

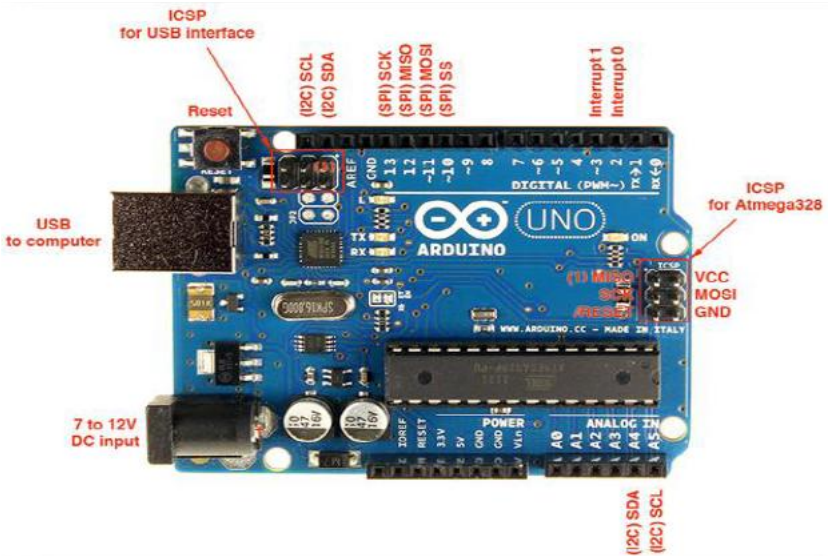

Fig.4. Arduino Uno Board

12. FUTURE SCOPE

The future scope of the active smart stick, directs the visually impaired person in their navigation separately in an competent manner guarantees the person's safety.

a. The Braille input device provides the blind person a straightforward method to offer the destination address for navigation.

b. The programmable wheels steers the stick away from the impediment and also fecilitating the blind person towards the target place of reach.

c. Internet of Things is an innovative concept which can augment the benefits of the smart stick by allowing one stick to converse with another smart stick (or mobile , PCs) nearby to make use of the functionality of the other stick when one stick's functionality breaks down. d. To make run this integrated set of hardware to be able to use solar panels as an alternative to the battery. The utilisation of solar panel occurs to be more advantageous as it uses sunlight, the easily available renewable resource of energy, to get recharged.

13. CONCLUSION

This article emphasises the execution of a smart stick that lends a hand to a visually impaired folks to their desired destination safe and protected. Various sensors are used to distinguish the obstacles ahead and caution the blind person about the obstruction through beep sound. The

intensity of the beep sound amplify as the person in close proximity to the obstacle which aid them to move aside of the impediment. The use of GPS module and GSM/GPRS module, where GPS module assists to trace the blind person using the data collected by it. In case of hazardous circumstances the person whose phone number has been saved is notified that the blind person is at jeopardy, along with the existing location of the blind person. The smart stick also makes possible the sightless person to make calls at times of urgent situation. All these features are advantageous in lending a helping hand to make the visually impaired folks to become independent while moving to the desired place.

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