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NAVIGATION ASSISTANCE FOR VISUALLY IMPAIRED PEOPLE USING NODE MCU

GIRI.K[1], VINOTH.C[2], SATHISH KUMAR.U[3], NAVEEN.R[4], PRABATH.K[5]

1 ASSISTANT PROFESSOR 2,3,4,5UG SCHOLAR

ELECTRONICS AND COMMUNICATION ENGINEERING

MAHENDRA ENGINEERING COLLEGE, TAMILNADU, INDIA

ABSTRACT

Mobility for blind and elderly people is a problem as they have to face many difficulties in their day to day life. Most commonly, stick is use by blind and elderly people as a support for their body to stand and walk. The most common disadvantage of walking stick is user should have to be in close proximity of obstacle so that he can sense the location of obstacle to avoid bumping while waggling. We proposed a new concept of walking stick which is helpful for both blinds and elderly people to move in unfamiliar environment and monitor their medical condition. In this methodology we have used different sensors mounted on a walking stick which will help a user to navigate easily indoor and outdoor along with monitoring their health. Unlike other electronic blind stick which were helpful in detecting obstacle and alert user we designed a stick having multiple feature embedded in a single stick. This stick used for detecting obstacle, pit, water on ground to some level, location of user, body temperature measurement of user and alert another person by sending message about the health issue of user or some other emergency.

Keywords: WHO, smart walking stick & GSM modules

1.1 INTRODUCTION

According to the World Health Organization, there are 285 million people projected to be visually impaired around the globe. There are 50 million people estimated to be blind who are of prolific age and need independent mobility to work or walk outside and be part of the mainstream and do all other daily essential works. There are 12 million people in India with blindness, the greatest number for any country in the world, according to 2011 census data. The earlier used white cane has major issues as subject need to be in close proximity of obstacle and sense the location of the obstacle by the tip of the white can. While sensing obstacle by the white can he could get hit to other obstacles around him. White can gives no knowledge of the obstacle nearby. The designed smart walking stick is equipped with different sensors which will alert user about various obstacles coming ahead in his way while walking. This smart walking stick has health monitoring features. User can check their pulse rate and body temperature using those health monitoring features. GPS and GSM modules are equipped in stick to track location of user and send an alert message to other person. Another important feature of this walking stick is voice alert system. The user will be notified by voice alert about obstacle, pit, wet surface and health issues. This will ease mobility of blind person as he will get attentive after listening voice alerts. Other embedded important features of this smart stick are object detection, pit detection, water detection. These features of smart walking stick are helpful in guiding elderly and blind users in their mobility and to avoid accidents. With the help of this smart walking stick user can walk freely and easily in unknown environment without depending on other person.

1.2 OBJECTIVE

To develop a prototype hardware for modern blind stick.
To help the blind people navigate the route at their best.
To reduce the risk of injuries and lost for the visually impaired person.
To creating a suitable software for the visually impaired person.

1.3 PROBLEM STATEMENT

Blind people can't easily recognize obstacles or stairs while using normal blind stick.
No safety features on the normal blind stick.
Can't locate the location of the normal blind stick user when they are having an emergency problem or lost in a public area.

1.4 WALKING STICK SENSOR

The walking stick sensor system, it is consisted of a sensing part, sound alert, control unit, receiver and a power supply. The range finder is operated by using the radio frequency carrier with the center frequency at 27.6 MHz. In operation, the required detection range is recognized as the safety zone, in which all required data is controlled by the control unit. The radio carrier is generated by the sensor and propagated to the target, in which the reflected signal can be detected by the receiver, where finally, the distance can be calculated and compared to the database by the control unit. There is no voice alarm in the safety condition. However, the sound alert system is operated whenever the distance is not within the safety zone. In applications, the use of Nano device can be provided within the walking stick, in which more applications such as multi function sensors, blind network can be formed. The application of walking stick, in which the walking stick can be for the short range network which is called ad hoc network. By using the ad hoc network for the blind, the applications such as GPS, walking rally, city tour can be realized. The advantage of the ad hoc network for the blind is that the movement of the blind can be a group of blind people, in which one of them can be formed as a node that links all of them together. Alternatively, the separated note can also be applied to follow and monitor the blind movement, whereas the safety condition can be controlled.

1.5 OBSTACLE-DETECTING ETAs

The system consists of a wearable hat, a mini-hand stick, and shoes, and the components used in this system are ultrasonic sensors for obstacle avoidance, an Arduino microcontroller for processing the signal received by the sensors, and Raspberry Pi as a speech synthesizer to inform the VCP about detected obstacles. The proposed system can detect obstacles in the front, backside, left, and right directions of the user. Mocanu et al. proposed a wearable device for efficient obstacle detection as well as recognition using sensors, computer vision, and machine learning techniques. The system uses four ultrasonic sensors, Bluetooth, an Arduino microcontroller, and a smartphone. The sensors and smartphone camera collect information about the obstacles and send it to the obstacle recognition module to understand the presence of obstacles in the surrounding scene. A K-mean clustering algorithm was applied for identifying dynamic objects, and a support vector machine (SVM) classifier with Chi-square kernel was used for training and prediction. Accordingly, it generates a feedback signal for the VCP. The proposed system provides a better solution for obstacle detection, as it integrates both sensors and machine learning techniques, but it can only detect obstacles up to the waist level. Yi et al. designed a blind guide crutch based on ultrasonic distance measurement for obstacle detection. It consists of three ultrasonic sensors for detecting and avoiding obstacles overhead, in front, in the right-front, and in the left-front. A STC15F2K60S2 microcontroller is used to control the whole system and processes the signal between the ultrasonic transmitting and receiving module to obtain distance information.

Voice and vibration modules are used as feedback modules. The system has the capability of detecting obstacles in multiple directions. Mohammed A. The rib proposed a system that comprises a blind stick in order to help blind people avoid collisions with obstacles. It consists of an Arduino microcontroller and two SRF06 ultrasonic sensors: One sensor is fixed at an angle of 40 degrees on the stick to detect stairs or holes, and another sensor is used to detect obstacles such as a wall or any persons in front of the blind person. A moisture sensor is used to detect wet surfaces or ponds, and a vibration motor and buzzer are used as an alarm. The system can detect obstacles, holes, stairs, and moist surfaces. It helps a blind person to walk on the sidewalk and avoid falling off of the sidewalk by calculating the distance between the blind person and the sidewalk border. A radio frequency identification (RFID) tag, RFID reader, middleware, and a database are the major components of RFID technology. In this system, the RFID tags are placed at the center of the sidewalk at a certain distance from each other. Thus, when the VCP gets closer to the border, the reader attached to the walking stick detects the frequency from the tag, and vibrations are produced to alert the user. The system is reliable, as RFID technology provides an accurate level of detection, but for this, a lot of RFID tags need to be placed in many places, and each tag has a specific working range, and hence this requires a lot of testing. In addition, if any tag is covered by anything, then it may not work properly.

1.6 HYBRID ETAs

These ETAs are designed with obstacle detection sensors along with either localization or communication technology. Thus, the systems provide information about the obstacles encountered and the VCP's location, and also the VCP can contact parents or guardians. A prototype of a global position system (GPS) and global system for mobile communication (GSM)-based navigational aid called a "smart white cane" that helps visually impaired people in easy navigation. The system consists of IR sensors for obstacle detection, a water detection sensor, a playback recorder integrated circuit (IC) to provide instructions about the presence of obstacles, a GPS module, and a GSM for finding location and sending SOS messages to family members, respectively. A prototype named "substitute eyes for the blind", in which the embedded system mainly helps in obstacle detection, and the APP helps in navigating directions. The system consists of a TI MSP430G2553 microcontroller as an embedded device, two HC-SR04 ultrasonic sensors, and three mobile vibration motors. The proposed device is lighter and affordable, but the designed structure needs to be held through fingers, which is not comfortable for long-term use. A walking stick prototype that helps the VCP to move independently both indoors and outdoors. The walking stick is embedded with an SRF02 sonar sensor for obstacle detection, and RFID and a GPS module are used for indoor and outdoor location detection, respectively. A GSM module is also used for sending alert messages to preregistered contacts. A stick to guide the VCP on their way. The components used in the system are an Arduino Uno as a controller for processing the signal obtained from different sensors, two HCSR04 ultrasonic sensors to detect obstacles, and an IR sensor for staircase detection. GPS-GSM modules are also used to find the location of the VCP and to share that location information with a registered contact. A wearable smart system to improve the independent and safe mobility of visually impaired persons. It includes an ATmega328 microcontroller embedded with an Arduino Uno with various types of sensors. An HC-SR04 ultrasonic sensor is used to detect obstacles, an ADXL345 accelerometer is used for fall detection of the user, and a voice recognition sensor is used that detects the user's voice when he or she needs assistance. As GSM and GPS modules are used, it can send an alert message to a registered mobile phone number, and also the location of the user can be tracked by their parents using that registered mobile phone.

In this proposed system, the author's idea is to keep the device always with the VCP without being forgotten, which may be beneficial in emergency situations. It has the features of lower body part obstacle detection and localization and communication in emergency situations. Since the system is designed to be worn on the wrist, therefore the user needs to maintain hand posture. Otherwise, it may always change the range or direction of obstacle detection, which may lead to a dilemma in detecting obstacles by the VCP. A system called "GPS talking" to help a VCP in independent navigation. This device is basically a localization-based aid and does not have the feature of obstacle detection. It contains a GPS receiver, programmable interface controller (PIC) microcontroller, voice recorder, liquid crystal display (LCD), microphone, and headset. The GPS receiver receives the location coordinates and sends these data to the microcontroller for comparing these coordinates with the predefined coordinates. If the coordinate range is matched, then it plays a voice recorder message and notifies the user through the headset. The LCD is used to read the current position coordinates by the designer. A navigation system that produces voice messages for obstacle detection and navigation. This system consists of an 89c51 microcontroller, Bluetooth, an analog-to-digital converter (ADC), an IR sensor, an RFID sensor and RFID tags, and android APP. The IR sensor detects obstacles and the RFID sensor that is fixed to the walking stick reads the RFID tags that are installed in public places and sends these data to the microcontroller to produce an alarm. Apart from this, the APP of the blind person gets this information through Bluetooth and produces vibrations or voice messages for obstacle avoidance and location navigation. Another APP is used by the user's family members to get the latest location of the user. RFID is one of the very good solutions for navigation, but has some drawbacks, which are discussed in the work. The above-mentioned systems of have only obstacle detection capabilities and do not have any features for localization and communication, and the systems of are position locator devices and are integrated with other sensors to extend facilities for VCPs. Since these systems provide various features and are the amalgamation of many electronic components, so they are termed hybrid ETAs. Altogether, if we summarize, the above-discussed systems use various sensors with different techniques to detect obstacles such as ultrasonic sensors, IR sensors, and sonar sensors.

Ultrasonic sensors and sonar sensors are quite related, as both sensors work based on the principle of reflected sound waves, whereas IR sensors work based on reflected light waves. IR sensors have a drawback in dark conditions, so in bright conditions they have better performance, but sometimes they may fluctuate in various light conditions and also get interfered with from sunlight. Thus, these are some limitations of using IR sensor-based devices. However, ultrasonic sensors are applicable for both light and dark conditions, and also are not affected by many other factors such as dust, smoke, mist, vapor, and lint. In addition, ultrasonic sensors have a longer range of detection compared to IR sensors. However, IR sensors are less expensive compared to ultrasonic sensors. Apart from this, in many proposed systems, GSM technology has been mentioned for communication. GSM is a worldwide technology, but it has certain limitations, such as bandwidth lag, so with multiple users the transmission can encounter interference. GSM is second-generation technology, but now already faster technologies such as 3G, 4G, and 5G have developed in different networks. Again, it may interfere with certain electronic devices, such as hearing aids. As we can see, some of the proposed systems are wearable, and it is good that the hand of the VCP is not occupied. However, according to our observations, a stick is more important for a VCP: If unfortunately, any of the sensors fail, the stick can prevent direct collision with obstacles. A VCP walking is different from a normal person, as human eyes cannot be completely substituted by any other substitution, so a stick can be a good supporter along with the sensors. Again, using the stick, the VCP can have a basic idea about the path, such as if the VCP's stick is in front of him/her and there is no terrain, it means a pit. Thus, in this paper we propose a hybrid ETA that provides multiple beneficial features. In this system, we combined a microcontroller with a single board minicomputer Raspberry Pi to make it more reliable, powerful, and efficient.

Raspberry Pi works as the master controller, whereas a PIC microcontroller acts as a slave controller, and simultaneously they perform and achieve multiple features. The ETA is a sensor-based walking stick, along with APPs. It has the capability of long-range obstacle detection up to 6 m ahead of the VCP for both upper and lower body parts, and also water puddle detection. Again, we did not use extra components such as an analog-to-digital converter (ADC) for this, as the used microcontroller has an inbuilt feature of ADC. In addition, it has the features of localization and communication in emergency situations. For communication, an APP is used using a faster-speed network instead of an additional component. The emergency APP has not only the features of call forwarding and SMS sending, but also a remarkable feature for partially sighted people. The APP is camera-enabled and captures the location image with the address automatically when the cell phone is shaken, and then an option pops up to share this image using social media with friends or parents. This means a fewer number of components are used in this system to make it simple, light in weight, and affordable.

1.7 SMART WALKER

Our system consists of a standard off-the-shelf walker, retrofitted with sensors and data-processing capabilities. The sensing and processing unit is built in a modular fashion, such that it can be easily mounted on different walker brands. The system additionally includes a vibration belt comprising five vibrating motors, which provide haptic feedback to the user. We use two planar laser range finders for perception and estimation of the ego motion. The first laser scanner is fixed with respect to the walker and it is used to calculate the ego motion by laser scan matching. The second laser scanner is continuously tilted by a servo motor to sense the three dimensional environment. We fuse the ego motion estimation with the measurements of the second scanner and the servo motor to obtain a dense three-dimensional point cloud. Our approach leverages terrain classifiers from robotics to detect hazardous positive and negative obstacles from point clouds.

Specifically, we modified the "height-length density" (HLD) classifier, which is designed to determine safe and traversable cells in a planar grid map. Our modification improves its suitability to human motion with a walker in tight narrow indoor spaces. We compute the distances to nearby obstacles by fusing travers ability information from the classifier and data from the fixed laser. This information is then relayed to the vibration belt via Bluetooth. Obstacle distances are encoded with pulse frequency modulation such that closer obstacles result in the respective motor vibrating with a higher repetition rate. If the obstacle proximity is below a provided threshold, the corresponding motor is turned on constantly.

2. LITERATURE SURVEY

2.1 "ELECTRONIC GUIDANCE SYSTEM FOR THE VISUALLY IMPAIRED-A FRAMEWORK" NAMITA AGARWAL, ANOSH IYER, SONALAKSHI NAIDU, SNEDDEN RODRIGUES.

Ability to move confidently is critical in maximizing independence, regardless of age and with or without existence of other disabilities. Orientation and mobility helps both children and adults to develop and master the concepts and skills which are necessary to move safely and efficiently within their world with confidence. Mobility for the visually impaired is always a great problem. With over 39 million visually impaired people worldwide, the need for one assistive device that allows a user to navigate freely is crucial. The traditional and oldest mobility aids for persons with visual impairments are the walking cane and guide dogs. The important drawbacks of these aids are the requirement of necessary skills, range of motion and little information being conveyed. A stick requires the person to come into close proximity with the obstacle to determine its location. This paper proposes the design and architecture of a new concept of Smart Electronic Guiding Stick for the visually impaired. Visual impairment means loss in vision of a person such that it qualifies for a need for an additional support due to significant limitation of visual capability. This can be because of some disease, trauma or degenerative conditions that cannot be corrected by conventional methods like refractive correction or medication. According to World Health Organization fact sheet, 285 million people are estimated to be visually impaired worldwide of which 39 million are blind and 246 have low vision. Approximately 90% of the visually impaired people of the world live in low-income settings. Accessibility to everyday-life environments for the old or differently abled people has attracted public interest in recent years. Although improvements have been done like having textured paving blocks, slopes instead of steps, elevators or handrails but still these changes are limited to specific places.

2.2 "AN ELECTRONIC WALKING STICK FOR BLINDS" SHASHANK CHAURASIA AND K.V.N. KAVITHA

Visually impaired persons find themselves challenging to go out independently. There are millions of visually impaired or blind people in this world who are always in need of helping hands. For many years the white cane became a well- known attribute to blind person's navigation and later efforts have been made to improve the cane by adding remote sensor. Blind people have big problem when they walk on the street or stairs using white cane, but they have sharp haptic sensitivity. The electronic walking stick will help the blind person by providing more convenient means of life. The main aim of this paper is to contribute our knowledge and services to the people of blind and disable society. There are many guidance systems for visually impaired travelers to navigate quickly and safely against obstacles and other hazards faced. Generally, a blind user carries a white cane or a guidance dog as their mobility aid. With the advances of modern technologies many different types of devices are available to support the mobility of blind. These mobility aids are generally known as Electronic Travel Aids (ETAs). The most important function of ETA for the blind persons is to get information on the shape of the road and the position of obstacles when they are in unknown places. With this information, they need to arrive at their destinations, avoiding unexpected obstacles.

2.3. "SMART WALKING STICK- AN ELECTRONIC APPROACH TO ASSIST VISUALLY DISABLED PERSONS" MOHAMMAD HAZZAZ MAHMUD, RANA SAHA, SAYEMUL ISLAM.

Blindness is a very common disability among the peoples throughout the world. According to the World Health Organization (WHO) 285 million people are visually impaired worldwide, 39 million are blind and 246 have low vision. About 90% of the world's visually impaired live in developing countries. Looking at this locally, we see that within Australia, it is estimated that there are 380 thousand people who have low vision or are classed as legally blind. A person who cannot see at 6 meter nor has a field vision of 10° or less is considered legally blind. 95% of people classed as legally blind have some vision. To be classed as blind, there is a total loss of vision. Low vision cannot be corrected by visual aids such as glasses and contacts. For the indigents blindness is a curse. They need help to walk outside and all other daily essential works. So the paper glows a system that tries to remove the curse of blindness and make them self-dependent to do their daily chores. It is a walking stick, normally used by the blinds. But it is fully automated, easy to maintain, cheap and it is very comfortable to use. The power consumption is low and can be operated easily. The entire project is designed using micro-controller based upon its reliability. The micro- controller is code protected so its security bridge cannot be override except the vendor or owner. Here one micro-controller is used, that is PIC16F690. All sensors' data are taken by the micro-controller and it produces different Pulse Width Modulation (PWM) based on the sensors output to operate pager motor. The output indications provided by the microcontroller are distinctive as per sensor. Based on the strength of vibration of the motor or the beeping of the buzzer or the blinking of the LED embedded with the stick a disabled person may determine if he/she is walking towards a manhole or an edge or a large opening at nearby bottom or something similar. At the same time, he/she may get the sense of his/her distance from nearby objects and if he/she is walking in a wet or muddy or potentially slippery terrain. The microcontroller and power circuitry (preferably battery based) are the crucial part of the scheme. The simplicity of the design makes it easy to use by any person and at the same time the cost of manufacturing such sticks is kept low.

2.4. "AN ULTRASONIC RANGING SYSTEM FOR THE BLIND" DAVID T.BATARSEH, DR. TIMOTHY N.BURCHAM, AND DR. GARY M.MCFADYEN

A mobile ultrasonic ranging system was developed for the blind. Currently, the most common method of range detection used by blind people is the walking stick The limitation of the walking stick is that a blind person must come into close proximity with their surroundings to determine the location of an obstacle. In this project, a commercially available ultrasonic sensor, the Sona Switch TM 1700 (Electronic Design and Packing, Livonia, Michigan) was used to expand the environmental detection range of blind individuals. This sensor has a DC voltage output proportional to distance measured and an internal solid state switch. The DC voltage changes inversely with respect to changes in object distance. By using a monolithic voltage-to frequency (V/F) converter, the DC voltage from the sensor is converted into an AC frequency that produces an audible frequency of chirps in two small headphones. The larger the DC voltage input into the V/F converter, the higher the frequency of chirp's output. The result is a system that produces a varying frequency of chirps that is inversely proportional to the distance measured. The sensor is mounted on a lightweight helmet allowing the user to obtain a reading in whichever direction their head points. The purpose of this design project was to develop an ultrasonic ranging system that will expand the environmental detection range of blind individuals and reduce the need for the walking stick. The ultrasonic ranging system developed fulfilled its purpose in that it expanded the environmental detection ranges for blind individuals and reduced the need for the walking stick. The analog mode of detection allowed the user to form a mental picture of the environment based on the different patterns and frequencies of chirps elicited. On the other hand, the digital mode of detection basically served to alert the user of nearby obstacles. A few improvements could be made to increase the precision of the system. First, using different emitting and receiving ultrasonic transducer pairs could reduce the problem of ultrasonic angular misalignment. Placing the receiving transducer at an angle to the reflecting surface that is We rent from the emitting transducer angle will allow more of the echo pulse response to be captured. Different echo pulses captured by different receiving transducers could then be integrated by a microprocessor to give the correct distance to object calculation. Also, the use of a laser transducer would bypass the problem of ultrasonic angular misalignment. Due to a limited amount of undergraduate research funds, this option has not been explored.

2.5. "SMART WALKING STICK FOR VISUALLY IMPAIRED" G. GAYATHRI, M. VISHNUPRIYA, R. NANDHINI, MS. M. BANUPRIYA

In this paper, we introduced a smart electronic aid for visually impaired. The smart cane provides a solution to visually impaired who face complications in detecting obstacles and changes in environment. The smart cane comprises of three sensors: infrared sensor, ultrasonic sensor and flame sensor. These sensors are implemented and programmed using microcontroller (Arduino UNO R3). This stick can detect obstacles which lie in the range of about 2m from the user. According to the WHO definition, blindness implies visual sharpness less than 3/60, or corresponding visual field loss to less than 10 degrees in the better eye, with the best available spectacle correction. [2] India currently has around 12 million blind people against 39 million globally- which makes India home to approximately one-third of the world's blind population (March 2017). Previously, the techniques used by the blind were white cane and dog assist. With the rapid growth of technology many different devices have been invented to support the movability of blind. The main objective of this project is to design a smart cane which is used to detect the depth and the presence of obstacle. This allows the user to walk independently. The Arduino Uno R3 is a microcontroller board based on the ATmega328P. It consists of

20 digital input-output pins out of which 6 pins can be used as Pulse Width Modulation (PWM) pins. These pins are configured to take analog input. Logic based programs are created in the Arduino compatible software and fired into the microcontroller.

3.1 EXISTING SYSTEM

The system has the capacity to detect obstacles that exist on the ground during walks indoor and outdoor navigation.

Moreover, many people simply afraid of being helpless in constant movement of people, vehicle and other road users. It is therefore advisable to offer new solutions of the problems with existing technologies.

The idea of the proposed system came into existence because of a short visit to a blind school.

3.2 PROPOSED SYSTEM

This paper proposes a Node MCU based obstacle finding stick for visually impaired people, which helps a blind person by detecting the obstacles using Ultrasonic sensors and IOT application.

One button is used for the emergency text transmission purpose from the user and second one is used to know self-location of the visually challenged person.

When visually challenged person very near to object the vibration starts and speaker tells how near to obstacle and also send notification call to guardian.

The proposed method is a simple walking stick equipped with sensors to give information about the environment.

3.3 FEASIBILITY STUDY

The feasibility of the project is analyzed in this phase and business proposal is put forth with a very general plan for the project and some cost estimates. During system analysis the feasibility study of the proposed system is to be carried out. This is to ensure that the proposed system is not a burden to the company. For feasibility analysis, some understanding of the major requirements for the system is essential. Three key considerations involved in the feasibility analysis are:

Economic feasibility
Technical feasibility
Operational feasibility

4. RESULTS

During the evaluation of the design and development of Smart Sensor Based Walking Stick it was tested in practicable and real time conditions. It is also evaluated by blind person. There are different conditions on different routes have been chosen to test the performance. In first route, we have placed dummy of wall as obstacles in numbers. The blind person was unfamiliar with this place. At first Blind person used the white cane on this route and comparative performance with white can has been evaluated. The route was 27m long in distance and it was covered at a speed of 0.522 m/s with help of white cane. But when blind person used smart stick it was covered at speed of 0.78 m/s and without any problem. In the end route shows that "Smart walking stick" has outstanding performance as compared to white cane. Likewise, first route we got excellent results when we tested this stick in other routes as well.

A. OBSTCLE DETECTION

Obstacle detection is another feature that has been added in this smart stick. The obstacle detection circuit has provided an accuracy of approximately 4 feet. Data is collected from an ultrasonic sensor used to find the obstacle distance. The detection of obstacle is then shown on the

16X2 LCD. For a blind user who is unable to see the message on LCD, an audio message was **delivered by APR33A3 module so** that the user gets alert. In the Figure 3 below, an obstacle came in front of ultrasonic sensor which is about 3 cm far. The object gets detected by ultrasonic sensor and the calculated distance of obstacle from sensor is displayed on LCD.

B. PIT DETECTION

While walking there is a probability that a blind person can fall due to his stepping into small or even bigger pits. Hence there is a requirement to intimate him/her about any pit coming in his way whi9le he is walking. So we provided a passive infrared sensor, placed in the stick facing downward. Any hole or pit in way is detected by using this sensor. The signal from this sensor is fed into the microcontroller which decides whether there is a pit or not. On the detection of the pit, the user will be notified by voice alert and by displaying it on LCD. The range of detection can be set accordingly in this sensor. The detection range that we manually configured is the height from bottom of stick to sensor location so any pit below that fixed distance can be detected. For testing this stick, it is carried by the user on the stairs. While walking on the stairs, the proximity sensor stops getting even surface and it detected uneven surface and shows pit detected. The user will be notified by displaying message on LCD and by voice alert which is generated by the APR system, that there is a pit and user will get attentive. D. Body temperature measurement The normal body temperate is considered 36.1±0.4 °C. We have used NTC thermistor to detect the body temperature. By using the integrated temperature sensor, we get the user's temperature as 36ºC which lies in normal range of human body temperature. If the temperature is not normal i.e. if it is above 37 °C, the APR will give an audio alert.

C. LOCATION FORMATION USING GPS AND GSM MODULE

When a blind or elderly person is out of home for walk or for other reason, if his/her health becomes suddenly poor i.e. if he feels that it is difficult for him to reach home back, he can intimate one of his relatives about this. There is an alert button provided on the stick, this button when pressed sends the coordinate of stick to a pre stored mobile number, i.e. "+91**********" via GSM module through SMS. The GPS module calculates the latitude and longitude of the location of the user.

4.1 TESTING

Implementation is the stage of the project when the theoretical design is turned into a working system. This is the final and important phase in the system life cycle It is actually the process of converting the new system into an operational one.

4.2 UNIT TESTING

Unit testing comprises the set of tests performed by an individual programmer prior to integration of the unit into a larger system. The module interface is tested to ensure that information properly flows into and out of the program unit. The local data structure is examined to ensure that data stored temporarily maintains its integrity during all steps in an algorithm's execution. Boundary conditions are tested to ensure that the module operates properly at boundaries established to limit or restrict processing. All independent paths through the control structure are tested. All error-handling paths are tested.

4.3 BLOCK BOX TESTING

Black-box testing is a method of software testing that examines the functionality of an application without peering into its internal structures or workings. This method of test can be applied virtually to every level of software testing: unit, integration, system and acceptance. It is sometimes referred to as specification-based testing.

4.4 SYSTEM IMPLEMENTATION

Implementation is the stage of the project when the theoretical design is turned into a working system. This is the final and important phase in the system life cycle It is actually the process of converting the new system into an operational one.

5. CONCLUSION

The smart walking stick is more advance, easy to maintain, cheap, durable than conventional one. With the help of smart walking stick blind, elderly people can advance more than 15-20% travel speed, reduce minor collision; do not lose their way, and increase safety and confidence. Blind and elderly users can move confidently without any dependence on other person with the help of this smart stick. With the help of this walking stick user will feel secure and independent. This stick is very helpful in avoid accidents. Other person will remain in touch with the user via alerts. If there any problem occurs, emergency alert regarding user health and his location will be send to related person and he will be notified immediately. Thus this is very helpful for both blind and elderly people both in terms of health monitoring and safe travelling. The future work can be the performance of stick can be improved by adding extra health monitoring features. We can add diabetes monitoring feature in stick as it is one of most arising problem in elderly persons. Future work will be focused on enhancing the performance of the system and reducing the load on the user by adding the camera to guide the blind exactly. Images acquired by using web camera and smart cameras helps in identification of objects as well as scan the entire instances for the presence of number of objects in the path of the blind determining long range target objects. The other scope may include a new concept of prime and safe path detection based on neural networks for a blind person. It can also detect the material and shape of the object. The principles of mono pulse radar can be utilized for determining long range target objects. The other scope may include a new concept of prime and safe path detection based on neural networks for a blind person.

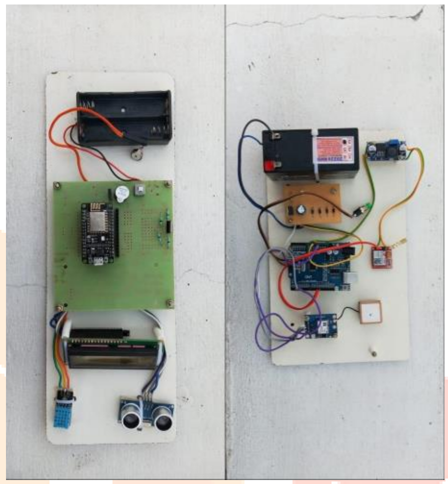

FIG 1 CIRCUIT CONNECTIONS OF THE PROPOSED SYSTEM

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