RESEARCH ARTICLE OPEN ACCESS

Design of Atmel based smart shoe for blinds navigation

E.Senthil Velmurugan
Department of Electrical and Electronics Engineering
Murugappa Polytechnic College, Chennai, INDIA.

Abstract:

In this Era the major problem for the humanity is the Physical problems like Deafness, Blindness and etc. This project is used to overcome the People's problem due to the blindness. It is achieved by creating a ultra-sonic waves same as bats for that HC SR04 Sensors are used to emit the ultra-sonic waves. But it can't hear by the normal human ears, so the vibration motor is used to sense and that signal received by the ultrasonic sensor and vibrate(in the users leg where it is fixed). Thus the user can sense there is an obstacle in front of him. The Microcontroller controls the whole operation. It sense the timing covered by the ultra-sonic waves and it triggers the vibration motor. All these components fixed in the shoe. Three HC SR04 sensors and three vibration motors are used in this process. The first ultra sonic sensor fixed in front of the shoe and second and third sensor fixed in the sides of the shoe. And the vibration motor fixed in the leg respective to the sensors

Introduction

This venture is utilized to discover an answer for conquer the issues because of visual impairment. It is accomplished by making ultrasonic waves to identify the impediment in that way the client can distinguish and sense the snags in the environment. In this manner it can be useful for the visually impaired individuals to respond to their snag like ordinary individuals. In nowadays the visually impaired individuals utilizes stick for their movement and to recognize the snag around their environment, however it has a few hindrances, for example, when the visually impaired individuals needs to cross the street the stick can't distinguish the vehicles so he/she may get injured or far more terrible. The stick must be tap in the ground with a specific end goal to identify something, all things considered if the stick accidently tap in the city puppy, the canine gets distraught and the client gets injured. To defeat these issues this venture is presented. It transmits the ultrasonic sensors to identify the impediments, it won't aggravate anybody and it can be extremely valuable than the stick. With this task the Blind People no compelling reason to sit tight for others to cross the street.

LITERATURE REVIEW

An enormous number of research works are being performed in different organizations over the globe to give a financially savvy and proficient route help for the blinds. At first the outwardly impeded people were helped by located people for their fundamental needs and portability at that point came the period of managing canines. Controlling mutts are prepared pooches and they help the visually impaired individual for a helped portability. Be that as it may, this arrangement was not powerful. Scientists invest their exertion and composed various Electronic Travel Aids (ETA). This segment contains a survey on gadgets grew up until this point. White can is viewed as world's most generally utilized route help for blinds. White stick can recognize impediments exhibit on the ground, pits, puddles, uneven surfaces and furthermore steps [7]. White sticks are comprised of light materials and give a simplicity of conveying it as it is foldable and effectively fits into ones pocket [8]. Subsequently, the underlying expense for white stick is less. Be that as it may, discussing general cost, the case isn't the same. A client requires a training session of around 100 hours to get settled with the

gadget so he can walk securely and legitimately. Presently the "100 hours" venture is viewed as the additional cost which is high [9]. Aside from this gadget a few different gadgets have been created throughout the years are as yet produced for a superior help to the visually impaired individuals. Maybe a couple of the gadgets are examined beneath. Endeavors for the recovery of visually impaired individuals have been made since decades. The previous three decades have seen various electronic gadgets being produced for the reason. The point behind advancement of the considerable number of gadgets however have been the same, wellbeing, certainty and speed 12 in versatility of a visually impaired individual [10]. Rundown of couple of ETAs are: C-5 Laser stick [11]: It was presented in 1973 by Benjamin et al. It depends on optical triangulation by three laser diodes and three photodiodes going about as recipients. These photodiodes are silicon photodiodes [12]. The stick is fit for recognizing snags at head level; ground level and before the client. The gadget can identify hindrances in the middle of a scope of 1.5-3.5 m in front of the client [13]. There are a few burdens joined with utilization of a laser stick [14]. The utilization of laser stick can be destructive if appropriate safety measures are not taken and can influence the eyes of a person with no legitimate eye wear. The photodiodes utilized at the getting closes are well on the way to react to different surrounding sources, the daylight and so forth. In addition, in hot and smoky territories the proficiency of the stick hangs radically [14]. The Mowat sensor [15] and the Nottingham snag finder (NOD) [16] both are hand held gadgets utilized for impediment location. The Mowat sensor utilizes ultrasonic based separation estimation framework [17] while the NOD is a sonar gadget. Mowat sensor requires connecting with the two hands of the client for a viable filtering for the hindrances. The Binaural Sonic Aid (Sonicguide) [18] is a gadget wimilar in appearance to a couple of display outlines. These edges permit the position of ultrasonic transreceivers. The transmitter is sitted amidst the edge with two recipients, one each mounted on side of the casing [19]. Its rule of separation estimation depends on the recurrence move and consequently the recipients have an interaural sufficiency distinction which in this manner helps client in the assurance of the outcome as separation and heading of the impediment [20].

Methadology

The working of the Shoe is Very straightforward, the HC-SR04 sensor discharge the ultra-sonic wave and if the sonic wave hit any deterrents it will again send towards to the sensor, at that point the Microcontroller sense the accepting estimation of that ultra-sonic sensor and essentially turn on the vibration engine. The vibration engine is utilized to advise the individual that there is a snag before them and it will inform them by making a vibration in their Leg (where it is settled). Absolutely three ultra-sonic sensors is utilized here so as to gather the full data in that encompassing and additionally three vibration engine is accustomed to detecting that three sensors esteems. The principal ultra-sonic sensor is settled before the shoe and next one is settled left half of the shoe and the last one is settled in right half of the shoe individual to the vibration engine. At that point the Microcontroller and different parts, for example, Battery, sun oriented board, battery and so forth are settled in the shoe.

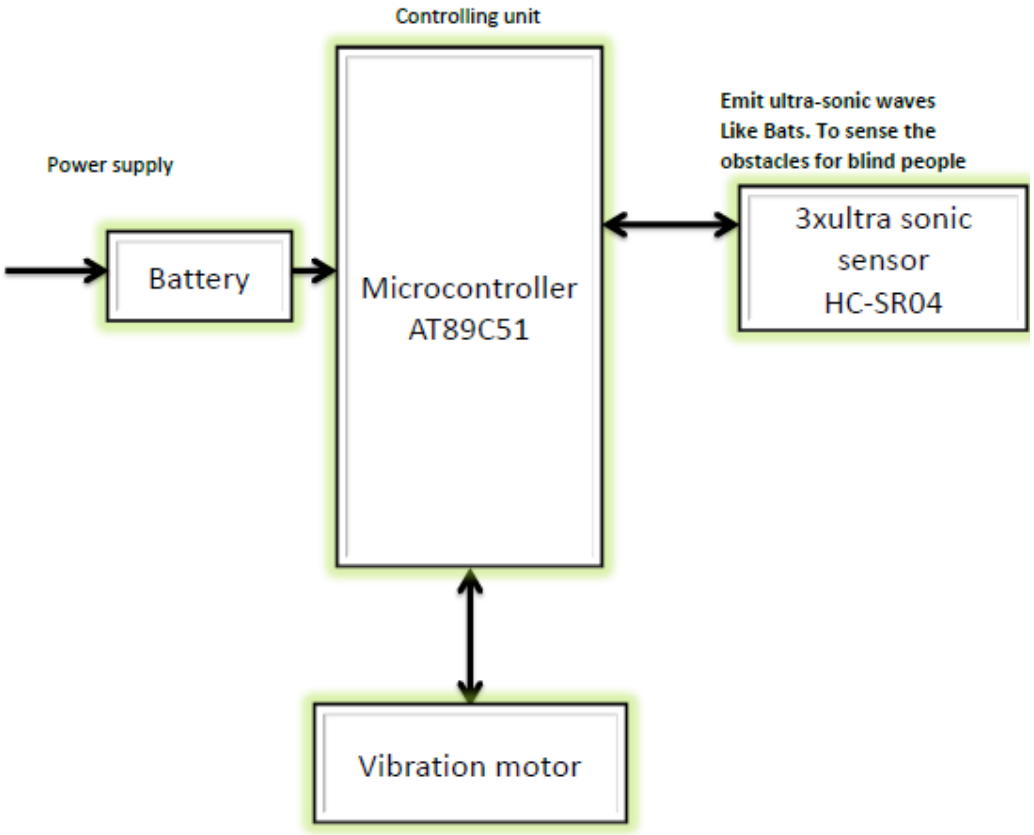

Figure 1: Block Diagram

Atmel 89C51 Microcontroller

AT89C51 is a 8-bit microcontroller and has a place with Atmel's 8051 family. ATMEL 89C51 has 4KB of Flash programmable and erasable read just memory (PEROM) and 128 bytes of RAM. It can be eradicated and program to a most extreme of 1000 times.

In 40 pin AT89C51, there are four ports assigned as P1, P2, P3 and P0. Every one of these ports are 8-bit bi-directional ports, i.e., they can be utilized as both info and yield ports. But P0 which needs outer force ups, rest of the ports have inside draw ups. At the point when 1s are composed to these port pins, they are pulled high by the inward force ups and can be utilized as sources of info. These ports are additionally bit addressable thus their bits can likewise be gotten to independently.

Port P0 and P2 are likewise used to give low byte and high byte addresses, separately, when associated with an outside memory. Port 3 has multiplexed pins for unique capacities like serial correspondence, equipment interferes with, clock information sources and read/compose activity from outer memory. AT89C51 has an inbuilt UART for serial correspondence. It can be customized to work at various baud rates. Counting two clocks and equipment interferes with, it has a sum of six intrudes.

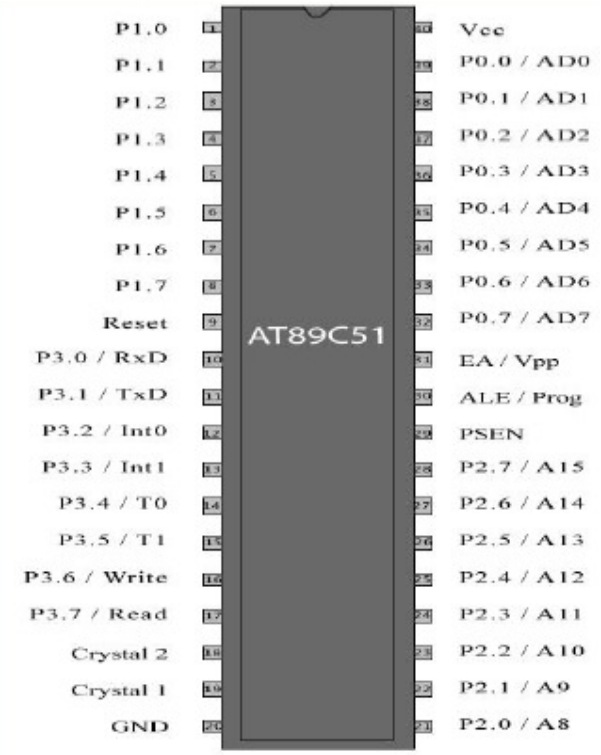

Figure 2: Pin Diagram of AT89c51

HC SR04 (Ultra Sonic Sensor)

A Ultrasonic sensor is a gadget that can quantify the separation to a question by utilizing sound waves. It allots remove by sending a sound wave at a particular recurrence and tuning in for that sound wave to bob back. By recording the passed time between the sound wave being produced and the sound wave bobbing back, it is conceivable to ascertain the separation between the sonar sensor and the question.

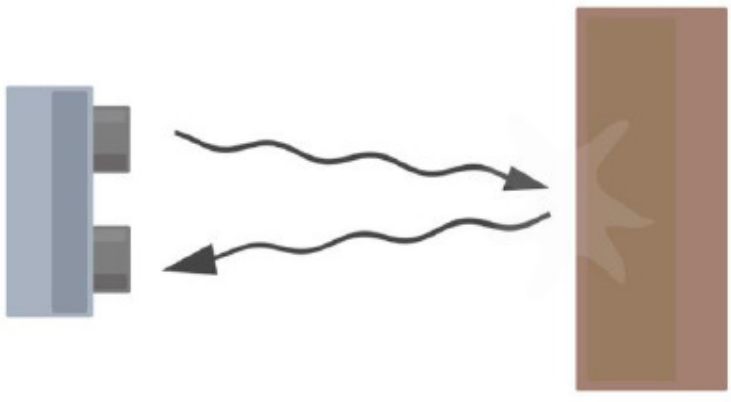

Figure 3: Ultra sonic sensor

Since it is realized that sound goes through air at around 344 m/s (1129 ft/s), you can set aside the ideal opportunity for the sound wave to return and increase it by 344 meters (or 1129 feet) to locate the aggregate round-trip separation of the sound wave. Round-trip implies that the sound wave voyaged 2 times the separation to the question before it was recognized by the sensor; it incorporates the 'trek' from the sonar sensor to the protest AND the 'excursion' from the protest the Ultrasonic sensor (after the sound wave ricocheted off the protest). To discover the separation to the question, essentially partition the round-trip remove into equal parts.

Ultrasonic extending module HC - SR04 gives 2cm - 400cm non-contact estimation work, the going exactness can reach to 3mm. The modules incorporates ultrasonic transmitters, recipient and control circuit. The fundamental standard of work: (1) Using IO trigger for no less than 10us abnormal state flag, (2) The Module naturally sends eight 40 kHz and identify whether there is a heartbeat motion back. (3) IF the flag back, through abnormal state , time of high yield IO term is the time from sending ultrasonic to returning.

Test remove = (abnormal state time × speed of sound (340M/S)/2

Vibration motor

Rotor:

The rotor is the non-stationary piece of a turning electric engine. The wires and attractive field of the engine are masterminded so a torque is produced about the rotor's pivot. In a few plans, the rotor can act to fill in as the engine's armature, crosswise over which the info voltage is provided.

Stator:

The stator is the stationary piece of a rotational electric engine. It could be filled in as the magnet field and communicate with the armature to make movement. Another capacity of the stator is it could go about as the armature, which gets its impact from moving field loops on the rotor.

Commutator:

A commutator is a rotating electrical switch in specific kinds of electric engines or electrical generators that intermittently turns around the present bearing between the Chen 6 rotor and the outside circuit. In an engine, it applies capacity to the best area on the rotor, and in a generator, picks off power also. As a switch, it has especially long life, considering the quantity of circuit makes and breaks that happen in typical activity.

Armature:

The armature in this engine is an arrangement of thin metal plates stacked together, with thin copper wire wound around every one of the three posts of the armature. (How the electric engine functions) The fundamental capacity of the armature is to change over the attractive vitality into the dynamic vitality.

Windings:

Windings are comprised with a few turns of curls. These curls are amassed to create an attractive field once power experiences them.

Weight:

Keeping in mind the end goal to make a vibrating caution, a weight mass should be connected to the pole. Through the rapid dislodging of weight, the vibration can be accomplished. Additionally, the greatness of the power can be controlled and balanced, and the components that could influence it will be talked about beneath.

Brushes:

In engine's pole, the brushes direct the current amongst stator and curls. The life of the engine relies upon when the brushes will be exhausted. In light of this factor, brushless dc engine, which is additionally called BLDC, is utilized to broaden the life of engines.

Interfacing of the Project

To make this task the above segments ought to be associated according to the square chart. To start with the microcontroller ought to be put in the PCB board for interfacing it to alternate parts. Interfacing of the Microcontroller with different parts isolated into 4 writes, in particular:-

1. Plan 1(interfacing Atmel with HC SR04)
2. Plan 2(interfacing Atmel with LCD)
3. Plan 3(interfacing Atmel with Transistor and Motor)

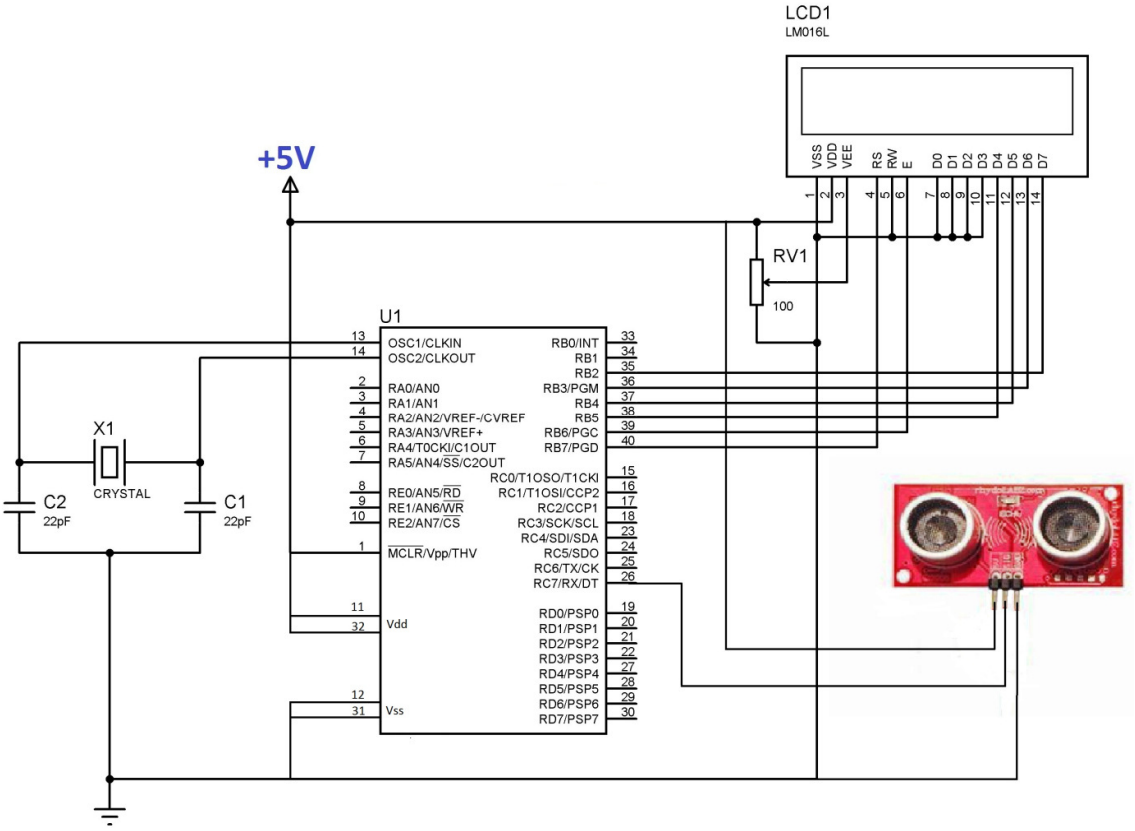

Figure 4: At89c51 interface with Ultrasonic sensor and LCD

SEQUENCE 1(interfacing Atmel with HC SR04)

The Atmel 89C51 Microcontroller have 4 ports and the HC SR04 (Ultra-sonic sensor) is associated in the port 1. The HC SR04 has 4 sticks in particular Gnd, Vcc, Tr1g and Echo. The Gnd and Vcc are associated with the supply (battery), and the Tr1g stick is associated with P1.0 and the Echo stick is associated with the P1.1 of the Microcontroller. In the Same way other two HC SR04 Sensors are associated with the Port 1 of the Atmel 89C51 Microcontroller, and there supply point is likewise circled in the fundamental supply.

SEQUENCE 2(Interfacing Atmel 89C51 with LCD)

The LCD is associated with Port 0 and the Port 2 of the Atmel 89C51 Microcontroller. The LCD has following pins:- Gnd, Vcc, VEE, RS, R/W, Enable, Data 0 – Data 7 and the LED+ and the LED-. The Vcc and the Gnd of the LCD is Connected to the battery supply, and the Data pins are associated with the port 0 of the Microcontroller, RS and the Enable pins are associated with Port 2. At that point to control the Contrast of the LCD Screen the VEE stick must be associated with the Variable resistor. The Variable resistor has three terminals, the gnd and Vcc of the resistor is associated with the LCD's gnd and Vcc. At that point the center terminal must be associated with the VEE stick in the LCD. By Varying the Resistor the complexity in the LCD is balanced.

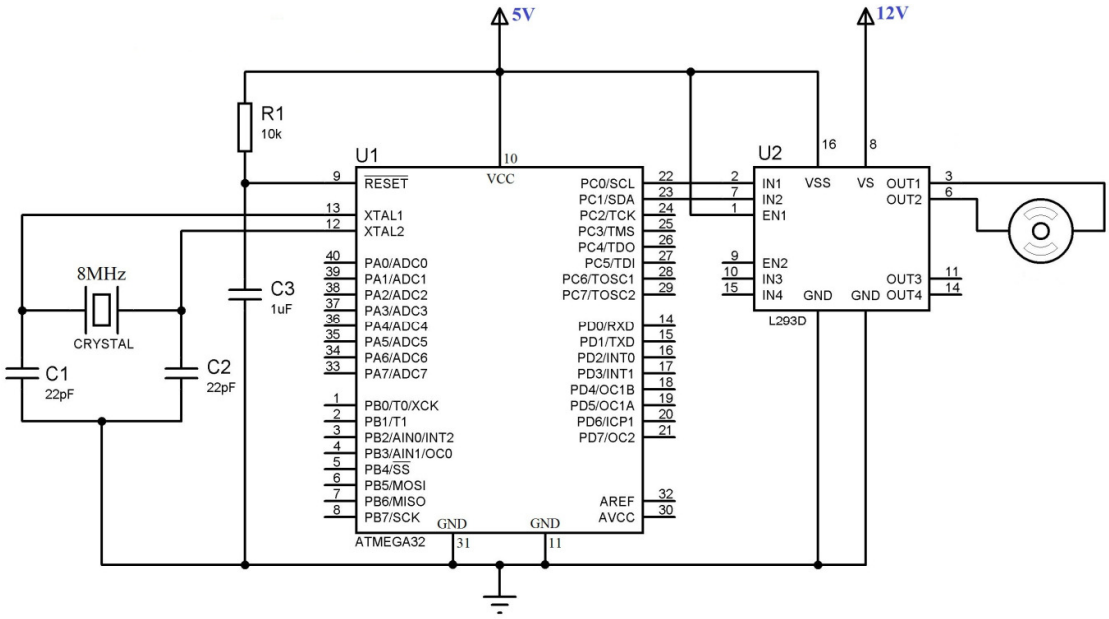

Figure 5: At89c51 interface with vibrator motor

SEQUENCE 3 (Interfacing Atmel 89C51 with MOTOR)

Transistor

BC547 is a NPN bi-polar intersection transistor. A transistor, remains for exchange of opposition, is ordinarily used to enhance current. A little current at its base controls a bigger current at gatherer and producer terminals.

BC547 is mostly utilized for enhancement and exchanging purposes. It has a most extreme current pick up of 800. Its equal transistors are BC548 and BC549.

The transistor terminals require a settled DC voltage to work in the coveted district of its trademark bends. This is known as the biasing. For enhancement applications, the transistor is one-sided to such an extent that it is halfway on for all information conditions. The info motion at base is opened up and taken at the producer. BC547 is utilized as a part of normal producer arrangement for intensifiers. The voltage divider is the ordinarily utilized biasing mode. For exchanging applications, transistor is one-sided so it remains completely on if there is a flag at its base. Without base flag, it gets totally off.

While interfacing the Transistor with the Atmel 89C51 microcontroller the base of the transistor is associated with the Port 3, and the Collector of the transistor is associated with negative terminal of the vibration engine to keep away from the engine, at that point the Emitter of the transistor is associated with the Ground. Same way other two transistors likewise associated with the Microcontroller and the engine. The positive end of the engine is associated with the positive supply. Here the Transistor demonstration like a driver and interface with the Microcontroller and the Vibration Motor.

Conclusion

This venture can go about as the vision for the Blind individuals, it is basic in plan and has exquisite look. While enhancing this venture, the undertaking can be associated with the IOT, along these lines it can be screen, and each protest in this planet has its own particular recurrence, in this manner it can be included the task so when the ultra-sonic sensor recognizes the obstruction, it can detect the idea of that impediment and distinguish its name send it to the client. Along these lines it go about as GPS framework which can distinguish the most secure way for the visually impaired individuals.

Reference

1. Bousbia-Salah, M., M. Bettayeb, and A. Larbi, A navigation aid for blind people. Journal of Intelligent & Robotic Systems, 2011. 64(3-4): p. 387-400.

2. Pradeep, V., G. Medioni, and J. Weiland. Robot vision for the visually impaired. in Computer Vision and Pattern Recognition Workshops (CVPRW), 2010 IEEE Computer Society Conference on. 2010. IEEE.

3. Faria, J., et al. Electronic white cane for blind people navigation assistance. in World Automation Congress (WAC), 2010. 2010. IEEE

4. Nunokawa, K., S. Ino, and K. Doi, Vibration of the White Cane Causing a Hardness Sense of an Object, in HCI International 2013-Posters' Extended Abstracts. 2013, Springer. p. 493-497.

5. Hersh, M., Deafblind people, stigma and the use of communication and mobility assistive devices. Technology and Disability, 2013. 25(4): p. 245-261.

6. Morrison, R., et al. Design of a Novel Electronic Travel Aid to Assist Visually Impaired Individuals Navigate Their Environment. in ASME 2012 Summer Bioengineering Conference. 2012. American Society of Mechanical Engineers.

7. Kim, S.Y., et al., Electronic Cane for Visually Impaired Persons: Empirical Examination of Its Usability and Effectiveness, in Human Centric Technology and Service in Smart Space. 2012, Springer. p. 71-76.

8. Doi, K., et al. Influence of the Weight of White Canes on Muscle Load of the Upper Limbs. in World Congress on Medical Physics and Biomedical Engineering May 26-31, 2012, Beijing, China. 2013. Springer.

9. Nalavade, K., et al., Use of ultrasonic sensors, GPS and GSM technology to implement alert and tracking system for Blind Man. 2014.

10. Martins, M.M., et al., Assistive mobility devices focusing on Smart Walkers: Classification and review. Robotics and Autonomous Systems, 2012. 60(4): p. 548-562.

11. Takizawa, H., et al. Kinect cane: An assistive system for the visually impaired based on three-dimensional object recognition. in System Integration (SII), 2012 IEEE/SICE International Symposium on. 2012. IEEE.

12. Ye, C. Navigating a Portable Robotic Device by a 3D imaging sensor. in Sensors, 2010 IEEE. 2010. IEEE. 31

13. Bouhamed, S.A., et al. New electronic cane for visually impaired people for obstacle detection and recognition. in Vehicular Electronics and Safety (ICVES), 2012 IEEE International Conference on. 2012. IEEE.

14. Jubril, A., et al., Obstacle detection system for visually impaired persons: Initial design and usability testing. Technology and Disability, 2013. 25(3): p. 199-205.

15. Brabyn, J.A., New developments in mobility and orientation aids for the blind. Biomedical Engineering, IEEE Transactions on, 1982(4): p. 285-289.

16. Hossain, E., et al., State of the art review on walking support system for visually impaired people. International Journal of Biomechatronics and Biomedical Robotics, 2011. 1(4): p. 232-251.

17. Ifukube, T., T. Sasaki, and C. Peng, A blind mobility aid modeled after echolocation of bats. Biomedical Engineering, IEEE Transactions on, 1991. 38(5): p. 461-465.

18. Dunai, L., et al., Sensory Navigation Device for Blind People. Journal of Navigation, 2013. 66(03): p. 349-362.

19. Dunai, L., et al. Real-time assistance prototype—A new navigation aid for blind people. in IECON 2010-36th Annual Conference on IEEE Industrial Electronics Society. 2010. IEEE.

20. Wang, Y. and K.J. Kuchenbecker. HALO: Haptic Alerts for Low-hanging Obstacles in white cane navigation. in Haptics Symposium (HAPTICS), 2012 IEEE. 2012. IEEE.