Navigation guide for visually challenged people

M.Indhumathi [1], D.Supriya [2], Pandieeswari P [3], Pavithra P [4]
Assistant professor[1,2],UG Scholar[3,4]
Department of Electronics and Communication Engineering,
P.S.R Engineering College, Sivakasi/India.

Abstract: Visually challenged persons always depend upon others for their locomotion. Eyes are prime sense organ in perceiving the outside environment. Dysfunction of such prime sense organ severely effects the knowledge perceiving capability of the outside environment. Traveling in such outside environment is a challenge because the blind cannot depend upon his own eyes. In our project we are proposes to help visually challenged people with obstacle free path finding. The Navigation Guide is an electronic device.

KEYWORDS :Navigation Guide, visually impaired, obstacle detection, ultrasonic sensor, water sensor,temperature sensor,speaker,GPS(global positioning system),IR sensor.

I. INTRODUCTION

People with disabilities, especially blinds and partially sighted, are every day confronted with plenty of problems while performing routine activities and moving through unfamiliar areas. Current society guarantees freedom of movement and access to a preferred goal under the same conditions to all the people. In order to meet the desires of a person with disabilities in the Republic of Croatia, traditional building measures such as curbs lowering, ramps construction and platforms lifting, have been mostly in use. The possibilities provided by advanced information and communication technology, planning for the people's orientation in space, determining the position where a person is located (locating), tracking, leading to the goal (navigation), etc., have been under-utilized.

Till now there was no advanced technology to help the blind. An electronic solution has been developed for the detection of obstacles and dangers on the way and they were used as a replacement for a walking stick which is a basic tool of the blind people. That way the variants of sticks with laser or ultrasonic sensors were developed, but they have not entered into widespread use.

Blind and visually impaired are in need and depends on some stuffs because they lack information about the obstacles and dangers, they have little information about the visual markings in space, they have no sense of direction and speed, essential to the people who can see for navigation through familiar, as well as through the unfamiliar environments using maps or instructions. An idea is based on the way of NavGuide obstacle detector that consists of components is the detection of the immediate environment which includes finding obstacles like solid part and dangers like fire and hazards. The alerting system consists of intimates the current position and positioning the direction of movement along the requested route using voice alert and the vibration mode.

In this paper, we are proposing the NavGuide with an additional features which is an electronic device to assist visually impaired people with obstacle free path-finding. The NavGuide system is to provides a simplified information on the surrounding environment and deduces priority information without causing information overload. The priority information is provided to the user through audio feedback mechanisms. It also used to a guide for fire detection.

II. LITERATURE SURVEY

The first technologies that could be used to locate the users within the enclosed areas are those that are already available and should not be built, such as mobile technology (GSM) and wireless networks [1] (WLAN). Public services (police, emergency services) use the mobile network to locate user, but that locating is too coarse for this application.

The distribution of the transmitter, it can achieve an accuracy of about 100m. In a similar way, one can use the existing WLAN network, so that the signal strength is read, and compared to the database in order to determine the distance from the transmitter. Using a trilateration technique, the location of the user can be determined from multiple signal sources. The problem are WLAN should have enough points, which is not possible everywhere, and especially not in outdoor areas. The accuracy varies, as well as, depending on the conditions, reflections and propagation and it can be from 1 to 3 m.

Radio-frequency identification (RFID) belongs to these radio technologies. This technology has a lot of potential and there are the projects which are used for navigation and for locating. There is a whole system of guidance of the blind people, developed using RFID technology. SESAMONET [3] system was installed at several points in northern Italy and it consists of a cane for the blind with an embedded RFID reader, that is connected wirelessly to a mobile device. The navigation software in a mobile device sends voice instructions to the user, and data are drawn from a central database to which it is connected via mobile network. The white cane reads the RFID passive tags that are embedded in the tactile floor and on each turning point or crossing, the device signalizes in which direction one should continue in order to reach the goal. This system is efficient, but it is not easy to install it on the new terrain, because it needs to a lot of work and installation of expensive tactile path with RFID tags.

In the end, there are passive technologies using MEMS (Micro Electrical Mechanical Systems) sensor to determine the displacement and orientation of the user from the decoded values of acceleration, rotation, magnetic field and pressure. Digital accelerometers, gyroscopes, magnetometers, compasses, barometers, thermometers (temperature compensation) have been used to do that. The simplest devices as pedometers, which count steps and based on the number of steps and the average step length, they can determine the distance traveled, but they cannot determine the information about direction.

More advanced category of the system are dead reckonig systems that contain some or all of the above sensor and calculate the shift of the user based on the data measured. There are two types of devices. In first the acceleration sensor is placed on the shoe, and in the second, the sensor is attached to the belt. In both types of sensor it is important that the fastening device is securely connected to the body so that it transmits all its movements accurately. Then the software evaluates user behavior from the data on the sensor (walking forward, backward, sideways, running, standing). This technique is known as Pedestrian Dead Reckoning (PDR).

III. PROPOSED SYSTEM

Proposes a NavGuide which is an electronic device to assist visually impaired people with obstacle free path-finding. The NavGuide system is to provides simplified information on the surrounding environment and deduces priority information without causing information overload. The priority information is provided to the user through audio feedback mechanisms. The proof-of-concept device consists of allow power embedded system with ultrasonic sensor, and a battery. The NavGuide system in daily-life mobility of visually challenged people, we performed an evaluation using 70 blind people of the "school & home for the blind."

The design and structure of the NavGuide, electronic device to assist visually impaired people in obstacle free path-finding. The main goal of the NavGuide is to create a logical map of the surrounding and provide appropriate feedback to the user about the obstacles in the surrounding.

The NavGuide consists of six ultrasonic sensor, a wet floor detector sensor, a step down button, microcontroller circuits, and a battery for power supply. An ultrasonic sensor is used to send out high frequency sound waves and record the time it takes for the reflected sound waves to return. The total of six ultrasonic sensor are divided in two groups, i.e., group 1 and group 2.Group 1 sensors (S1, S2, S3)detect floor level obstacles while group 2 sensors (S4,S5, S6)detect knee level obstacles. Sensors S1 and S4 are front facing,S2 and S5are left facing and S3 and S6 face towards the right side. All six ultrasonic sensor are wide beam ping sensors. An ultrasonic sensor uses high frequency sound waves to find the distance of an object from the NavGuide. When a sound wave hits an object, it is reflected off the object as shown in Fig.

An object may be directly in the front of the transmitter or at an angle for the signal to be reflected and received by the ultrasonic sensor.

i)Proposed NavGuide methodology

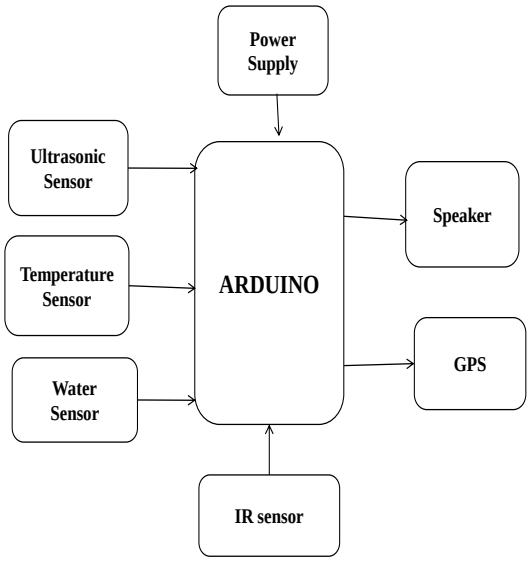

Fig. block diagram of proposed

The block diagram shows the proposed an efficient modified NavGuide obstacle detection and navigation assistance system for visually impaired people. From the existing NavGuide detector, we are implementing the some of the features for the welfare of visually challenged peoples. The extra features are added with the NavGuide detector is the vibration sensor, water sensor, temperature sensor and voice alert.

Here in the modified NavGuide system the vibration sensor (i.e)., the piezoelectric sensor is used to alert the individual by vibration when it senses the obstacles or any other stuffs infront of the blind. Then the temperature sensor(LM35) is used to sense and detect the fire alert or some other precautions from the overheated elements is before the person then it should be alert the person by instruct with the voice alert. And we also adding an another important features is water sensor. The water sensor is used to detect the water on the floor which may cause the blind people to fall down, and causes some danger health issues. A voice alert is used in the system to instruct the blind, when if the obstacles are detected then the person need to be taken some actions to avoid the obstacles. So the voice alert used to give some instructions like take right, left, move behind etc.

An arduino controller fetches the input from all the sensors like temperature, water, ultrasonic and IR sensor, when it exceeds the limit then the controller take an actions to alert the person through the voice alert. So the precautions can be taken and followed by the person very ease and quick. This type of modified NavGuide obstacle detection and navigation assistance is carried a good result for the visually impaired people.

Functionality of the NavGuide

1) Generates a logical map of the surrounding, for detecting the obstacles in front, on the left, and on the right side of NavGuide.
2) Obstacles from floor-level upto knee-level are detected by NavGuide.
3) Wet Floors are detected if stepped on by a visually impaired person using NavGuide.
4) Tactile feedback is provided to the user of NavGuide through audio feedback mechanism.
5) Auditory feedback is provided by the Navguide to its user using wired or wireless headphones.

IV. HARDWARE SPECIFICATION

Arduino controller: Arduino is a microcontroller or it can be called as tool for making computers that can sense and control more of the physical and real world than your desktop computer. It is a physical computing platform containg a simple microcontroller board, and a development environment for writing software programs in the Arduino board can be used to develop interactive objects, taking inputs from a various switches or sensors, and controlling a variety of lights, motors, and other physical outputs.

Temperature sensor: The advantage of this sensor has more memory, processing and communication capabilities than other sensor nodes. The temperature sensor(LM35) is used to sense and detect the fire alert or some other precautions from the overheated elements is before the person then it should be alert the person by instruct with the voice alert.

Water sensor: The water sensor is used to detect the water on the floor which may cause the blind people to fall down, and causes some danger health issues. A voice alert is used in the system to instruct the blind, when if the obstacles are detected then the person need to be taken some actions to avoid the obstacles. So the voice alert used to give some instructions like take right, left, move behind etc

IR sensor: An infrared sensor is an electronic device, that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. This types of sensors measures only infrared radiation, rather than emitting it that is called as a passive IR sensor.

V. CONCLUSION

Our system, it can be applied in the straight path, right angle path and the curved path. The broad beam angle ultrasonic sensor enable wide range of obstacle information. The speaker is used to alert the person in a quick manner and voice alert gives the proper instructions.

The main functions of this system is the clear path indication and the environment recognition. With the help of electronic NavGuide detector, blind people can improve their travel speed, reduce minor collision, do not lose their way, and increase safety from the fire, down fall and an accident as compare to unaided equipments. Future work includes installation of GPS system along with additional sensors like accelerometers, PIR motion detector and digital compass which tell the exact location of the user.

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