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Review on Strategies for Visually Impaired People

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Abstract: Vision is the most important part of human life. The proposed paper refers to a systems that are capable to assist or guide people with vision loss, ranging from partially sighted to totally blind, by means of sound commands. Many technologies are working on implementation of smart eye for visually impaired people in different ways like voice based assistance, ultrasonic based assistance ,camera assistance and some researchers are trying to give transplantation of real eyes with robotic eyes which can capable enough to plot the real image over patient retina using some biomedical technologies. Creating a combined system of sensing technology and voice based guidance system which could give better result than individual technology by the use of microcontroller. There are some limitation in system like obstacle detection which could not see the object but detection the object and camera based system can't work properly in different light level so the proposed system is a fusion of colour sensing sensor and the Obstacle sensor(ultrasonic sensor)as well as GPS Navigation along with the voice based assistance system. . These system does not requires a huge device to be hold for a long distance and it also does not requires any special training. This system also gives time timing through voice feedback. The main idea of the proposed system to make person aware of path he is walking and also the obstacle in the path.

Keywords: Navigation system; visually impaired; obstacle detection; microcontroller.

1. INTRODUCTION

Blindness is the condition of lacking visual observation due to neurological and physiological factors. For blind pedestrian secure mobility is one of the biggest challenges faced in their daily life. According to the World Health Organization (WHO) in 2012, out of 7 billion global population there were over 285 million visually impaired people and 39 million were totally blind out of which 19 million are children (below 15 years) and this number is growing at an alarming rate. So, some navigation system is required to assist or guide this people. Many researches are being conducted to build navigation system for blind people. Most of these technologies have boundaries as its challenge involves accuracy, interoperability, usability, coverage which is not easy to overcome with current technology for both indoor and outdoor navigation. The proposed system mainly focuses on two components; sensing of the immediate surrounding environment against obstacle for the visually impaired person and warning about the obstacle by means of vibration as well as GPS Navigation along with voice feedback system.

II. LITERATURE REVIEW

Now a days, white cane is the most popular, simplest tool for detecting obstacles due to its low cost, portability. It enables user to effectively scan the area in front and detect obstacles on the ground like holes, steps, walls, uneven surfaces, downstairs etc .but it can only be used to detect obstacles up to knee-level. Its detection range is limited up to 1-2 feet only. Certain obstacles (e.g. protruding window panes, raised platforms, a moving vehicle, horizontal bars) cannot be detected till they are dangerously close to the person. Even dog guides are very capable to guide these persons but they are unable to detect potentially hazardous obstacles at head level. Guide dog service stage is on average 6 years and requires regular dog up-keeping expenditure and lifestyle changes. [3]Several solutions have been proposed in the recent years to increase the mobility and safety of visually impaired persons.

A system "Roshni" determines the user's position in the building, navigation via audio messages by pressing keys on the mobile unit. It uses sonar technology to identify the position of user by mounting ultrasonic modules on ceiling at regular intervals. This system is portable, easy to operate and is not affected by environmental changes. But this system is limited only for indoor navigation because it requires detailed interior map of the building. [4]

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Another real-time technology developed to alert visually impaired user by the presence of static / dynamic obstacles in a few meters surrounding, which works without depending on any Smartphone, uses camera for background motion detection. This system is robust to complex camera and background motion and does not required any prior knowledge about the obstacle size, shape or position. This camera based image processing system can be a better option but it requires lot processing power and hence system becomes bulky, costly and it must be transportable. [5]

GPS based technique is "Drishti" which can switch the system from an indoor to an outdoor environment and vice versa with a simple vocal command. To provide complete navigation system, authors extend indoor version of Drishti to the outdoor versions for blind pedestrians by adding only two ultrasonic transceivers that are smaller than a credit card and are tagged to the user's shoulder. System provides a real-time communication between user and the mobile client via the headphone in which user can ask for the path, obstacle prompts, and even his/her current location in familiar or unfamiliar surrounding also. Unfortunately, this system has two limitations. As only two beacons attached to the user's shoulder, so it becomes impossible to obtain the height data of the user. Used algorithm calculates the location of user in two dimensions assuming the average height of a person, which gives larger error if the user sits or lies down. Another limitation is that because of signals reflection or blocking by walls and furniture, there are some "dead spots" due to the bad faulty date reads. [7]

"Blind audio Guidance system" is based on embedded system, uses ultrasonic sensor for distance measurement, IR sensor for object detection and AVR sound system for audio instructions. The main functions of this system are environment recognition and path detection. Ultrasonic sensors receive visual information and this visual information is transformed into auditory information. To represent the information about the position of obstacles audio components of intensity, frequency, binaural phase difference are used. This signal transformation system reduces the training time required to use a white cane. However, only issue of this system is the difficulty to know one's location globally. [8]
The "NavBelt" is developed based on navigation and obstacle prevention technologies that are originally designed for mobile robots. This system consists of eight ultrasonic sensors worn on a user's waist like a belt, a portable computer on his/her backpack, and a stereophonic headphone. [9]

Vibration and voice operated navigation system developed using ultrasonic sensors to detect obstacles. Since visually impaired people are more sensitive in hearing and possesses strong perception than ordinary people. So this system gives alert through vibration and voice feedback. System works in indoor as well as outdoor navigation and focus on continuously sensing surround obstacles and alerting through vibration and voice feedback. Depending upon the distance between obstacle and user different intensity levels are provided to vibration motor to alert user's mobility. [2]
A navigation system designed for blind people using RGB-D sensor with range expansion. System uses a consumer RGB-D camera for range and visual information, which support range based floor segmentation. Cheaper RGB sensor supports in object detection and colour sensing. User interface is given through audio instructions and sound map Information. [10]

Ultrasonic navigation system enhances the independent mobility of visually impaired people. It consists of a portable device based on microcontroller with synthetic speech output and obstacle detection system using ultrasounds and vibrators. This device uses the principle of reflection of high frequency ultrasonic beam to detect obstacles in the path. [11]

A wearable jacket-type scheme is proposed in [12]. Sonar sensors and vibrators are attached on a jacket, and are used to let a consumer know the direction from which an obstacle is coming .One more jacket-type scheme using an RGB-D camera with tactile devices [13] is proposed for real-time navigation with obstacle avoidance. The RGB-D camera generates depth data registered with RGB images, and traverse ability maps are provided to indicate free and occupied (obstacle) spaces. Instructions such as "Go straight" and "Turn right" are given to a consumer via four micro vibration motors on a jacket. A talking assistance type location finding system proposed for both indoor and outdoor navigation. System consists of walking stick having GSM module to send message to authorized person at the time of tragedy, sonar sensors and RF transmitter and receiver. For indoor localization RFID and for outdoor localization GPS system is used. Thus, this GPS system used in walking cane reduces the cost of installing many RFID tags in outdoor to identify the place.[14]

III. PROPOSED SYSTEM

The proposed system consists of two main units:
1. Sensor unit.
2. GPS unit.

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1. SENSOR UNIT:
The proposed device uses ultrasonic sensor and RGB Sensor.

- ULTRASONIC-SENSOR

It can detect an object that situated a distance of certain meters from the user. The minimum size of the object that can be detected should not be less than 3 cm width (or diameter). In operation a beam of ultrasound of 40 KHz frequency is transmitted at a regular interval in the forward direction. The ultrasound will be reflected from a nearby object, if any. It will then detect the presence of any object by reflected sound beam. The time intervals at which the transmitter will transmit ultrasound depend on the walking speed of the user.

- RGB SENSOR:

RGB sensor is used to detect obstacles depending upon its red, green and blue colour level intensities of detected obstacle. RGB sensor is used to detect the red, green, blue colour level from reflected light at the boundary of obstacle. This sensor will be connected on stick at front facing toward ground. The output of RGB sensor in the form of 3different values of colour intensities is given to microcontroller.

2. GPS UNIT:
It alert the blind person when reaches destination by voice .It consists of microcontroller and GPS and one voice module to generate the voice. The Micro controller is the main part of the device. It stores the data of the current location which it receives from the GPS system. For comparing with the destination location of the user and produce an alarm to alert the user in advance.
The Global Positioning System (GPS) is a satellite-based navigation system made up of at least 24 satellites. GPS works in any weather conditions, anywhere in the world, 24 hours a day, with no subscription fees or setup charges. USDOD originally put the satellites into orbit for military use, but they were made available for civilian use in the 1980s. GPS satellites circle the Earth twice a day in a precise orbit. Each satellite transmits a unique signal and orbital parameters that allow GPS devices to decode and compute the precise location of the satellite.

IV. RESEARCH METHODOLOGY

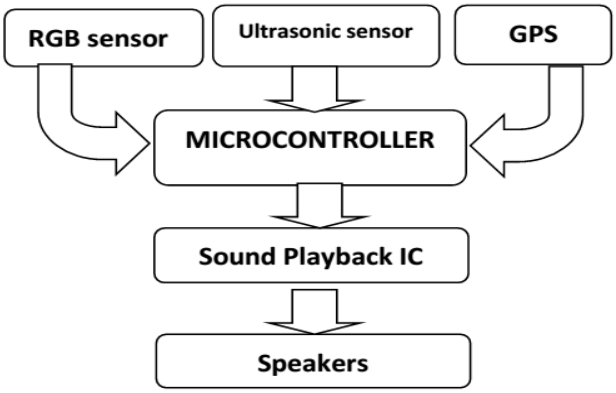

Fig: 1. Flow Chart

Flow chart and its explanation
In the proposed system, ultrasonic sensor as an obstacle detector and RGB sensor as a colour level detector both working as input device. This sensed input data is collected by microprocessor and according to developed algorithm (in embedded C) it gives comments to vibration assist and voice assist to alert blind pedestrian. Test to sound conversion IC has maximum 32 different messages storage capacity. IC in its record mode records different possible alert messages while developing and according to immediate environment it plays appropriate message to guide user through speakers. RGB sensor makes it possible to assist user about flour on which he/she is walking. This will be definitely useful for visually impaired person. If user listens green then he/she is assume as walking on grass he/she will feels save to move. But if user listens that he/she is on road then user will be more alert and conscious at his/her every step .Other navigation system for blind are not been able to give the way to destination. Proposed system will give a voice message by headphone when destination is reach and also have the Navigation till destination. Proposed system has capacity to alert user at different terrain like grass, road, zebra crossing etc by giving specific message though headphones as soon as it senses any obstacle by Stick.

V. CONCLUSION

This system provides the visually impaired- a reliable partner that would never leave in the situations of need. The system will alert the user about the nearby obstacles and surroundings thus, avoiding the collision and accidents of blind persons. The system has been used to receive the data from the sensing devices. We have integrated the ultrasonic obstacles, accelerometer sensor data in order to detect obstacles, and to obtain more detailed regarding the blind's environment. We also have integrated GPS Navigation. Thus, allowing blind people to move independently, safely and quickly among obstacles and hazardous places. This device does not require any special training.

REFERENCES

[1] Chaitali K. Lakde, Dr. Prakash S. Prasad**,"** Review Paper on Navigation System for Visually Impaired People", International Journal of Advanced Research in Computer and Communication Engineering, Vol. 4, Issue 1, January 2015
[2] N. Mahmud, R. K. Saha, R.B. Zafar, M.B.H. Bhuian, and S. S. Sarwar, "Vibration and Voice Operated Navigation System for Visually Impaired Person", 3rd International
[3] B. B. Blasch, W. R. Wiener, and R. L. Welsh, Foundations of Orientation and Mobility, 2nd ed. New York: AFB Press, 1997.
[4] Roshni: Indoor Navigation System for Visually Impaired by D. Jain and M .Balakrishnan, P. V. M. Rao.
[5] R. Tapu, B. Mocanu, T. Zaharia" Real time static/dynamic obstacle detection for visually impaired persons" IEEE International Conference on consumer electronics (ICCE),978-1-4799-2191- 9/14, pp. 394-395,2014.
[6] V. Kulyukin, C. Gharpure, J. Nicholson, S. Pavithran, "RFID in Robot- Assisted Indoor Navigation for the Visually Impaired", Proceedings of 2004 lEEE/RSJ International Conference on Intelligent Robots and Systems, September 28 -October 2,2004,Sendai, Japan.
[7] Lisa Ran, SumiHelal and Steve Moore, "Drishti: An Integrated Indoor/Outdoor Blind Navigation System and Service", Proceedings of the Second IEEE Annual Conference on Pervasive Computing and Communications 2004 IEEE.
[8] Arjun Sharma, Rahul Patidar, Shubham Mandovara, Ishwar Rathod, "Blind Audio Guidance System", International Journal of Emerging Technology and Advanced Engineering, volume 3, January 2013,pp.17-19.
[9] Shraga Shoval, Johann Borenstein, and Yoram Koren," The navbelt - a computerized travel aid for the blind based on mobile robotics technology",IEEE Transactions on Biomedical Engineering, Vol. 45, No. 11, pp. 1376–1386, 2014.
[10] A. Aladren, G. Lopez-Nicolas, Luis Puig, and Josechu J. Guerrero, "Navigation Assistance for the Visually Impaired Using RGB-D Sensor With Range Expansion", 2014 IEEE.
[11] MounirBousbia-Salah ,AbdelghaniRedjati, Mohamed Fezari, MaamarBettayeb, "An Ultrasonic Navigation System For Blind People", IEEE International Conference on Signal Processing and Communications (ICSPC 2007),Dubai,24-27November2007,pp. 1003-1006.
[12] Sylvain Cardin, Daniel Thalmann, and Fr´ed´eric Vexo. A wearable system for mobility improvement of visually impaired people. The Visual Computer, Vol. 23, No. 2, pp. 109–118, 2007.
[13] Young Hoon Lee and G´erard Medioni. Rgb-d camera based navigation for the visually impaired. In RSS 2011 RGB-D: Advanced Reasoning with Depth Camera Workshop, pp. 1–6, 2011.
[14] Nandhini.N , Vinoth chakkaravarthy.G , G.Deepa Priya, "Talking Assistance about Location Finding both Indoor and Outdoor for Blind People", International Journal of Innovative Research in Science, Engineering and Technology, volume 3, February 2014, pp. 9644-9651.
[15] Saurabh Gupta, Pablo Arbel´aez, and Jitendra Malik." Perceptual Organization and Recognition of Indoor Scenes from RGB-D Images", 2013 IEEE Conference on Computer Vision and PatternRecognition.

BIOGRAPHY

Dr. Prakash S. Prasad is working as Professor and Head CSE at Priyadarshini Institute of Engineering and Technology. He is having 20 Years of experience in the field of teaching to engineering students.He completed his engineering in the year 1997, master of engineering in 2006 and PhD in 2014. He is member of IEEE, IACSIT, CSI, ISTE. He is having more than 36 research papers published in international journals and conferences. He is on editorial member of few International Journals. His interestes includes real time operating system, kernel programming, system software and operating systems.