Survey on assistance systems and Navigation for blind people by using sensors

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Abstract – Blind people facing many challenges moving indoor or outdoor. Over 285 million people are visually impaired worldwide: 39 million of them being blind and 246 million have low vision. About 90 percent of the worlds visually impaired live in developing countries.The blind traveller should depend on any other guide like blind cane, people information, trained dogs, and etc.Blind people need some support to feel safe while moving. The survey of the system which is proposed to help those people who are blind or visually impaired.

Keywords-Blind people; Navigation system; Ultrasonic sensor; RFID; Obstacle detection

INTRODUCTION

Blind people may lose intention and have a higher risk of falling but people need to move whether at home, at work or addressing meeting. Most of blind people depend on other human for movement and environmental sensitivity [11]. The impairment is not fixable, even though the employment of glasses, contact lenses or in extreme cases, surgical operation. The incapacity is generally caused by diabetes, macular degeneration, traumatic injuries, infection and eye disease. Alternative causes include blocked blood vessels, complications of premature birth, complication of eye surgery, stroke and tumours. Here square measure several early signs of blindness such a discomfort and weary eyes, foreign body sensation, and pain. Patients could experience discharge from the eyes. World Health Organization has calculable that regarding 285 million individual's worldwide square measure visually impaired; during which 39 million are blind while another 246 million have an occasional vision [11]. The number of people stricken by loss of sight is increasing dramatically. The Royal National Institute of Blind individuals have foretold that by 2020, the amount of visually impaired in UK are going to be over two million people.

Blind individual's expertise difficulties once travelling to their intended destination. One in every of the larger obstacles is to notice foreign objects across their walking path. With relation to Mau et al., roughly 90th of the blind population is unable to travel alone. 3% of them square measure addicted to their pet whereas the remaining seven-membered uses the white cane. Even with the white cane, their quality is still limited; each indoors and out of doors.

In the twenty first century, the most recent sensible cane to hit the market was introduced by the Indian Technology Delhi's helpful Technologies group. The device helps the blind people to navigate around an obstacle by measure the distance through vibration detection and measuring device technology. Developers have place in effort to assist the visually impaired feel safe, secure and comfy whenever going enter public or at home. The cane is unceasingly refined to function their second eye that ultimately permits them to steer severally. Smart Cane; developed by Rutgers University and GSET implements inaudible sensors to notice obstacles and a vibrating motor to alert the user. Its construct is comparable to the one developed by Assistech, however with an extra feature which permits the sensing element to be adjusted in step with the peak of the user. Each device but, targeted on obstacles in front of the blind people. Meanwhile, the cane developed by Yoshihiro et al, conjointly considers uneven floor conditions. Dangerous surfaces square measure detected via infrared sensing element and also the information is relayed to the user via earpiece. This project aims to more revolutionize the concept exploitation metal my RIO-1900 [1]. The proximity sensing element for obstacle detection will be adjusted to suit user specification. Meantime the output is produced as associate exteroception signal through headphone.

The project is expected to alter the visually impaired walk severally without the necessity to comb or knock the cane as data related to distance to the obstacle and uneven floor conditions have already been created accessible by the system.
Electronic aid to blind's cane establishes communication with blind people through the touch by the use of vibration of motors. This device is designed to be exhibited a high efficiency at detecting obstacles. Which offers reliability and comfort ability to blind people? The smart cane provides a safety zone between them and obstacle [2]. Electronic long cane which was developed as a mobility aid for visual impaired people. This approach comprises an ergonomic design along with an embedded electronics inside the grip of traditional long cane. The obtained results showed the ELC effectiveness for detecting physical barriers [8].

Traditional cane makes blind needs outside help reverse smart cane which guide it alone. The limitation of this design is that the sensor detects obstacle at narrow range [6]. Tactile signals for giving information rather than acoustic signals. Prototype is easy to learn, use, and buy or be subsidized from public service, so we concluded the acceptability, usability, and cost benefit are satisfied. Network environment and compatibility with infrastructure and current standard. Extending network environment to system can enable range to be not only high-value applications of walking decisions [5].

2. LITERATURE SURVEY

Woojin Chung, "Integrated navigation system for indoor service robots in large-scale environments" It contains architecture of navigation system, the development of crucial navigation algorithms like map, path planning, and localization, and planning scheme such as fault handling. This system provides some advantages that are 1) A range sensor based generalized scheme of navigation without modification of the environment. 2) Intelligent navigation-related components. 3) Framework supporting the selection of multiple behaviors and fault handling schemes [9]

Denis Tudor, Lidia Dobrescu, Drago Dobrescu, "Ultrasonic Electronic System for Blind People Navigation" This system presents a new electronic system using an ATmega328P microcontroller, two ultrasonic sensors and vibrating motors as a helping solution for blind people navigation. In order to determine the distance, HC-SR04 ultrasonic sensors are used. The HC-SR04 ultrasonic sensor uses sonar A short ultrasonic pulse is transmitted at the initial time, echoed by an object [10].

Kanchan M. Varpe, M.P. Wankhade," Visually Impaired Assistive System" which focuses on independent portability of blind people who travel in an unfamiliar environment without any manual assistance. System include on the server side zigbee transceiver for wireless conversation, RFID reader with an integrated microcontroller, zigbee transmitter and TTS for playing information to user. The VIAS can be used by visually impaired or blind users at the system implemented environment such as organization campus which can be school, college, hospitals, shopping mart, bus stands, etc [14].

A. Aladrén, G. López-Nicolás, Luis Puig, and Josechu J. Guerrero" Navigation Assistance for the Visually Impaired Using RGB-D Sensor With Range Expansion", In this paper, a new system for NAVI is presented based on visual and range information. Rather of using multiple sensors, we choose one device, a consumer RGB-D camera, and take advantage of both range and visual information. In appropriate, the combination of depth information with image intensities, resulting in the robust expansion of the range-based floor segmentation. Our system detects the main structural elements of the scene using range data [15].

B.S. Tjan, P.J. Beckmann, R. Roy, N. Giudice4, and G.E. Legge, "Digital Sign System for Indoor Wayfinding for the Visually Impaired", In this we describe the design and implementation of a digital sign system based on low-cost passive retro-reflective tags printed with specially designed patterns that can be readily recognized and identified by a handheld camera and machine-vision system. Performance of the prototype showed the tag recognition system could cope with the real-world environment of a typical building [16]. In this survey, we observe that main problem of blind people should depend on any other guide like blind cane, black glasses, people information, trained dogs. But trained dog would also be burden of them as they can move only to the places that dog are trained.

Blind people need some support to feel safe while moving indoor or outdoor.Smart cane, range notification system, path finder, real time localization system, ultrasonic electronic system, novel indoor system etc. Systems are previously used by blind people. That system based on various techniques such as An electronic system using an ATmega328P microcontroller, A remote processing system analyzes-by computer vision algorithms, Assistive technology device called Electronic Long Cane, Eye Stick, tactile signals for giving information rather than acoustic signals, white cane or Hoover cane.

2.1 Design and Implementation of Eye Stick for Blind People:

The paper has made a example which will discover objects or obstacles ahead of users and feeds warning back, within the types of voice. It permits blind folks to recognize any obstacles and it permits period of time feedback to the user with voice on speaker, mistreatment the supersonic Ranger, the obstacle at intervals four hundred cm aloof from the cane is detected. There three famous sensors used for obstacle detection. They're infrared device, supersonic device and optical maser device. Since optical maser device was costly it absolutely was neglected from the beginning of the project. The opposite two device outputs similar result however infrared sensors area unit notable to be disturbed by daylight and dark objects. Since the device is needed to discover obstacles at intervals person size the supersonic device was chosen. The unit will be used as associate independent navigation tool while not the necessity of the cane. This may also ensure that the user will use the cane while not the unit for places that area unit acquainted to them. The limitation of this design is that the device detects obstacle at narrow range.

2.2 An Rfid Application for the Disabled: Path Finder:

After the tests, it's clearly seen that blind people, who are not accustomed to the field, reached the target simply and correctly. Also, check users of the system turned back to the main gate from that they entered the field, successfully. Unfortunately, just in case of quite one target chosen, expected success result couldn't be achieved within the system, which can be seen from the graphs on top of. Besides, it is observed that passive RFID tags may be scan simply during a distance of thirty cm. to the reader, however whenever the tag holder is much away than 35 cm. to the reader, tags weren't read any further. So as to beat this drawback, either emission of the reader can be inflated or active RFID tags can be utilized in the system.

2.3 Voice Assisted Navigation System for the Blind:

This work presents a model of a navigation system that helps the visually impaired to maneuver in each indoor and outdoor environments. This method is intended to be completely self-sustainable and bank as very little as doable on virtual mapping ways. It's hopped-up by AN on-board power source and permits the user to sense objects in their environment. Obstacle is perceived from supersonic sensing element and an audio is played looking on the space of travel of ultrasound. An obstacle as shut as 4cm are often detected by the module. With a resolution of 15cm of obstacle distance, an acceptable audio instruction is given to the blind user. The navigator satisfactorily plays an applicable audio into the headphones which corresponds to the space of obstacle from the user. Change within the ground gradients has been tackled simply as the sensors method the sharp modification in ground level and intimates the user concerning constant. This planned system will be factory-made because the system is cheap. The system is implemented on the cane to produce a safer feeling to the blind. The project is often makeshift by the utilization of wireless LAN connections that supports the use of GPS. This helps the user to navigate a lot of accurately and effectively as a GPS module will actuate the position use of GPS co-ordinates.

2.4 A Real-time Localization System Using RFID for Visually Impaired:

This analysis given tag style and sensible white cane for ease in reading data while not additional devices. Short analysis is completed per the context of use that considers main user, task and environmental characteristics of matters during which it'll be operated. The example is simple to be told, use, and get or be subsidized from public service; therefore we all over the acceptableness, usability, and price profit are satisfied. Also huge decision opportunities and visibility for the blind in operating are given. Future work is going to be network environment and compatibility with infrastructure and current customary. Extending network environment to system will alter range to be not solely high-value applications of walking choices, however additionally following risk things that imply help through the network. to boot, road or building condition changes can be simply updated by the server. Compatibility with existing infrastructure and current customary like EPC global tag theme are required for smooth application.

2.5 Design and implementation of electronic aid to blind's cane

ETAs, just like the sensible cane provide blind individuals an independency level that is simply potential by the employment if this device. The sensible cane offers a security zone between them and also the possible obstacles. One of the most effective characteristics is that the ability of the design to any quite cane therefore a blind man wouldn't want to change the cane to use the device. With this technological equipment, blind people are more assured once occupancy the streets and those they don't have to be compelled to modification their cane by another tool or technique as a result of this proposal is adaptable to the one they have already got.

2.6 Smart Cane with Range notification for blind people

The system uses of an ultrasonic sensor for getting input and use earphone as the output. Ultrasonic sensor is used to measure distance from the obstacle present in their path. The information is then fed to the NI myRIO-1900 which is after translated into the audio output. The beeping frequency increases as the user goes closer to the obstacle. The placement and orientation of the sensor on the cane was also well examined in terms of accuracy. The upper position sensor with angle of 90 degree has been found to the most real organization.

2.7 Electronic long cane for locomotion improving on visual impaired people, A case study.

In this work, a novel electronic cane, called ELC, was registered and calculated. This approach involved an ergonomic design along with an embedded electronics inside the grip of a traditional long cane which circulate human dimensional and tactile approach. The device indicates obstacles above waistline and warns about potential crash. Qualitative assessment of an ELC prototype was carried out by voluntary blind people. The obtained results showed the ELC effectiveness for detecting physical barriers located above of the imaginary waistline, so, contributing to a better perception of the surrounding space by blind people or visually impaired people. The electronic circuit embedded on the grip can detect obstacles above the waistline in order to give a tactile feedback, through a vibration inside the cane. This tactile reply becomes more frequent meanwhile the user reaches the obstacle. The integrated hardware-ergonomic solution, in spite of simplicity, gives a new concept to improve flexibility, by indicating the related surrounding features above the user waist, thus, sharing to a safer human progression.

2.8 Novel indoor navigation system for Visually Impaired and blind people

It provides the blind people the ability to travel without any other assistance. The planned system architecture uses a network of IP cameras placed at the roof of each room. A remote processing system investigate-by computer vision algorithms-photos taken from the environment in order to inform the subject about his location and reacts accordingly to pass the sufficient assistance and then use for bind people. A guidance algorithm used for destination using a simple interactive mobile application installed on his smart phone. The proof of concept prototype was designed with one camera on top of a wooden floor model to resemble the system. The proposed system access has a straightforward architecture. There are two principal actors in this architecture are the blind person and the remote processing system.

2.9 A 2d vibration array as an assistive device for visually impaired.

The 2D vibration array consists of 4x4 miniature vibrators attached to a portable computer, which is the main computing component of the whole wearable navigation system, called Tyflos. Tyflos consists of two miniature cameras which are attached to a two dark glasses, a microphone, an ear speaker, the 2D vibration array, and a portable computer. The cameras click images from the environment and later convenient processing 3D representations are created. These 3D space representations are projected on the 2D array, which vibrates in various levels corresponding to the distances of the surrounding obstacles. The 2D array is attached to the blind user's chest in order to provide the convenient vibrations of the distances from the surroundings environment. The 2D vibration array is a dominant part of the Tyflos navigation system for visual impaired and blind people. The designing of the array, its reproduction and its first 4x4 implementation were also provided. This implementation was very useful despite several issues related with the high to low representation of the 3D perceived space.

2.10 A tool for range sensing and environment discovery for the blind.

As the blind user strokes the hand-held system around, then blind user or visually impaired people will gain regional range information. In inclusion, the time profile of the range will be investigated by the onboard processor to detect environmental features that are demanding for flexibility, such as curbs, steps and drop-offs. In this implementation, range is collected by a short-baseline triangulation system that is formed by a point laser and a miniaturized camera, producing readings at frame rate. An Extended Kalman filter is used to record the range data and also recognize environmental features of interest. Prototype sensor will be part of a hand–held mobility device for use by the visually impaired. Also we have presented an algorithm, based on Extended Kalman Filter tracking, that can recognize environmental features corresponding to curbs, steps, and drop–offs. prior experiments in laboratory environment have given promising results.

3. CONCLUSION

In this survey, we have observed some assistance system used for blind people to detect the obstacle in their path such as range notification system, path finder, real time localization system, ultrasonic electronic system and novel indoor system and they get motivation to blind people. Also there is scope to develop a different system which will be more efficient and reliable to blind people.

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