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Review on Navigation Device for Blind

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Abstract: In today's world blinds are less secure and suffering lots of problems in their life. Blinds are always dependent on someone else, even if there are certain devices to support them. Although there are many existing systems for their purpose but they lack certain features. In order to overcome this problem, This paper introduces a solution with concept of IoT based smart shoe for blind. Main features provided by this new system is outdoor navigation and indoor navigation along with obstacle detection in the path they are moving. This paper also explores behavior analytics of blind user, traffic signal identification, face recognition of known and unknown people who are communicating with blind, text to speech convention, it provides health monitoring and at crucial health situation an alert message with current location of blind will be sent to relatives and authorized doctors. Thus through the data collected from the sensors like temp, heart beat sensors. These data will be sent to both doctors and relatives. Thus it saves the life.

Keywords: GPS, Indoor Environment, IoT, Voice Feedback

I. INTRODUCTION

This paper explores the usage IoT that can be really useful to the visually impaired individual. By using hardware and software modules, makes the system better and reliable. By using various methodologies all the features can be well utilized. Though the existing system has lot of disadvantages it can be overcome by this system. Thus the previous system was based on the white cane. If contain several features that helpful for blind, even though it is not efficient in all situation. In order to overcome those difficulties, it can be modified by this system. Thus this make the blind to move freely in everywhere, Thus it enabled with GPS Tracking System, Global position of blind can be identified. Being a blind they don't possess normal life as others. They are to be monitored time to time. When a blind walking in an environment they are not aware about the obstacle in their way, such situation can be overcome by this system. Mainly this explains more features along with obstacle detection to blind person. All the helps needed for a blind person, to lead a normal life as others is embedded here. Purpose of the system is to detect obstacles in the way they are in travel. After the detection information about obstacles is given through audio information. Unlike other peoples blinds are not able to lead a secure life. Over a small change in their health, it may affect their normal life status. This system provides a solution in continuous checking of their health. So in such situation, the information about current situation of blind person is informed to relatives through message. Also information about the critical condition is also given as an alert to doctors. In outdoor environment, blinds are not able to identify the traffic signal. Here traffic signals are detected; information about the traffic signal and the direction to be followed is given through audio information. It also helps the blinds in situations where they need identification of text. It such situation, text to speech conversion mechanism is used. Then the information is given to blind through audio. Face recognition technique is used to identify peoples. Images of close peoples are stored in a database. Whenever the face of a person is detected by camera, it checks in the data base, to check whether he or she is a known person. Otherwise that was an unknown person. In both cases it is informed to blind person through audio information. To provide more efficiency and accuracy behaviour analytics also included here.

II. THEORY

Main aim of this device is to help the blind people to navigate to the selected location and to help them with other helpful processes in their daily life. For navigation part to make successful obstacle detection is deployed. So obstacles can be avoided in the path the blind user navigates. Navigation is on both indoor and outdoor environment. Android applications are used for localization. Thus this devise will be deployed with GPS technology. The blind user can interact with the device through headset and speaker. For this to be implemented blue tooth technology is enabled. Thus the blind user will get proper directions for successful navigation in the form of audio commands. He can choose the location also by commanding the location in the form of audio commands. For obstacle detection depth camera is used.

For recognition of text written in his environment there is a text to speech conversion. This will convey what is written through audio command. For blind user to read the text a read button is provided. So through pressing this button device will be set to text to speech conversion. The input for this technique is provided in the form of image. Then this image will be processed and the patterns of the text will be recognised. Output will be the dictation of the text which is recognised. The other feature is the face recognition technique. This technique will be helpful in case when the blind user is unable to recognise the person in front of him. This is made possible through already registering the person information to the device. So if a match with the already stored information is found the person is recognised by the device else is rejected. This is also done through image analysis. The other feature which will help them to navigate on the road is the traffic signal detection technique. For analysis IR sensor is used. The RGB camera is also used for detection. The input for this process will be also an image. From this colour texture and shape is detected and thus detected. Output will be the correct time at which he can pass through the area. This system will also help to monitor the heath condition of the blind user. It will detect the body temperature through temperature sensor used. Heart beat is detected through heartbeat sensor provided. All sensors will be connected to a component which will help the proper functioning of these sensors it can be LM324.Thus in case of bad health condition a message can be sent to the relatives and doctors connected with this device. The message will contain the current location of the blind user and a text indicating bad health condition. Behaviour analytics of the blind user is also detected. Behaviour analytics will be more efficient if the user uses this device for more amounts of time. Thus information about the movement and action of the blind user can be analysed. This entire system can be connected to raspberry pi which acts as CPU for this entire device.

III. RELATED WORK

In this paper [1] explains that For Weak sighted people we use Augmented reality technique to display the surroundings to them through are AR glasses. Finder consisting of an ultrasonic sensor and MCU, and embedded CPU board, earphones are mainly used. Ultrasonic sensor's working is continued by micro controlled unit attached to it. Depth based way finding algorithm process the image acquired from depth camera and then outputs several candidate moving directions. Optimal moving direction selected by using multisensory fusion based obstacle avoid algorithm and auditory information can be given to blind person. Advantage is that it have high accuracy. Disadvantage is that it can't find shortest path to destination.

This paper [2] focuses on the direction and identification of traffic signals. Street crossing, traffics lamps, cars, cyclists, other people low of high obstacles can be detected by this system. Stereo image acquisition module contains two cameras that is placed on both sides of the heady symmetrically. Thus better of line of sight can be achieved. DPU is mini personal computer that works with external power supply, and it can work for two hours. There is a data processing unit decodes and transforms the data extracted from cameras. Image processing unit searches for moving in stereo images, cross walks, stares and searches for traffic lamps. Based on the output of image processing unit, data evaluation unit evaluates traffic situations. Audio signal generated by signalling generator unit provides audio information through earphones. By identifying the frequency of their audio signal threat lever of the object can be determined. Advantage is that moving object decision is easier, disadvantage is that difficult to maintain the external power supply for a long time.

This paper [3] explains a system that used for the detection and classification of main structural elements of the scene. Then the user can be provided with obstacle free paths along which the blind can free paths along which the blind can move. Here we use the combination of range information with colour information with colour information. Structural elements of the scene are detected and classified using range information. To expand this segmentation to entire scene, we combines colour information to range information. Range information is captured using RGB-D Camera. By using range information we can only detect obstacles within same range. when we uses the colour information along with range information, we can detect obstacles in wide range. Here navigational commands to the blinds are given through voice commands or sound map. Mainly we use stereo beep, that identifies the distance between user to obstacles to provide voice commands to users. Efficient guidance can be provided to blind people through voice commands. Here floor segmentation is done using range data, and this range data is captured by RGB-D device. For getting proper path planning, we need to use the colour information provided by RGB-D device. Colour information is used why because, it would be enough for reactive obstacles, but not enough for applications, Advantage is that here we can guide the person in indoor scenario. Disadvantage is that there is no path planning.

Here is a system [4] contains a camera, different from all other systems, this camera is used to capture video frames, but not for stills. This camera is taken by users from the captured video frames, both the gradient and intensity statistics are extracted. Here a support vector machine classifier unblurred frames. When the unblurred frame have further processed, and good quality frames are generated for text extraction. In this it is observed that the edges are wide in blurred frame than unblurred frames. Hence to differentiate b/as blurred and unblurred frames we can trace edge width as a main feature. For each frame average edge width is calculated by cuing a sobel edge detector, the average value of the edge width of each edge pixels for the whole frame is calculated. When the detected edge width for a frame is

greater than their average value, then that frame is blurred, otherwise unblurred. By some processing blurred frames can be converted to unblurred frames. By detecting text from their frames, we can analyse the text. Then the location that identified from their text can be informed to blind person through voice commands. Advantage is that it extracts the text from frames and converts into voice command to blinds. This can be used in both indoor and outdoor environment disadvantages are that some processing and required to extract unblurred frames from blurred frames.

Here [5] is a device for blind for use in indoor environment. The main components are two vibrators. Here is a device for blind for use in indoor environment. The main components are two vibrators. Here information about obstacles is given to the users through synthetic speech output. Here one ultrasonic sensor is mounted on to the cane. This device provides information about urban walking routes to blinds. While the users moving, it also provides time information about the distance of overhanging objects with in a distance of 6m. The obstacles care sensed through sonar sensor, the information about closet obstacles in the travelling path s provided to user in the form vibro-tactile feedback. When the user feels a vibration, then the person can easily understands the there is an obstacle near to him. In addition to this there is a microcontroller, accelerometer, a speech synthesizes also. Here by sending ultrasonic wave, when these are an obstacle, it will reflect back and received by receiver. If the obstacle is near to the person, then there will be increase in vibration to person, specifies to the person that obstacle is very close. If it is far away from user, then there will be decrease in vibration given to person. Advantage is that it provides info about urban walking routes and distance to overhanging objects within 6m. Disadvantages are that it is difficult to place the ultrasonic sensor on user shoulder.

The device used for the navigation for blind people in [6]is in the indoor environment. It will help the blind to walk safely without anybody help in a particular environment. There are route following, shortest path estimation to a given location, obstacle detection modular included in this device. The main aim is navigation to a given place with the help of voice commands provided from the device. A dynamic sub goal selecting strategy is the method used for the navigation to a given place. This strategy will help the blind people for a successful navigation in the indoor environment. Since we can't use GPS system for indoor navigation. It is not chosen since there will be signal breakage in the indoor environment. Hardware used in this system are fishy camera ultrasonic range finder depth camera an embedded CPU board and earphone Module used for the indoor navigation are rendering module and obstacle detection module. Rendiering module is used because it can convert the information from the environment to audio or visual cues. Also depth camera is used for obstacle detection. Here we build a virtual blind road for them with help of visual SLAM module. For this they use RGB and depth image. A key feature proposed by this module is the shortest path estimation for this the virtual blind round build with help of visual SLAM module serve a PoI graph. This navigation is done to find shortest path we use A*and dijikstra algorithm. Thus their method helps the blind to navigate successfully to a location with help of these methodologies.

A GPS based navigation device in [7] is developed for blind which will serve as an excellent device for blind navigation at outdoor environment. The main module used is the inverse differential global positioning system (CDGPS). A DGPS algorithm is built with the help of digital map. It acts as a Global Positioning System (GPS). It is operated in different modes for positioning of blind. For GPS positioning. Here there is only use of three satellites instead of four for other systems. It is because of the differential global positions system (DGPS) algorithm. If more than three satellites are available. We can select three among them. Thus it will increase portion accuracy. For this there is a navigation centre linked with cellular mobile networks. The navigation centre receives pseudo range measurement from GPS receiver through General Packet Radio Service (GPRS). Positioning offset is calculated by the base station. It also calculates through information from digital map. The position of user is visible on the digital map. This is then used to provide voice commands which will direct the user.

In this system [8] there is visual maker technique used. By using this technique it is able to find the point of interest that is the place to be navigated. Here there is other important feature which is the ultrasonic obstacle detection. With the marker technique blind can navigate to his desired location. The software modules will identify the visual markers. Visual marker identification is done with help of one RGB camera and ultrasonic sensors. A headset is provided to the blind for receiving audio commands. These audio commands are direction given by the device for successful navigation. A mini PC is used for running the algorithms. Ultrasonic sensor is controlled by microcontroller board. The software of their system is the ultrasonic perception modules and computer vision modules.

The obstacles are detected by computer vision module image processing is also adapted for their system. Here there is three algorithm used Haar like cascade. They are object marker, create sample and Train Cascade. For this device the indoor environment can be home or work place. Here the object in environment can be static or dynamic. Through visual pattern analysis a marker is identified. When using this system, when it detects a marker, the current location information, information about other location etc. are recorded and updated. Thus this system helps in successful indoor navigation with more precise obstacle detection.

This paper [9] focus on obstacle deals detection. Here this system is wearable device based Radio Frequency Identification Device (RFID) it uses radio moves. The main component of the system is the portable RFID system. There is RFID reader and Bluetooth module in it. The RFID technology is very useful for a blind person objects are detected. It done with single reader. The device is placed inside a glove. It also give information about the distance of the obstacle. The information inside scanned tags is provided to the blind. There is received signal strength indicator

RSSI. RSSI value will help in correlating bio feedback signal. There is audio signals provided so that blind can reach the desired object. If the user is near the antenna of lag then frequency increased and if he is far away the frequency decreases. If there are multiple tags, the tags which is closes to it is choosen device provide blind with informations which are stored in the scanned to.

This paper [10] describe about a walking stick and a Bluetooth headed which is wearable for blind which helps in easy navigation. The current location of the blind uses can be detected with help of Global Positioning System (GPS) embedded in the stick. The headset and stick is paired using Bluetooth skilk. The headset is worn by the blind in order to receiver voice feedbacks. There is vibration system provided here , if the distance of obstacle is too closer strength of vibration is high if the distance of obstacle is low the strength of vibration is also made low. The product is modeled as rechargeable using lithium battery, main technique for detection used in the paper is reflection from ultrasonic waves. There is ultrasonic sensor module, navigation system module, speech synthesizes, GPS recovers and voice plack unit in it to achieve its fast.

In this paper [11] a smart shoe is implemented based on IOT, it is wearable as a shoe to the blind user. An electronic kit is fixed inside the shoe. The hardware porter of the smart shoe is four vibrators, one arduino Bluetooth connection and one battery. Sensor used for detecting obstacles when obstacle detected it is informed to the user. There is an android application developed for their smart shoe. The source and destination is set through mobile phone the vibrator are pot at the left and right. If the user take a left move vibrator which is set on left will vibrate. If the user move to right the corresponding vibrator set on right will vibrate.

In this paper [12] it is very complicated to locate person among group of people or in a shopping mall. There are various technologies had been developed to monitor people. There are some work at are highly précised detect how people move inside a building. Most common method used are video camera, Bluetooth and Smart phone. These method provide automatic Monitoring of individuals. These signals are based on antennas. The behavior analysis of individuals can be calculated based on communication abilities. Thus this paper explores adequate monitoring of people. Tracking of user can be based on collected data by using Wi-Fi. The Wi-Fi sensor count the number of individuals outside and inside the environment. This paper mainly focusing in behavior analysis of individuals. Through the WiFi technology behaviour can be analyzed anywhere globally.

In this paper [13] user behaviour is examined, here usual and unusual behaviour is examined though action sequence. The user behaviour in a digital system is identified. Here how user make decision is examined components that are included in multilevel analysis approach are constraint – based sequentice pattern mining and semantic distance clustering. Here fine analyses are done. Deep understanding about analyst is gained. It is achieved through action sequencer. The approach used analysis is the novel visual design and interaction techniques. Data mining algorithms are used.

In this paper [14] the visually impaired individual feel hard in crossing roads. This paper introduce a solution to this problem. This algorithm use machine learning. This include mainly three mechanism 1) extraction, 2), recognition, and 3) spatial analysis. It is attached to pc with camera. Visually impaired individual lack the ability to feel the ambiance of environment, it may leads to dangerous condition while crossing the road. In this scenario, they are well occupied with guiding devices to protect them from dangerous situation. Very development had been developed to protect them from hazards, PCL is one of such algorithm to protect them while crossing the Road. PCL detect the colour of road signals and then verifies it. These colours are captured by camera at moderate distance. Alarms are used to activate the user from hazards. But under rainy conditions output of PCL is not ideal.

This paper [15] explains an application software that helps visually impaired people to get information about traffic signals such as whether it is turn to red or green. This application software can be installed in a mobile device with a camera. When the user tapping on the app-icon. The camera becomes on and captures the traffic timer display. Then information about time is given to user through voice message. Then the blind person can hear information about the time left to turn on the pedestrian s/g. the identification of time is done through some comparison. There is a database containing 10 images depicting every image from 0-9. Also the image of the traffic timer display taken by camera is given for processing. Here the RGB image taken by camera is converted into binary image. From the image of time all other symbol like colons are removed. Here we compute histogram for each extracted digit. This is compared with histogram PL storied image in database. If the correlation coefficient get after the comparison is near to 1, then two digits are same. Then we can understand that actual digit stored in extracted image. Then this remaining time is informed to blind people through voice command by text to speech conversion. Advantage is that the system mainly focus to capture Image containing digits and to identify them. So it can be used in other application that including digit identification. Disadvantage is that since the device is used by blind persons, no guarantee that the image takes actually contains the time. So pattern machine algorithm is further required for enquiry this.

In this paper [16] face detection of the person is the first and foremost step it detect all the faces that gave us an input.

In region based approach, DCNN classifies each data into face and non face. R-CNN Network is used to detect face in multiple images. Facial features include corners of eyes, nose tip, ear. During test these features are shaped. End to end pipeline are used for face identification and verification. These pipeline points are used to match the canonical points. All in one face work is used to match the canonical points. All in one face work is used to match the collected face samples. Once we get face in image we map the face to related image stored on the database. To get a correct image we

need to construct a template where all images are gathered. It is impossible to get image from two different template. It is based on face recognition using DCNN. This paper explores the use of all in one CNN it also uses well define pipeline instructions for image verification.

This paper [17] focus on face recognition. Here face recognition is done through age and gender classification. Face recognition is a technique which is fastly growing in recent decades. Face recognition technical is considered as a better biometric than others. Through this technique is able for blind people to recognise a person. A face recognition system first take an image as input from standard camera. Then this image is further preprocessed to improve image quality. Next stamp the segmentation, here only the face part is extracted by cropping all other parts of body. After that features extraction step is done. Here through this step it is able to distinguish different persons. Here relevant features of the person is identified and categorized. For last step a template is extracted for matching purpose, then matching is performed at biometric system. If there is a match between input and output is marked as successfully matched age classification is sensitive and difficult to accrue. The data set during age classification should suggest the age. Gender classification is quite easier and can be classified through features of image. Thus this paper focus on face recognition through various techniques.

This paper [18] explains that blinds recognize objects through sound and touch. There is a need for developing a text reading device. Here is a text reading system that automatically locate and read the text to visually impaired person. Here first we recognize the text characters and then at is given to pre processing module .The pre processor prepares the text for recognition. The preparation unit segments the text into individual characters, each of the characters are stored in the text file. The process is done using MATLAB, then they are converted by using speech. All these are performed by using OCR system which consists of optical scanning, segmentation and the feature extraction. Here OCR convert the scanned image into a computer format text. This text is passed into speech synthesizer. This is a computer based system that reads this text aloud. When the text is given to the speech recognizer it normalizes the text and process it. The end portion recognizer converts it to make a sound .Advantage of this is that it helped the blind to improve their poor reading approach. It also helped the poor person with less vocal ability. Main disadvantage of this paper is that it is little bit complex.

This paper [19], explains efficient method of text to speech conversion for visually impaired person, we propose a smart spec for this purpose .Here text image printed text is captured by using a spec for the efficiency of the purpose we uses an camera that uses OCR .This detected text is converted into speech using a speech synthesizer. By this method synthesized speech is produced and given through headphone. Raspberry pi is the main module used in this implementation. Here the USB camera captured the image containing text .This image are compared with the already predefined images with specified conditions , these conditions are text in the form of black and white, text is in the form of colour ,text with image and text with different font styles ,finally the text is merged with image. After image processing of sample image ,it is compared with actual textual image main advantage of this device is compact and highly economical as well as efficient for blind people.

In this paper [20] monitoring are important mode to provide secure health status to the blind. In case, the blind has to register into a mobile app, all the personal data will be stored in their data base. Through this app doctor can monitor the health status and can provide better medical recommendation . Major component of this mobile app include button and label. It also include various component such as accelerometer, motion sensor and also include components to store the images, information and so on. App mainly composed of viewer palette, components and media. The viewer palette influence the appearance of images, The component specifies the component in the library and Media handles the sound. Thus there features complete the app, it can work on any device. Main advantage of this app, is that any changes to the app will be automatically updated. It is very simple to use and it alerts patient in case of emergencies.

In this paper [21] this systems is mainly divided into hardware and software, Hardware mainly consist of transmitter and receiver blocks. Software languages like Phyton and MATLAB software languages are mainly used in this paper.

Main operations are Data acquisition, Data processing, Data storage, Data Transmission. Two operations are included in every stage.Energy efficiency the date acquisition is achieved though MEMS Technology energy efficiency of the processing unit is achieved through processors and co-processors. Both hardware and software will work in parallel. Raspberry pi is the important component, all other hardware are connected to it.

This paper [22] explores the use of various sensors. It provides an aid to medical field by sharing the collected records. It works different modes depending upon the data collected it mainly compared of different tier. First tier compared of wild sensor. Second tier include processing unit and last tier include the webpage. The proposed model process all the data sample collected and delivers it to the web page for remote access. The usage of this method can detect various diseases. It provide real time monitoring of patient.

This paper [23] presents a wearable IoT sensor network. That can be connected for health monitoring wearable sensor has 2 node one is safe Node for monitoring the environment condition such as humidity, temperature, UV rays. Second node is health Node for monitoring each safe Node. Mainly consist of LORA, MCU, for monitoring the environment LORA module for long-range data transmission. Every health Node include physiological sensors for monitoring the body temperature. Thus all collected records in health Node will transferred to safe Node via WBAN.

Thus we can conclude that this paper monitors environmental and physical well being of the individual.

In this paper [24] the usage of internet of things are widely increased. This paper mainly explores the behavior of patient. Thus biological information can gathered from their behaviour. Mainly, doctors and doctors get benefited from this system. Arduino101 is the principle components of this system. This Arduino board collects the information gathered from patient behaviour, also emergency condition of patient is well monitored. It also monitors blood pressure level. But ECG is not monitored. All the sensors are based on the body movements made by the patient. Also this papers explores the usage of this system in ICU, because many people are died in the ICU without proper care, Thus this system saves the life of individuals.

IV. CONCLUSION

In this era of new technologies, we can use IOT based smart shoe for blind .we all know that blind wish to live a normal life, but their disability prevent them from live a normal life. This paper will help them to live normally .On detecting obstacle in their path they walk help them to walk freely and safely. Being a blind they lack certain biological and behavioural features. To make them safe their activities are monitored. GPS enabled system is also programmed that provide them correct location of place where they wish to go, during their walk road signals may appear ,thus shoe enabled with Bluetooth module that give auditory information about the signal. Text to speech module also helps them to convert a text into a speech. Being a blind, they are not well fit in their health, whenever there is a change in their normal health status that can be monitored by the doctors as well as by the relatives. During such emergency situation location information is send to both relatives and doctors, thus they can saves the life of blind by giving proper care at the right time.

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