

Navigation for Blind People using Ultrasonic Tester

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Abstract

This paper demonstrate about the navigation for blind people using ultrasonic tester based on visual markers recognition and ultrasonic obstacles perception used as vibrator with RFID tag for acquiring required bus number detection for blind people. In this prototype, visual markers identify the points of interest in the environment additionally this location status is enriched with information obtained in real time. The RGB camera, ultrasonic sensor, vibrator, RFID Tag and cane enhancing the amount and quality of the available information. The user navigates freely in the prepared environment identifying the location markers. Based on the origin point information or the location point information using image processing the bus number is discerned. To raise the perception of the environment, avoiding possible obstacles, it uses three ultrasonic sensors with vibrator. The audio assistance provided to the user makes use of an audio bank, with simple known instructions to indicate precisely the desired route. Ten blind users tested and evaluated the system. The results showed rates of about 95.92% successful recognition of the markers using only 32 frames per second and 98.66% of ultrasonic obstacles perception disposed between 0.25 meters and 5.0 meters. By this technique blind as well as foreign people can reach the destination without any manual aid.

Keywords: - *Navigation, Acoustics, Visualization, Cameras, RFID Tag, and ultrasonic sensor.*

INTRODUCTION

For blind people, walk freely is a challenge due to lack of information about

the destination addresses, obstacles, etc.

For them, there are plenty of new technologies that could be employed to

decrease the difficulties caused by this impairment, making the relationship between man and environment more harmonious as possible. Blind people use mainly the canes to move around and avoid obstacles. That is a very useful instrument and widely spread among blind people worldwide. Unfortunately, it is still a limited resource unable to provide an independent navigation and it cannot be used to detect objects or people more than a few feet away or above the waist of the user. For blind people, walk freely is a challenge due to lack of information about the destination addresses, obstacles, etc. For them, there are plenty of new technologies that could be employed to decrease the difficulties caused by this impairment, making the relationship between man and environment more harmonious as possible. Blind people use mainly the canes to move around and avoid obstacles. That is a very useful instrument and widely spread among blind people worldwide. Unfortunately, it is still a limited resource unable to provide an independent navigation . and it cannot be used to detect objects or people more than a few feet away or above the waist of the user. Based on already presented works we decided to develop a new low cost tool able to help the outdoor navigation by

detecting the bus number through audio assistance with ultrasonic tester. In this process of system the bus number is detected with image processing and obstacle with ultrasonic tester.

ENACTMENT OF THE PROPOSED SYSTEM

The proposed navigation device is a combination composed of a hardware module and two software modules to deal with the collected environmental information. The software modules recognize visual markers through one RGB camera and static or dynamic obstacles through ultrasonic sensors at a safe distance. The users receive instructions through sound messages in the loud speaker. The proposed system architecture shown in the fig.2

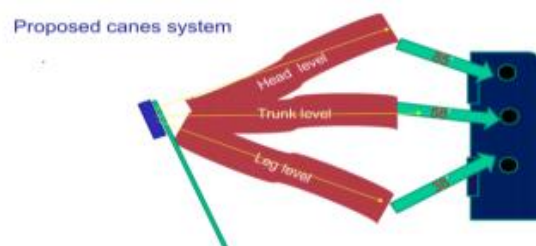


Fig 1 Proposed cane system

The hardware module consist of RGB camera Ultrasonic sensor PIC16F877A APR Voice, LCD, RFID Tag .The software module consists of image

equalization processed in the mat lab .In this process camera acquire the area of interest in the environment thus the bus detail is identified and fetch the information to the people through apr voice and speaker. A Microcontroller board controls the ultrasonic sensors. The cane system consist of sensor at three level namely head level, trunklevel, leg level which helps to detect the obstacle at various degree of axis. The tester functions using DC motor (vibrator) that helps to avoid the confusion to recognize the destination address and the objects on ground.

The computer stores the audio database, control bone conduction with speaker. The RFID Tag reader is implemented to sorts out the specific bus information so that the blind people can easily reach their destination more precisely.

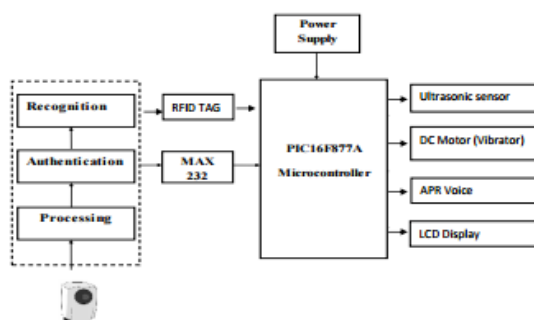


Fig 2 Proposed Hardware Module

Process of image detection

The software module uses Haar Cascade classifiers the flowchart in the matalb is shown in figure 3

A. Image Acquisition The first stage of any vision system is the image acquisition stage. After the image has been obtained, various methods of processing can be applied to the image to perform the many different vision tasks .The process is done to get the data .The image is acquired and detected.

B. Area of Interest A region of interest (ROI) is a portion of an image that you want to filter or perform some other operation on. In the mask image, the pixels that define the ROI are set to 1 and all other pixels set to 0.Thus the specific region of interest is detected and rest of the area is neglected.

C. Radiometric Calibration This is the conversion of the input image values to a common radiometric scale that allow us to convert an RGB images back to their original that is significantly more accurate than any existing methods

D. Morphological transformation It is the set of image processing operation based on shape of the image. Dilate

and erode often used in the binary image for image processing.

E. Smooth The image is further treated with average filters namely sobel and canny where the edge of the image is detected. The image boundaries are discovered by image segmentation and data is extracted from the area of region. In the cannyfilter the edge of the image is detected by intensity of image.

F. Equalization It read the image in the given work space and enhance the contrast of the image using histogram equalization.it display the both original and adjusted image.

G. Result The expected result is that the bus number ROI in the environment is detected by the above process and display it with the details that is route of the bus

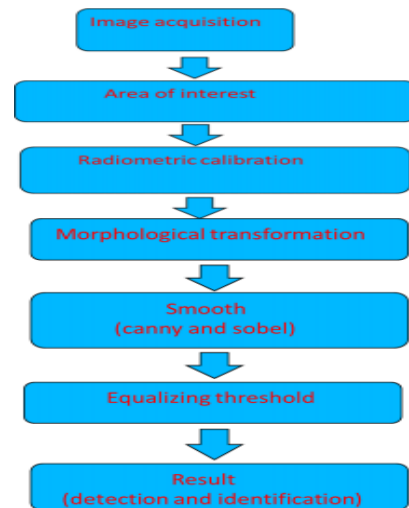


Fig 3 flowchart of image detection

By using this procedure bus number can be detected by neglecting the rest of portion. Source and destination of the people can also be clearly determined. By using speaker data can be received by people. Further process is carried out by the portion of hardware. Image processing result is given in figure4

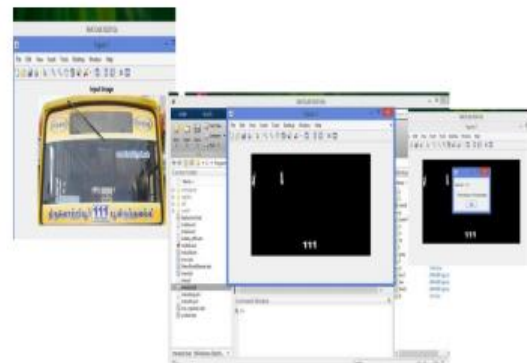


Fig 4 Image processing result

ESSENTIAL HARDWARE AND EXPLICATION 1. Micro controller

The electronic circuits that can be programmed to carry out a vast range of tasks is known as PIC microcontrollers (Programmable Interface Controllers). They can be programmed to control a production line or be timers and much more. These are programmed and simulated by Circuit Wizard software.

2) Ultrasonic sensor

This technology can be used for measuring direction. A transducer which generates sound waves by turning electrical energy into sound in the ultrasonic range, above 20,000 hertz, then upon receiving the echo turn the sound waves into electrical energy which can be measured and displayed.

3) Dc motor

In this process dc motor is used as vibrator. To avoid the confusion by audio recognition between the ground level obstacle and bus number detection this vibrator is used for ground level obstacle.

4) APR 9600 VOICE IC

APR9600 is a low-cost high performance sound record/replay IC incorporating flash analogue storage technique. Recorded sound is retained even after power supply is removed from the module. The replayed sound exhibits high quality with a low

noise level. Sampling rate for a 90second recording period is 7.2 kHz that gives a sound record/replay bandwidth of 40Hz to 5.1 kHz.

5) LCD display

LCD (liquid crystal display) is the technology used for display. Like light-emitting diode (LED) and gas-plasma technologies, LCDs allow displays to be much thinner than cathode ray tube (CRT) technology.

6) Max 232

A capacitive voltage generator to supply RS 232 voltage levels from a single 5v supply is known as MAX232. It is a dual driver/receiver. The microcontroller transmitter pin is connected in the MAX232 pin which converts input 5v level to RS232 level. Then T2OUT pin is connected to receiver pin of 9 pin D type serial connector which is directly connected to PC.

7) RFID Tag

By using this Tag the Processor controls RFID transmission and reception. Antenna sends high frequency EM waves out and converts EM waves into an electric current. It responds to its own unique radio

waves, which is further processed to achieve information.

8) Power supply

The power supply section is the important one. It should deliver constant output regulated power supply for successful working of the project. A 0-12V/1 mA transformer is used for this purpose and filtered by the capacitors, which is further regulated to +5v, by using IC 7805.

RESULT AND DISCUSSION

The blinder user outdoor navigation is possible in this process where the bus number is clearly detected using the camera and the details of the bus is announced using speaker. The canes help to detect the obstacle in the surrounding and navigate freely in the environment by the blind user, Here in the table given below the bus number is discovered in limited distance so RFID Tag is implemented for the sorted bus need for user so that bus driver able to know that the blind is awaiting for the bus. Therefore

blind user can navigate independently from their source to destination.

(See Table)

CONCLUSION

This paper discovers the navigation of the blind user in the environment independently from their source to the destination with the help of RFID Tag and cane system. Camera accesses all the route bus whereas the Tag help to identify the desired bus. By this device it helps not only the impaired people but also foreigner and illiterate.

Normally the cane system consists of single sensor to detect the obstacle but in this device, the cane system consisting of three sensor of various degree to detect the different level of obstacle. Thus the user can able to navigate freely in the environment and reach to their destination. However the efficiency is low with low cost equipment which can be increased with advanced technology and equipment.

TABLE 1 Indicate the Bus Number Using the Camera And The Details of the Bus Is Announced Using Speaker

S.no	Image	Distance	Bus Number detection	Image Clarity	Audio Output
1	Bus 1	50cm	62	60	Avadi
2	Bus 2	30cm	25G	75	Anna square
3	Bus 3	20cm	Pp66	80	Tambaram
4	Bus 4	10cm	153ct	94.1	CMBT
5	Bus 5	4.3cm	49A	98.72	T Nagar
6	Bus 6	2cm	Not detected	Not clear	Nil

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