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# INTELLIGENT GUIDANCE SYSTEM FOR VISUALLY IMPAIRED

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***Abstract:*** **This "intelligent guidance system for visually impaired" is a guidance system for the blind people based on joystick, ultrasonic sensor, IR sensor and image processing. Multiple functions are provided like image processing navigation and obstacle avoidance. Smart phone is used for the vision purpose. Zebra crossing and traffic light detection by this camera. Artificial intelligence is also implemented for the indoor navigation and GPS module for the outdoor navigation. The major concern for the blind is the traffic junction they are confused weather to cross the junction or ask someone help. Here the camera vision helps to detect zebra crossing and traffic light.gps values lat and long is recorded in a database and kept for future references.**

***Keywords:*** **Intelligent Guidance System, Visually Impaired, Camera Vision.**

## I. INTRODUCTION

Billions of the people in the world are suffering from blindness. Their guidance in indoor and outdoor environment is a major problem till now. lot of methods like white cane system and guide dogs are used widely at present . but white cane is practically not suitable in all environments. Guide dogs which requires special training needs lot of investment, some guide dogs which are trained for specific places and they cannot guide the master when there is a change of residence. In this paper research has been done to know how much successful it will be in crowded environment. Ultrasonic sensors are used for obstacle avoidance and ir sensor for any dips or pits. Accelerometer here is used as joystic for the control of the robot. gps module which is tested in the system for the location guidance in the outdoor environment. android smart phone is used for image capturing. this camera takes the images of the traffic light and zebra crossing lines.

This research aims to develop a system which can ensures masters safety in heavy traffic environment. In normal person's situation, master will meet obstacle avoidance problem, including static obstacle and active crowd. Besides, traffic lights detection also should be considered.. However, normal people have visual sense to observe surrounding environment. While visually impaired cannot do these, they are only capable to use tools to sense surroundings or follow blind roads. As masters' companion, the guide robot system should complete the task with high speed processors in which fuzzy logic or artificial intelligence could be implemented. Previous researches like MELDOG and HALO [5] [1] doesn't meet the requirement of the blind and they failed to guide the blind through harsh environment. Here the intelligent guidance system for visually impaired ( IGSVI) which can guide the blind will be the eye for the blind in the future.

## II. SYSTEM DESIGN

### *A. Control rope*

The contrl part of the robot system consists of a rope connected to accelerometer. This unit steers the robot in response to the feed back given to the master. Robot avoids the obstacles in front of iit using ultra sonic sensor and stops when there is traffic light signaling .this could be identified by the master through this rope .he can sense the action of the robot through the rope. In the noisy environment its hard to recognize the voice feedback, hence the rope will be a greater helpful for the person to control the robot. Fig . I shows the block diagram for the robotic system

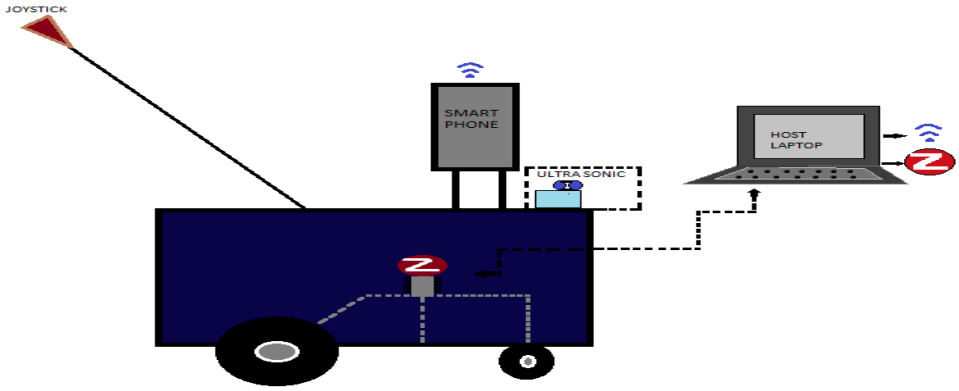


**Fig. I: Schematic diagram of hardware**

### *B. Smart robo vision*

People do self walking in all kinds of environments. they use eyes to recognize to traffic signals and zebra crossings to cross the road, here the smart phone camera is used as an eye for this intelligent system[3]. This detects the traffic light signal and zebra crossing and informs the master. So master can control the robot with his control rope attached to the accelerometer and choose the direction .TABLE I shows the turning angle of vehicle 0 -360 in 1000ms in forward and backward motion and tilting angle of camera 0-45 in 500 ms in forward and backward direction

**TABLE- I**

| Direction | Angle | Time(ms) |
|---|---|---|
| Forward | 0- 360 | 1000 |
| Back | 0-360 | 1000 |
| Forward,Backward | 0-45 | 500 |

### *C. Global positioning system*

Here gps module is integrated in the robotic system for determining the latitude and longitudinal values. The module used is iw-PRDLT . its is possible to obtain the variation in each 10 meters. Graphical plotting in matlab makes it easier to understand the positioning of the system. Here there is a need to create a database of the obtained values for the automated navigation of the blind and is my future work. Fig.II gives the lattitude a longitudinal values of GPS for each 10 meters.

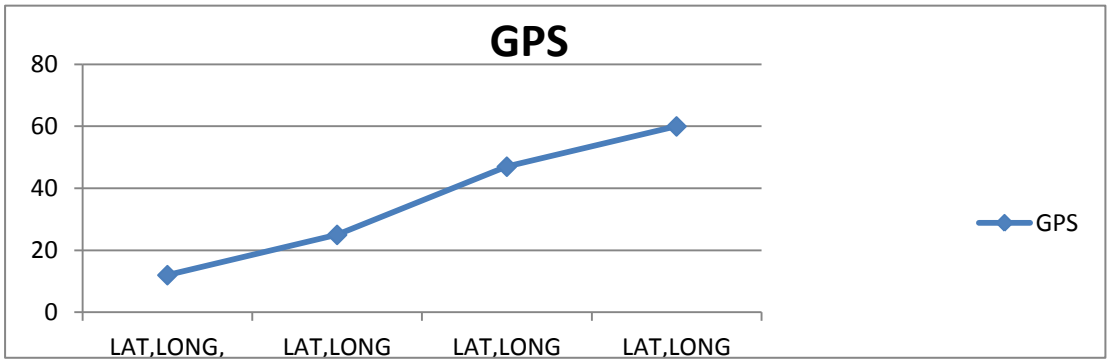


**Fig. II: GPS values at certain distances**

Gps guidance idea is the same as that of google chauffer. As the ultrasonics and ir sensor aids the navigation [2] [4] it could be an excellent guidance system for the visually impaired. Through

Other efficient sensors like PIR, laser scanner and controlling of the robot by brain signal instead of the control joystick the intelligence of the system can be improved.major issue in this work is power for the system and in future wireless transmission of power is considerd to step up the intelligence of the smart robo system.

## III. IMPLEMENTATION OF PROPOSED SYSTEM

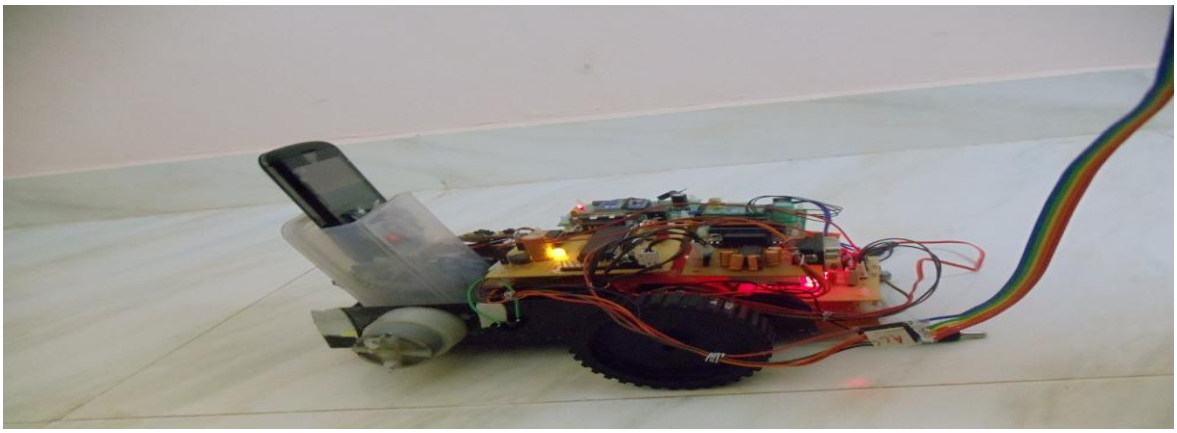

**Fig .III. : Vision based approach using smart phone**

The schematic diagram of proposed guide robot system can be seen in Fig. 1. It is built up on a mobile robot; the basic robot hardware for movement is RoboCar, designed by brain bitz electronics. Co., Ltd. It has the function to communicate with the laptop through zigbee, The "control rope" consists of a accelerometer joystick, and PIC board, a Zigbee serial adaptor ,one ultrasonic sensor, and one IR sensor.GPS module is installed to check the lat,long values for trial basis and later on this values could be recorded onto a data base for creating a global positioning map for the navigation purpose.and this idea is same as that of google car,but car is lot bigger than the robot therefor components used in this also small and hence affects the accuracy of the guide robo system .IR,GPs ultrasonic sensors' datas are transferred to the laptop via zigbee serial adapter.A little bit of artificial intelligence also implemented in the robo system for indoor navigation. camera in the system serves as an eye for blind and robot .it process the zebra crossing image and traffic light signal in real time.

Through the laptop the obstacle information and the final motion data will be transferred back to the motor controller LM293d IC.A 3 axis adxl 335 accelerometer is applied as a joystick The ultrasonic sensor chosen for this research is HC-SR04. It is capable to detect the obstacles between 2cm to 4m.here the value for detection is set for 10cm . The robot vision part consists of an SMART PHONE CAMERA which is locked into an upholder to prevent from the vibration during the movement. The smart phone can stream video to the laptop using WiFi. Video streaming in mat lab is possible with the IP WEBCAM application , it can stream video without lagging and this is very easy to connect .TABLE II shows the testing on different classes for a number of samples and obtained the efficiency for each .

**TABLE II**

| CLASSES | SAMPLES | DETECTED | MISSED | ACCURACY |
|---|---|---|---|---|
| CROSSWALKS | 15 | 10 | 5 | 66.6% |
| SIGNALS | 7 | 6 | 1 | 85.7% |
| OBSTACLES | 50 | 45 | 5 | 90% |
| NEGATIVE SAMPLES | 30 | 30 | 0 | 100% |
| TOTAL | 102 | 93 | 9 | 91.9% |

The following graph Fig. IV shows the testing results based on camera for 3 mega pixel and ultrasonic values. y axis represents the distance and x axis shows the increasing intensity and obstacle at various distance. Distance is in meters. camera detection is possible in .5 meter distance and ultrasonic sensing less than .1m distance. The range of ultrasonic sensor ranges from .1 meter to 4 meters. the red line indicates the camera detection in 1 meter to 3 meter distance .the detection is possible up to 5 meters because of the intensity of light. Ultrasonic sensor can detect the signal less than 10 centi-meter and for the project work it is tested and detection begins in the value of .06 meters

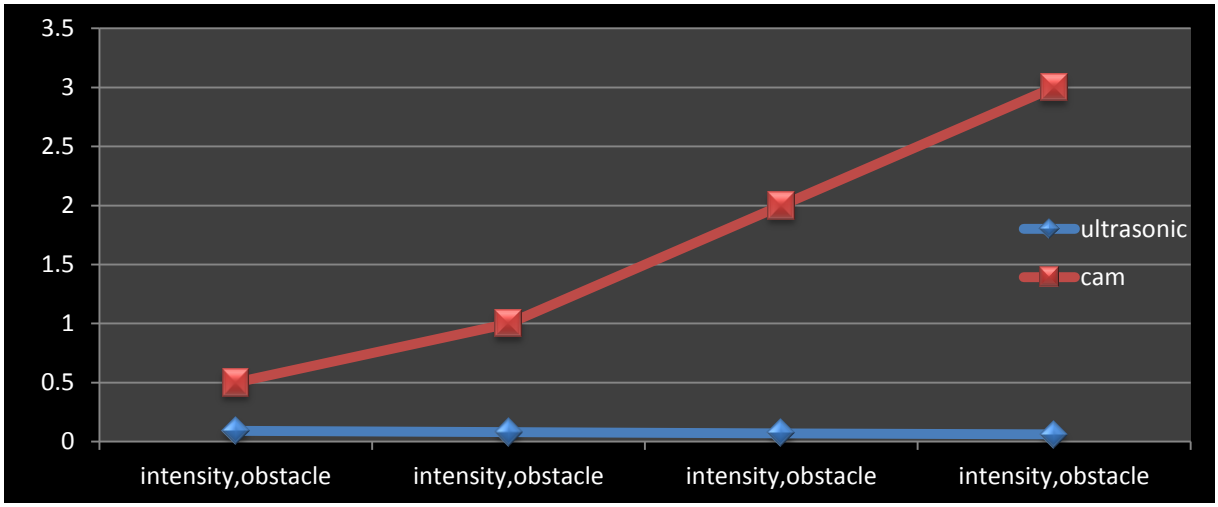


**Fig. IV: camera and ultrasonic values for distance and intensity**

## IV. CONCLUSION

Robotics have been a great help for the physically challenged persons in these days . researches are going on in the field for visually impaired people with huge investments .latest technology they used nowadays is the white cane which had an ultrasonic sensor of low hanging obstacles and likewise many systems are proposed to help the blind. my work here founds an alternative method to guide this people with the help of a small robotic system in which artificial intelligence and navigation based on sensors are implemented .camera vision helps in detecting the signal and crosswalks and inform the person which is not provided by the other systems .GPS implemented in the system finds the latitude and longitudinal values and in future this values if stored in a database could be used for the navigation like in google in chauffer. since we are using low cost sensors and modules and using MATLAB instead of OPEN CV it is very reliable for the people to use it .and errors could be fixed easily and if wanted they can edit the program for further modifications. Navigation using mobile and brain controlled system instead of manual control using joystick will be more helpful for the master. So we can expect brain controlled system, more sensors and new codes in MATLAB to enhance this intelligent system and will be readily available in the market within few years. Advantages of this system are used components are of low cost so and in bulk production and adding of few more sensors doesn't makes any difference and this instead of guide dog which are trained professionally cost four times higher than the robotic system.but the disadvantage is that sometimes response of the system is too slow so in real time high end DSP processors is recommended that can process much faster than current PIC16F877A.Detection of zebra crossing is one of the major problem out of 15 only 10 crosswalks are detected which shows an efficiency of 66% .as the intensity of light affects the vision this should be controlled using an new algorithm and a good camera.power supply is another major concern this battery powered system should be charged by witricity so that in future it could be a breakthrough for all automated system

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