Proceedings of the Fifth International Conference on Computing Methodologies and Communication (ICCMC 2021)
IEEE Xplore Part Number: CFP21K25-ART

Smart Alert and Intimation System for Vip (Visually Impaired Person)

V. Aarthi
Assistant Professor, Department of ECE
Velalar College of Engineering and Technology
Erode, India
aarthivellingiri@gmail.com

C.Sangeethaa Sre
Department of ECE
Velalar College of Engineering and Technology
Erode, India
sangeethaasre@gmail.com

M.Sumi Delfina
Department of ECE
Velalar College of Engineering and Technology
Erode, India
Sumidelfina159@gmail.com

G. Swarnamalya Arasi
Department of ECE
Velalar College of Engineering and Technology
Erode, India.
swarna1455@gmail.com

M. Tharan Kumar
Department of ECE
Velalar College of Engineering and Technology
Erode, India
tharankumarm7@gmail.com

2021 5th International Conference on Computing Methodologies and Communication (ICCMC) | 978-1-6654-0360-3/20/$31.00 ©2021 IEEE | DOI: 10.1109/ICCMC51019.2021.9418029

Abstract—**People with visual difficulties often rely on others and supporting technologies. Many aid devices are currently available, including assistive cane, Electronic Travel Aid (ETA), etc. There are several drawbacks to these devices, including high costs. Some use guide dogs that need several years of guidance and are therefore very expensive. Blind people do not find these devices easy and viable. The main aim of this paper is to provide blind people with low-cost, safe intimation devices. This system detects obstacles using ultrasonic sensors to avoid the barriers, and so this system produces a buzzer sound. If the blind person in a susceptible situation, the Global System for Mobile Communication (GSM) has been used to making an instant call, alerts their collective mates. Barriers on the route are detected with an ultrasonic sensor in the head (helmet). The user is indicated by a buzzer sound for the presence of obstacles. This work combined all the above functions and provided blind people with a low-cost portable warning and intimation module.**

Keywords—Helmet, Arduino, Sensor, GSM, Embedded System, Buzzer, Call alert.

I. INTRODUCTION

According to the survey, there are 285 million visually impaired people, 39 million blind, and 246 million who have poor vision. However, every year, the number of blind people above 60 increases by 2 million. As a result, more users are using navigation and orientation products. In their everyday lives, individuals who are blind or visually impaired need assistance. Outdoor navigation remains the most significant challenge for visually disabled individuals. They use assistive canes to clear obstacles, Electronic Traveling Aids (ETA), and guide dogs to navigate their way around, among other things, to solve this challenge.

There are many innovations present in today's existence, but their capacities are minimal. Smart canes can detect obstacles at the ground and middle level, but they cannot be used to detect the barriers at the head level, and they cannot be folded while they are not used. Guide dogs do not necessarily demonstrate the right path and must be qualified for more days to guide the blind. Electronic canes using laser technology are also available. But it has the drawback that it cannot sense barriers made up of glass and expensive. Other navigation systems are vision-based navigation systems that are implemented using image recognition techniques. Some of the vision-based navigation systems are VOICE, SVETA, etc. This technology requires a computer to make the installation of this navigation device cumbersome.

They are designing an obstacle mitigation approach to allow the device to work in a new environment while preventing collisions. The obstacle detection system detects and avoids obstacles in the route that will enable the vehicle to continue driving. This study proposes that these people worldwide be given an intelligent helmet to make their lives easier. This paper's fundamental goal is to use a long-range ultrasonic sensor to locate barriers in a broad range of fields. We use Arduino UNO as the central paper controller to carry out this operation. This theory can be applied in a helmet or cap fitted with this device to distinguish obstacles.

The paper's remaining sections have been ordered as follows: Section II gives a detailed literature review. The proposed system model has been explained in section III. Section IV provides the implementation of the proposed system. Section V depicts the results obtained by the proposed model.

II. LITERATURE REVIEW

Obstacle detection with adaptive control coupled has been designing and developed by M.G Plessen, D. Bernardi, H. Bemporad. This integral, autonomous driving control solution includes a corridor travel planner that defines vehicle location restrictions and a linear model analytical controller that incorporates trajectory scheduling and monitoring into a path coordinate system. The method is demonstrated by monitoring the road's curved road profile without obstruction, an adaptive cruise monitoring device (ACC) with obstructiveness prevention (OA) coupled with implementation and a standard road maneuver. The transfer rules are addressed for four diverse driving methods, i.e. ACC, OA, obstacle-free trailing and controlled braking. In test cases, including static and moving roads with stationary and moving obstacles, the proposed solution is tested [1]. Of all airborne vehicles, multirotor are fundamental tools in many cases, e.g. audiovisual recording, entertainment, pre-or after-disaster ecological surveillance. The probability of a prearranged route while circumventing hindrances is significant in the context of environmental monitoring. In this work, we propose a new way of describing pathways in the presence of obstacles that defines the bend as the crossroads between two exteriors. The proposer provides a system for manipulating the behaviours of multicopters, based on the path description and a cascaded construction and employing a non-linear regulating method for mutually controlled loops (place and attitude). The technique is seen to create a protected path with barriers seen in practical cases and to prevent impacts. These procedures are integrated into a software suite to monitor the journey of a wholly independent, two on-board camera-friendly AscTec firefly hexacopters designed and given in [2].

Unlike linear systems approaches, the ideal control of non-linear schemes cannot be carried out. The SDRE method is one of the essential points of view of optimal control of non-linear systems. This approach creates an adequate and stable function in several non-linear systems in addition to stability. SDRE is expanded to provide optimal LQR linear control, which is non-linear. The Strategic Riccati equation was introduced in the last decade by SDRE state dependent. In recent years there has been much attention devoted to monitoring the multiple link robot road. The robot controls many links have a hybrid system with a high non-linear material; connections and dynamic behaviour differ with time. It is expected to achieve good efficiency.

After this study, the connecting robot's tracking control by the state dependent Riccati equation (SDRE) is improved compared to the LQR process. The two links tracking control robot has been designed by S.M.H Rostami, M.Ghazaani[3]. Elimination of collisions is one of the critical issues in the design of a UAV system. It ensures that any UAV achieves its aim without any moving or static obstacles. Research on collision prevention algorithms has become a hot topic with UAVs' increased use in many operation fields. Several approaches have been identified for collision avoidance. This paper builds a 3D collision preventive on multi-UAV systems based on the original 3D obstacle process[4]. The article proposes a new LED device for low-cost infrasound applications that allows an indoor mobile robot to auto-locate. It is developed by Wang. J, Takahashi.Y. Only low-cost IR LED emitters, each with a photoset on the ceiling and a low-cost IR receiver on the mobile detection robot, is used in the proposed equipment.

The IR LEDs are used as active points of reference, operated by an on-off key module with different frequencies. Based on the signals emitted from IR LED, the mobile robot is localized. Although it would be ideal for giving each issuer a single ID, the inadequate frequency availability and individual microcontrollers' manufacturing rate would make it difficult to realize this. The system was evaluated in natural environments, and the validity and precision of the system and process are demonstrated by the experimental results [5]. Vision systems are a significant component of mobile robots' operation. By integrating the camera images of two cameras, we suggested an overview method with a broad view. This paper outlines our teleoperation vision system's features, and we include our system's attachment devices. The devices proposed are used to visualize the robot operator's likelihood of collisions. To test our vision system and the instruments, we have carried out two tests, and it was created and built by Sudha. R [6].

The Global System for Mobile Communications-focused on General Packet Radio Service (GPRS) has built a comprehensive system in front of Europe to keep up with the train's swift growth and encounter the great plea for communications commerce in China. But GPRS's currently using TCP/IP data communication mode has some drawbacks, including poor mobility, lack of protection, etc. That is why some GSM-R issues, such as the switch, make the quality of communication unwanted. The simulation results show that NDN-GSM-R performs better in the high-speed mobile communications environment and can make up for the loss of the current GSM-R based on the TCP/IP model proposed in [7].

As a result of the steady improvements in data quality and security and a decline in the related costs, wireless communication is expanding rapidly across almost all information technology sectors. This enables relatively cheap mobile unit (robotic) teams to collaborate to attain a mutual objective. It is highly desirable to provide real-time communication between team units to ensure consistent actions in the applications where robots are autonomous in unstructured environments. Finally, the feasibility of the methods suggested is demonstrated by various simulation findings, and this paper was developed and designed by Facchinetti, T., Buttazzo, G., & Almeida, L. [8].

The discovery of an actual robot location is a requirement for steering a mechanical structure. The researchers suggest that challenging simulations be carried out using a mobile phone as a robotic core. Simultaneously, a built-in microcontroller processes primitive sensor such as ultrasound and trace sensors inside the robot itself. A smartphone is wirelessly linked to a robot through Bluetooth to provide statistics on a robot's distance to a smartphone in its architecture. Lim, Jongil; Lee, Seokju; Tewold, Girma; Kwon, Jaerock. [9], provided the obstacle prevention relying on the static ultrasonic wave sensor if the intellectual cars fault with low sensitivity, sluggish performance and common obstacle avoidance. By analyzing and filtering the sampled data, the best route can be identified, and a broad spectrum of autonomous obstacle avoidance can be attained. The experimental results indicate that the device built can increase the independent preventing rate of success efficiently in pace, sensitivity and impediment [10].

The study made in [11] aimed to detect parking space area, projection of driver parking, perfect roadway parking and backward parking, and an ultrasound sensor on an intelligent SWMR mobile robot. The process included the work of the required car park, the identification of nearby obstacles, a parking path planning, the development of PWM signals for the driving of servo-engines and completion of steering controls to parking by car on the lane. The SWMR will automatically control the two-wheeled service engines, switch around, go ahead, reverse, and stop until the car's location is well in the target parking area when the ultrasonic sensors detect a sufficient number of parking spaces.

This paper proposes a microcontroller-based smart helmet system with GSM, moving a UV sensor in 360 degrees. This system is most efficient for the visually impaired person. The work used Arduino UNO and an ultrasonic sensor to detect the obstacles, and the motor rotates the sensor. This project is helpful for disabled persons.

III. PROPOSED SYSTEM

The device suggested is explicitly intended for those with a visible impairment who feel the object going forward as they move and warn the individual with visual impairments with a buzzer. This new scheme's key feature is that it would liberate the visually disabled person from the cane, making them the representation of visually impaired people. The method suggested is a low-cost, sustainable system for visual impairments. There are two aspects of the recommended approach: detecting the surrounding object with an ultrasonic sensor to alert the blind person. The second part is making the instant call if a blind person is in dangerous situations.

Table 1 compares the general characteristics of IR and Ultrasonic sensors. An ultrasonic sensor is used in the proposed methodology. The theory is based on reflected sound waves. Just one sensor is used to sense the target at 360 °. As compared to an IR sensor, the accuracy is also higher. It is ideal for both indoor and outdoor use. We get a higher degree of reliability than with an IR sensor. This device uses the sensor to identify the objects in its way intelligently. It is primarily powered by a central Processing Unit comprising of Arduino UNO. This open-source platform enables simple programming and comes at a low cost as compared to PIC. PIC receives sensor information on optical range and provides output as coded and sends output through the bus power supply to the centralized controller, allocating power to a variety of parts where the sensor is positioned on a servo engine rotating at 360°.

Here, we use GSM technology to send a call warning to closer colleagues, informing them of their dangerous situation. A wireless modem, which operates on a GSM wireless network, consists of a GSM modem. Like that of a dial-up modem, a cellular modem works. The most significant distinction is that a dial-up modem collects data from a fixed phone line while a modem sends and receives data over radio waves, such as a GSM cell phone. A GSM modem has a slot for a SIM card that requires a SIM card. GSM is finally connected to the central unit to operate the robot. For example, whenever a blind person is locked in a burial site and unable to move, the ultrasonic sensor will sense its objects. The buzzer would begin to sound for 10 seconds. A GSM call would be made to a mutual friend to assist them. As a result, they will be able to resolve any potentially dangerous circumstances. All the elements are attached with a jumper wire to the central device, and power is supplied via USB cable to the primary device. Fig. 1 shows the intelligent alert system for VIP.

TABLE 1: GENERAL CHARACTERISTICS OF SENSORS

Parameters	Infrared Sensor	Ultrasonic Sensor
Principle	Emits the light to sense the objects in the surroundings	Emits the sound pulses when they hit an object and reflect as echo signals
Range	From 20 cm - 150 cm	From 3cm – 10m
Beamwidth	Fairly thin	Wide
Environment	Affected	Not affected
Cost	Comparatively high	Low
Accuracy	Low	Comparatively high

Detection with an ultrasonic sensor is grounded on two features:

- Time of Flight (TOF): the amount of delay between the emission of a signal and the arrival of an echo, depending on the distance of the barrier directly proportional to space.
- The beam's size: The blockage depends significantly on the reflected volume of the wave. All radio signals will be reflected in the receiver, obstacles with dimensions more significant than the beam's height. When the barrier size is minimal compared to the beam size, the acoustic wave is mirrored in the recipient, and the remaining is lost.

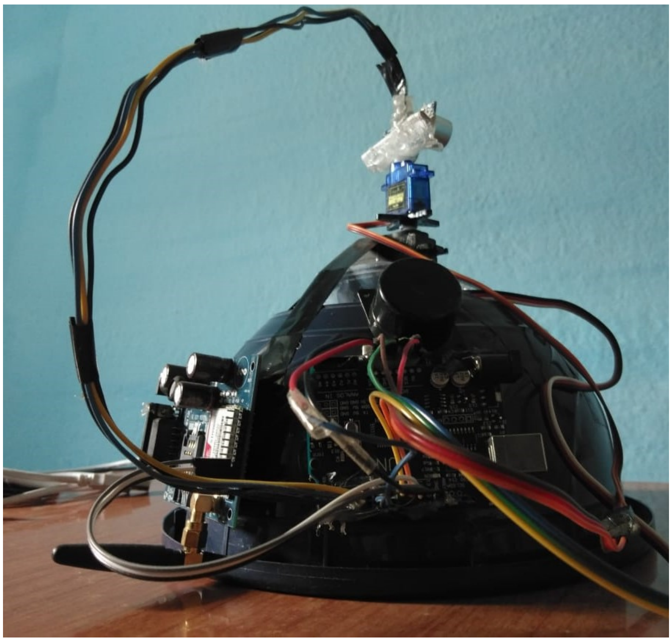
•


Fig. 1: Smart Alert System for VIP

Fig. 2 describes the process methodology. Arduino UNO receives the input results. In the Arduino UNO module, commands are pre-installed to automate input object detection. The instructions were processed and sent to the GSM module and buzzer. The buzzer will intimate them with a sound, as shown below.

Then the GSM module will generate an instant call and its features have been shown in Table II. The ultrasonic sensor and buzzer are fixed in the Arduino to avoid the obstacle clash. The Arduino UNO will send the data to the GSM module. Based on the instructions, the GSM will make a call. A 5V power supply is used to power the Arduino, and a 12V power supply is used to control the GSM.

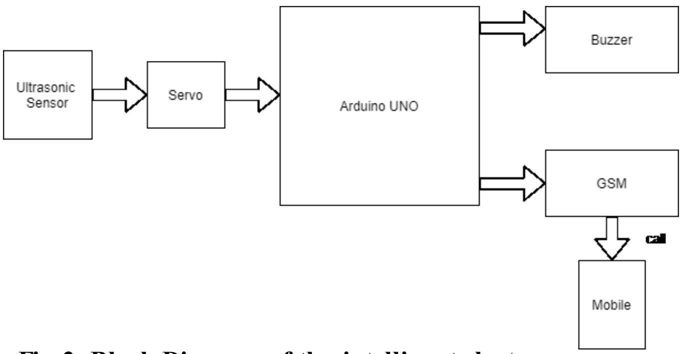


Fig 2: Block Diagram of the intelligent alert system

TABLE II: FEATURES OF GSM MODULE SIM900A

Particular	Features
Voltage	5V – 12V DC
Power saving mode	1.5mA (sleep mode)
Frequency	850MHZ/1900MHZ
Power supply	9 – 12V DC.
Baud rate	9600 – 115200 bps

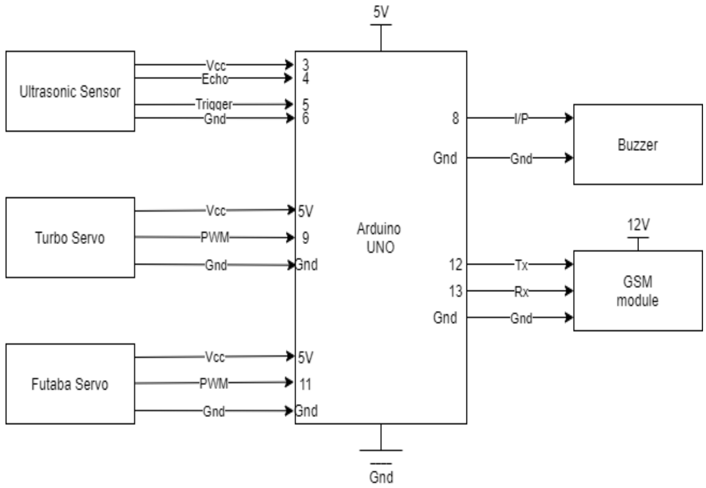


Fig 3 displays the circuit diagram of the intelligent alert system.

Fig 3: Circuit Diagram of the intelligent alert system

IV. IMPLEMENTATION

A blind helmet was designed with an intelligent warning system that follows the course of widely understood rotations. The sensor performs its sensing role after four independent rotations.

A. Tasks performed by the helmet

Fig. 4 shows the rotational views of the helmet.

1. This module covers a distance of about 5 – 10cm i.e. it senses the obstacles between 5 to 10cm.
2. Only one Ultrasonic sensor is used for 360-degree obstacle detection.
3. GSM module makes an instant call alert to their closest colleagues to intimate them with about their risky situation.

This system is primarily for people with visual impairments who notice the object moving towards them while walking; it warns them with a buzzer sound. One part of the proposed system senses the surrounding object and alerts the blind person with an ultrasonic sensor and the second part makes a quick call if they are at risk. In the suggested technique, an ultrasonic sensor is used. The principle is based on reflected sound waves. Just one sensor has been used for 360° to detect the target. The precision is also higher as compared to an IR sensor. It is optimal for indoor and outdoor applications and gets more reliable than with an IR sensor. The Arduino UNO controls this system. This open-source platform allows simple programming at a low price compared to PIC. This takes data from the sensor about the optical distance and handles the data conferring to the coding. Here, we use GSM technology to send call warnings to closer colleagues to tell them about a blind person's risky position. The GSM module has a modem that operates with a wireless network of GSM. Like that of a dial-up modem, a cellular modem works. The most significant distinction is that a dial-up modem collects data from a fixed phone line while a modem sends and receives data over radio waves, such as a GSM cell phone. Finally, GSM is attached to the helmet's central device.

For instance, when a blind person is trapped in a burial pit and cannot move, the ultrasound sensor detects the objects around the chamber, the buzzer begins to sound for 10 seconds, and then a GSM is called to a mutual friend to help it. In this way, they can overcome possible risky situations. All components are connected by jumper wiring to the central unit, and a USB cable provides power to the central unit.

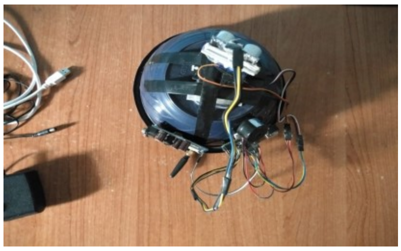
There are many innovations present in today's existence, but their capacities are minimal. This study proposes that blind people worldwide be given an intelligent helmet to make their lives easier. This project's fundamental goal is to use a long-range ultrasonic sensor to locate barriers in a broad range of fields. We use Arduino UNO as the central project controller to carry out this operation. This theory can be applied in a helmet or cap fitted with this device to distinguish obstacles. The pros and cons of the main components used in the work have been summarized in Table III.

However, this design can be applied to this design for different functions with little or no human interference, such as adding GPS to give a colleague the exact location. The helmet was eventually controlled with an Arduino UNO controller. Not only blind people but mining would profit from this initiative.

TABLE III: PROS & CONS OF MAIN COMPONENTS

Components	Pros	Cons
Ultrasonic sensor	It helps in identifying the obstacles around us	Used only for shorter range
GSM Module	Gives call/message alert to the registered number	No guarantee about the network
Buzzer	Provides an alert to the VIP by making a beep sound	Voice control is absent
Arduino UNO	• Open-source • Low power consumption • Portable	• Limited power processing • No data storage
Servo SG90	A heavy load can be placed, which will increase the current	The motor can be damaged at any cause
Futaba s3003		

This paper proposes a microcontroller-based innovative helmet system with GSM, moving a UV sensor in 360 degrees. This system is most efficient for the visually impaired person. In this paper, an Arduino UNO and an ultrasonic sensor are used to detect the obstacles, and the servo motor is used to rotate the sensor. And one more sensor Futaba, is used for turning the sensor 360 degrees. This work is helpful for disabled persons, particularly VIP. The rotations made by the ultrasonic sensor to detect the objects around the environment are as follows:

VIEWS	VISUAL MOVEMENT
TOP VIEW	
SENSOR AT 0 degree ROTATION	
SENSOR AT 90degree ROTATION	

SENSOR AT 180degree ROTATION	
SENSOR AT 360degree ROTATION	

Fig 4: Rotational views of the proposed model for VIP

V. CONCLUSION

This paper implemented the Simple, Economic Smart Alert and Intimation System for Individuals with Visual Disability. Ultrasonic sensors have been used to identify obstacles along the VIP course. There was a degree of accuracy and a negligible probability of loss. The servo engine is used for the movement of the ultrasonic sensor with the Arduino microcontroller's aid. It can be demonstrated by using the ultrasonic sensor to feel the cap. Several factors have calculated the accuracy of the helmet that we developed. This is because the helmet was tested at the eco stag. After all, the test area was crowded, or the form and shape of the obstacle were comparatively less crowded. The robot's exactness depends on the sensors used in the same way, and the precision of our helmet determines the precise nature of the sensor. Although the optimizing mechanism's evaluation Since there is an automated call facility in this article, there must be a daily review of the available balance operation. In the case of zero equilibrium, no call warning will be sent to their close colleagues.

The GSM call alert can be added with some standard command voice call to the closest colleagues in the future. In this work, we introduced only an alert system, i.e. it just makes a call and can be improved in the future.

References

[1] M.G. Plessen, D. Bernardini, H. Esen, A. Bemporad, spatial based predictive control and geometric corridor planning for adaptive cruise control coupled with obstacle avoidance. IEEE trans. Control syst. Technol. PP (99), 1-13(2018). IEEE

[2] P.D.H. Nguyen, C.T. Recchiuto, A. Sgorbissa, Real time path generation and obstacle avoidance or multirotors a novel approach. J. Intell. Roobot. Syst. 89,27-49(2018).IEEE

[3] S.M.H. Rostami, M. Ghazaani, state dependent riccati equation tracking control for oa two link robot. J. Comput. Theor. Nanosci. 15, 1490-1494(2018).IEEE

[4] Tan, C.Y., Huang, S., Tan, K.K., Teo, S.H.R. : three dimensional cooperative collision avoidance design on unmanned aerial vehicle. In 2018 international conference on unmanned aircraft systems, pp. 522-530. Dallas(2018).

[5] Wang, J., & Takahashi, Y. (2018). Indoor mobile robot self-localization based on a low-cost light system with a novel emitter arrangement. ROBOMECH Journal, 5(1), 1-17 IEEE

[6] Suda, R. (2014). A vision system with wide field of view and collision alarms for teleoperation of mobile robots. Robomech Journal, 1(1), 1-17 IEEE

[7] Li, Z., Chen, Y., Shi, H., & Liu, K. (2016). NDN-GSM-R: a novel high-speed railway communication system via named data networking. EURASIP Journal on Wireless Communications and Networking, 2016(1), 1-5. IEEE

[8] Facchinetti, T., Buttazzo, G., & Almeida, L. (2005). Dynamic resource reservation and connectivity tracking to support real-time communication among mobile units. EURASIP Journal on Wireless Communications and Networking, 2005(5), 1-19. IEEE

[9] Lim, J., Lee, S., Tewolde, G., & Kwon, J. (2015, May). Indoor localization and navigation for a mobile robot equipped with rotating ultrasonic sensors using a smartphone as the robot's brain. In 2015 IEEE International Conference on Electro/Information Technology (EIT) (pp. 621-625). IEEE.

[10] Jin, Y., Li, S., Li, J., Sun, H., & Wu, Y. (2018, July). Design of an intelligent active obstacle avoidance car based on rotating ultrasonic sensors. In 2018 IEEE 8th Annual International Conference on CYBER Technology in Automation, Control, and Intelligent Systems (CYBER) (pp. 753-757). IEEE.

[11] Wu, T. F., Tsai, P. S., Hu, N. T., & Chen, J. Y. (2016, November). Research and implementation of auto parking system based on ultrasonic sensors. In 2016 International Conference on Advanced Materials for Science and Engineering (ICAMSE) (pp. 643-645). IEEE.

[12] Ahamed, A., Islam, N., Soikot, M. A. S., Hossen, M. S., Ahmed, R., & Hasan, M. A. (2019, November). Train collision avoidance using GPS and GSM module. In 2019 International Conference on Power Electronics, Control and Automation (ICPECA) (pp. 1-4). IEEE.

[13] Rajadurai, S., Nehru, P. P., & Selvarasu, R. (2015, March). Android mobile based home security and device control using GSM. In 2015 International Conference on Innovations in Information, Embedded and Communication Systems (ICIIECS) (pp. 1-5). IEEE.

[14] Nasution, T. H., Muchtar, M. A., Siregar, I., Andayani, U., Christian, E., & Sinulingga, E. P. (2017, April). Electrical appliances control prototype by using GSM module and Arduino. In 2017 4th International Conference on Industrial Engineering and Applications (ICIEA) (pp. 355-358). IEEE.

[15] Sonali, K. K., Dharmesh, H. S., & Nishant, M. R. (2010, December). Obstacle avoidance for a mobile exploration robot using a single ultrasonic range sensor. In INTERACT-2010 (pp. 8-11). IEEE.