

Women Safety Night Patrolling Robot

Dr.M.Sivachitra¹T.NaveenRaj²V.G.Rekhasri³N.Sowmiyaa⁴

¹Professor^{2,3,4}UG Student

^{1,2,3,4}Department of Electrical & Electronics Engineering

^{1,2,3,4}Kongu Engineering College, Perundurai, Tamil Nadu

Abstract – In these days women safety is the biggest issue in all parts of the world due to increased violence against them. Getting physically or mentally abused has become a part of their daily life. Workplace harassment and public place harassment are forcing them to quit their passion and dreams. Even though the government has enacted several laws against women harassment, the rate of women harassment has not reduced. There are only few preventive measurements to reduce the probability of women harassment. The best way to reduce the violence (robbery, sexual assault, domestic violence, etc) against them is being a moral support. So the Women Safety Patrolling Robot will be an attempt to ensure women safety. In existing systems, CCTV cameras are used which only records the events and hence it will not be a preventive measure for women safety whereas the proposed patrolling robot will be patrolling in its assigned area and will be checking for anonymous activities. Hence the night patrolling robot will be of greater use to the women community.

Keywords: women safety, Robot, patrolling

I. INTRODUCTION:

Robotics is a multidisciplinary discipline combining computer science and engineering. Robotics is the study of the design, development, function, and application of robots. Robotics aims to create robots that can support and aid humans. Robotics is the study of creating robots that can take the place of humans and mimic their behaviour. Robots may be used in a variety of circumstances and for a variety of purposes, but many are now used in hazardous environments (such as inspection of toxic products, bomb detection and deactivation), manufacturing processes, or in situations where humans cannot survive (e.g. space, underwater, in extreme heat, and clean-up and contingency operations) [8-11].

Since the world faces serious issues regarding women safety it is inevitable to constitute our work towards it. Now a days robots have been used in various fields which also includes safety and defense. The Women Safety Night Patrolling is such an attempt to make use of the robots for enhancing women safety. It will be a great step towards the rise of automation and safety.

Women safety night patrolling robot makes the best use of its features in order to work without any problem. It has sound sensing ability, obstacle sensing ability and has IoT features in order to show what it senses with the help of cameras, GPS module and Bluetooth module. All its features are properly coordinated with the help of a microcontroller.

In this paper, Section II discusses about the details of the existing system, Section III discusses about the proposed system and the conclusion of this paper is discussed in Section IV.

II. LITERATURE REVIEW:

A Surveillance System using Internet protocol of Raspberry Pi was implemented by [1] in which the
<http://annalsofrscb.ro>

Raspberry Pi and internet protocol are used to build a surveillance device with a spy robot. It discusses different approaches to border surveillance. Border armies must patrol the border area with caution, but even with extreme caution, it is impossible to find all minor accidents in the middle of the night. As a consequence, a device that can detect activity in this area and send a message to the nearby security control unit is required. They build a spy robot with the Raspberry pi operating system and a remote monitoring and control algorithm in this system. The spy robot device is made up of three components: a Raspberry Pi module, a night vision camera, and a sensor. The system requires raspberry pi for operating which is comparatively expensive. It will be affordable for all people if the process control is made possible by using low cost microcontrollers.

A Mobile Robot using GPS with place recognition system was implemented by [2]. A survey of a mobile robot with GPS observations is suggested in this paper. When it comes to the robot's monitoring, GPS technology is crucial. The system can further be improved to provide outputs of high accuracy and stability.

A road night based on a planar reflection model was made by [3]. It has produced various road detection ideas as well as various monitoring concepts. Road and street surveillance is critical for a variety of tasks, including pedestrian identification, suspicious activity detection, and soon. This approach categorizes the road's picture pixels. The system efficiency can be further improved by providing obstacle sensing ability and GPS module to share its location.

A night rider: visual odometry using headlights was implemented by [4]. For a mobile robotic device, this technology uses a series of camera images to estimate relative motion. A camera can be used to capture vast quantities of data and is a relatively inexpensive sensor, making it an ideal choice for use in mobile robots. The system can be supported with solar cells to reduce its dependency on external power source. The image size and efficiency of face recognition of the system must be improved.

Research on sound source localization and real-time facial expression recognition for security robot [5] lead to the development of a security robot with abilities of sound source localization and real time facial expression recognition. The real time facial expression recognition is made possible with the help of image acquiring devices and deep data processing capabilities.

Arduino-controlled war field spy robot with a night vision wireless camera and an Android application was developed by [6][13][14]. The main goal of creating this robot is to track human activities in war zones or border regions in order to minimize enemy infiltration. The robot is equipped with a night vision wireless camera that can relay images of the battleground in order to avoid human casualties. The range of distance of the system might be increased to improve its efficiency.

A paper on IOT based smart multi-application surveillance robot was published by [7][11][12]. The primary aim of this paper is to design and build a surveillance robot capable of reducing wartime casualties. Until the intruder is attacked by the soldiers, the robot functions as a surveillance robot, capturing the intruder's surrounding details. The system can be further developed to provide alert messages.

Hence the proposed system is designed such that it overcomes a few of the above mentioned drawbacks.

III. PROPOSED METHODOLOGY:

The main objective of the system is to involve in night patrolling in assigned area and to function with least

human intervention with the help of its features. Since it need to move without colliding with objects in its path while moving towards the sound source it is provided with ultrasonic sensor for obstacle sensing. It has four different microphones placed facing towards four directions in order to find the direction of the source of sound. The signal obtained from the sound sensor is processed and given to microcontroller. Depending on the microphone which received the sound, patrolling robot detects the direction of the sound and moves towards the sound. The robot has GPS module which has to be interfaced with the device of user (smart phone or laptop) in order to know its location and to live stream the video it captures with the help of cameras. It also has Bluetooth module which has to be interfaced with user device in order to monitor the robot's movements. While interfacing the robot with user device IoT has done its vital role. The flowchart for the paper is shown in the Fig 1

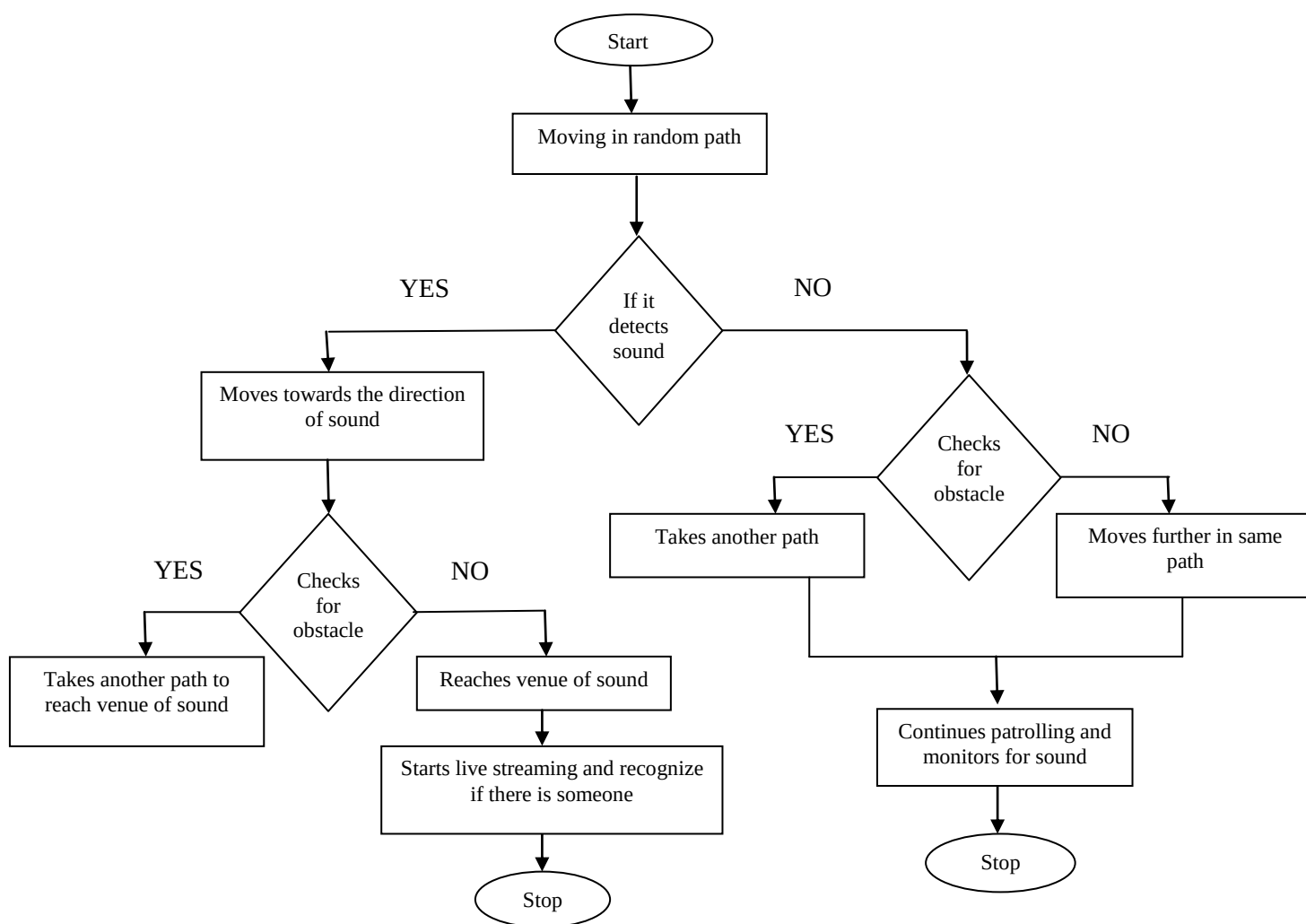


Fig 1. Flow chart of Women safety night patrolling robot

This system has a 12V battery which acts as power source for operating it. Microcontroller(ATMEGA 328p) and camera are connected with battery with the help of voltage regulators whereas motors are connected with battery with the help of relays. Ultrasonic sensor and sound sensor are connected directly to the microcontroller. The block diagram for the paper is shown in the Fig2

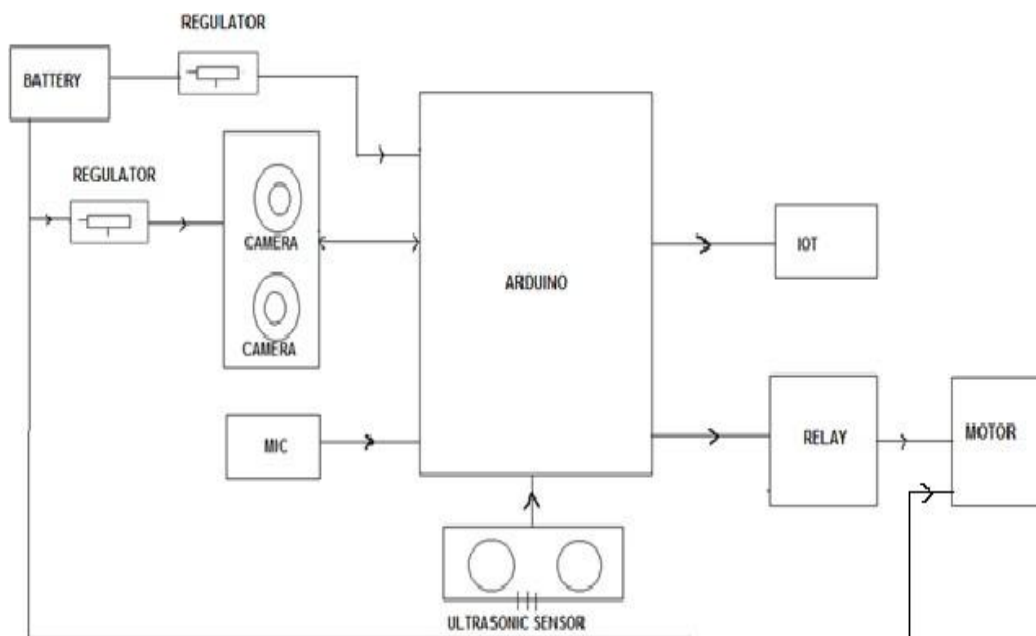


Fig2. Block Diagram of Women safety night patrolling robot

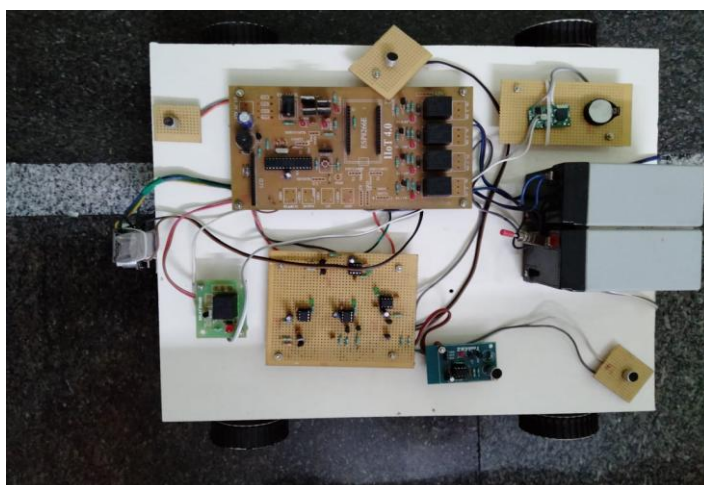


Fig3. Top view of Women safety night patrolling robot

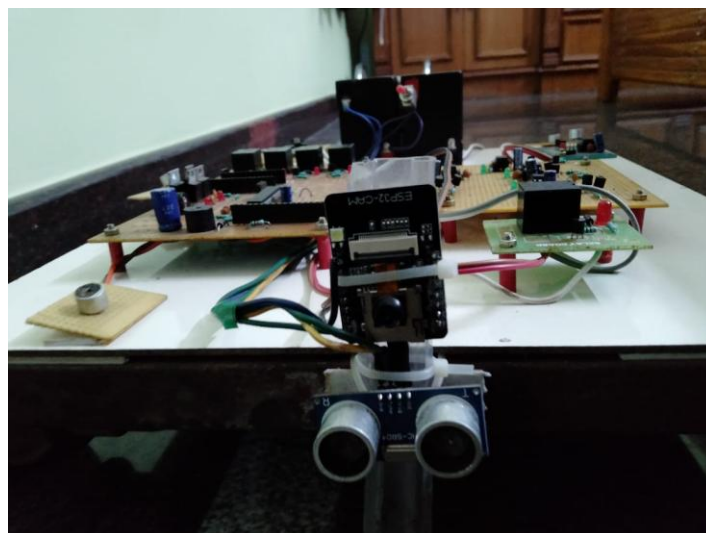


Fig4. Front view of Women safety night patrolling robot

Top view and front view of the women safety night patrolling robot are shown in figure 3 and figure 4 respectively. The system consists of four relays to control the movement of the four wheels of the robot so that it can turn easily to the desired direction. Ultrasonic sensor is fixed at the front side of the robot to detect the obstacles in its moving path and four sound sensors are placed along the four different sides of the robot.

PROCESS EVOLUTION:

1. The robot will be patrolling in the assigned area and will be checking for the sound.
2. Once it senses sound it will be processed and sent to the microcontroller.
3. The Women safety night patrolling robot has four microphones which are placed such that they face towards four different directions (east, west, north and south). Depending upon the sound sensor which sensed the sound the direction of source of the sound will be detected.
4. If a sound is detected by microphones in the robot, the sound received by all four microphones will be processed and compared to find which microphone has received maximum sound. So that microcontroller can decide the actual direction of the sound source i.e., the microphone which received maximum sound.
5. For example if the robot receives a sound from east direction the sound sensed by microphone facing east direction will be higher when compared with the sound sensed by microphones facing other three directions (west, north and south).
6. After deciding the direction of the sound the microcontroller will order the robot to move towards that direction.
7. While moving, the robot will check for obstacles, once it detects the obstacle, the robot will take another path to reach the venue of the sound.
8. The robot will check for the obstacle even while moving in random fashion.
9. Once the robot senses the sound it will send the alert

message to the device interfaced with the robot so that user can check whether there are any anonymous activities by watching the live video streamed by your robot.

10. It can highlight the human faces if there are someone.
11. If the user senses something anonymous he/she can find the robot's current location in the area where the robot is patrolling.
12. The result is depicted in fig 5, fig 6, fig 7 and fig 8.

Output of the system can be verified in two ways:

- (i) While the system moving in random fashion.
- (ii) While the system senses sound or obstacles.

(i) The output of the system while it is moving in random fashion has been discussed below. To obtain the output we require two software applications named i-searching app and Bluetooth electronics app to be installed in the user device so that the system can be easily interfaced with user device. The figure 5 shows the snapshot of the live stream shown via i-searching app which is captured by the system.



Fig5. Output 1-Snapshot of the livestream

Figure 6 shows the output obtained while the system was moving in random fashion via Bluetooth electronics app, it contains the path information about the movement of the Women safety night patrolling robot. The RIGHT 2 and LEFT 4 indicate that the robot has taken right direction two times and left direction 4 times during patrolling. NO SOUND DETECT in the output indicates that there are no sound disturbances in the

patrolling area

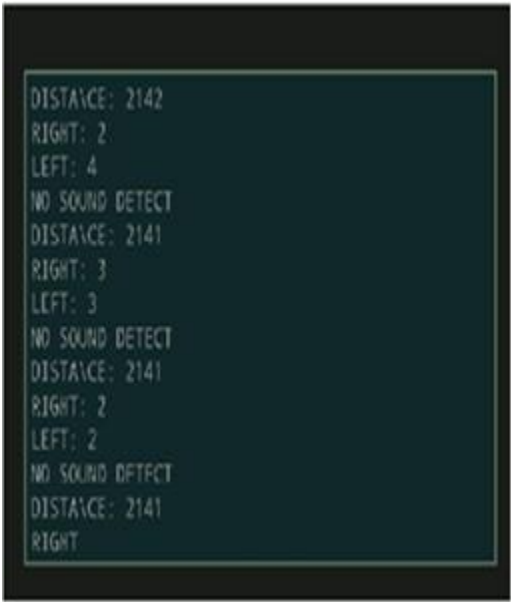


Fig6. Output 2-Movement/Location details of patrolling robot moving in random fashion

(ii)The output of the system while it is moving after detecting the sound or obstacle has been discussed below. The following figure 7 shows the snapshot of the live stream shown via i-searching app which is captured by the system.

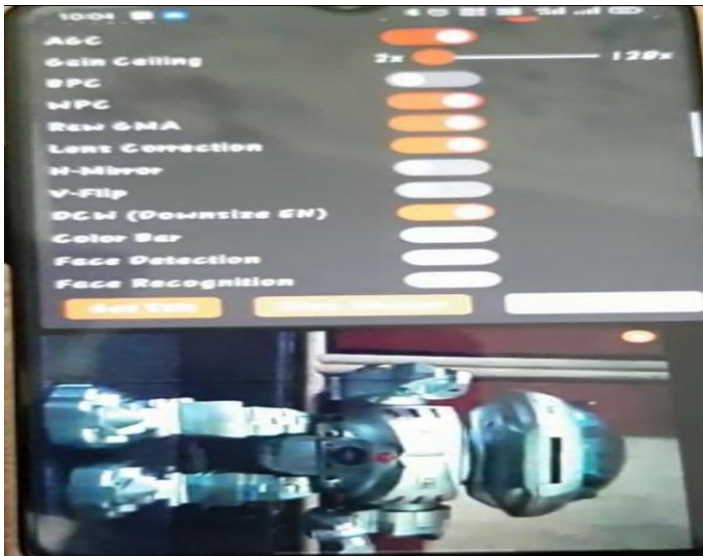


Fig7.Output 3-Live stream of patrolling robot moving after detecting sound

Figure 8 shows the output obtained while the system was moving after detecting sound via Bluetooth electronics app, it contains the robot path information about the movement of the Women safety night patrolling robot. Here SOUND DETECTED term in the output display indicates that the robot has detected a sound in the patrolling area. Moreover, the sound has been detected when the robot has already taken the third time RIGHT direction and second time LEFT direction in its patrolling area.

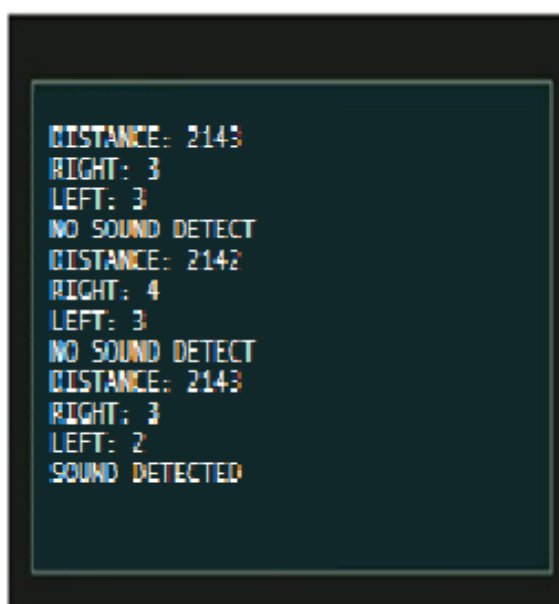


Fig8. Final output –android phone display after sound detection

IV.CONCLUSION:

Nowadays, women safety is the biggest issue in all parts of the world due to increased violence against them. The existing system either lags one of these features or require high end microcontrollers such as Raspberry Pi for its proper operation. Hence, the proposed women safety night patrolling robot makes the best use of its features such as sound sensors, ultrasonic sensors, ESP cameras and IoT in order to patrol in its assigned area with least human intervention.

V.FUTURESCOPE:

- This system can be further improved into a full-fledged security robot to reduce human work.
- The system can be provided having 360° coverage along with high end components with higher extend its operation and to increase its efficiency.
- The system can be provided with additional microphones facing more directions for better detection of direction of source of the sound.

REFERENCE:

1. J. Ghanem Osman Elhaj Abdalla ,:‘Implementation of Spy Robot for A Surveillance System usingInternet protocol of Raspberry Pi’, published in 2017 International conference on recent trends inElectronicsinformation andcommunication technology.
2. Takato Saito and Yoji Kuroda:‘Mobile robot localization using multiple observations based onplacerecognitionandGPS’,publishedinIEEEInternationalConferenceonRoboticsandAutomationRoad detectionat nightbased onaplanar reflection modelin2013.
3. Cheng Tang, QunqunXie, Guolai Jiang, YongshengOu,: ‘Road detection at night based on a planarreflection model’, published in IEEE International Conference on Information and Automation(ICIA) in 2013.
4. Kirk Mac Tavish, Michael Paton, and Timothy D. Barfoot,: ‘Night Rider: Visual Odometry UsingHeadlights’published in14th ConferenceonComputerand RobotVisionin2017
5. Zhonghuna Han and Tingting Li,: ‘ Research Sound Source Localization and Real-Time FacialExpressionRecognitionforSecurityRobot’,publishedinJournal ofPhysical Conferencein2020
6. Jignesh Patroliya, Haard Mehta, and Hitesh Patel,: ‘Arduino controlled war field spy robot usingnightvisionwirelesscameraandAndroidapplication’,publishedinNirmalaUniversityInternational ConferenceonEngineeringin 2015
7. Aishwarya K and Baswaraj Gadgay,: ‘IOT Based Smart Multi Application Surveillance Robot’,published in 2ndInternational ConferenceonInventive ResearchinComputingApplicationsin 2015
8. Dilliraj.E,Rekha.s,SinduPriya.N.R,Vedhavalli.A.,:‘RFcontrolledWarfieldspyrobot’,published in InternationalJournalofAdvancedResearchinElectrical,ElectronicsandInstrumentationEngineering;Volume 8, Issue 3.
9. Eun Som Joen et al.,: ‘Human detection based on the generation of a background image by using farinfraredlightcamera’,Sensors,vol.15,no.3.
10. Dushyant Kumar Singh, Dharmender Singh Kushwaha,: ‘Automatic intruder combat system : Awayto smartboard surviellence’,published in DefenceScienceJournal, vol.67,no1.
11. Dushyant Kumar Singh ,: ‘Review of Human detection techniques in night vision’,published in 2017 International Conference onWirelessCommunications,SignalProcessingandNetworking.
- [12]Punithavathani, D. Shalini, K. Sujatha, and J. Mark Jain. "Surveillance of anomaly and misuse in critical networks to counter insider threats using computational intelligence." Cluster Computing 18.1 (2015): 435-451.
- [13]Sujatha, K., and D. Shalini Punithavathani. "Optimized ensemble decision-based multi-focus imagefusion using binary genetic Grey-Wolf optimizer in camera sensor networks." Multimedia Tools and Applications 77.2 (2018): 1735-1759.
- [14]Chang, Jinping, Seifedine Nimer Kadry, and Sujatha Krishnamoorthy. "Review and synthesis of Big Data analytics and computing for smart sustainable cities." IET Intelligent Transport Systems (2020).
- [15]Song, Hesheng, and Carlos Enrique Montenegro-Marin. "Secure prediction and assessment of sports injuries using deep learning based convolutional neural network." Journal of Ambient Intelligence and Humanized Computing 12.3 (2021): 3399-3410.