Border Security Intrusion Detection Using IOT And Embedded Systems

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Abstract- *Border areas in some parts of the world are considered to be volatile and highly dangerous where great deal of illegal activities take place, which can cause loss of life and properties .This paper aims to introduce the current scenario and challenges in border security and survey different papers on border security intrusion detection system to overcome it.*

Keywords - Raspberry pi, ESP8266 module, Shock activators, Pi camera, Buzzer, Stepper motor, PIR sensor.

I. INTRODUCTION

Providing security across the borders 24/7 in the harsh and unsuitable environments can be a tedious task for any country's security forces. Further factors like human errors can also add to the inefficient patrolling of the border. To curb or reduce these above factors we are implementing this system which employs sensors and cameras for monitoring the border thoroughly.

Proposed system in this paper is designed to achieve following features:

The PIR sensor in the system is used to detect the motion of the humans within certain range of border which captures and sends the signals to control room via ESP8266 wifi module wirelessly. IR camera uses infrared sensor to capture the motion of the trespassers during day time. IR camera which is a captures images which is connected using Raspberry pi. Shock activators are installed on the border fence which is used to provide shock sense to the intruder if he attempts to cross the fence. The shock activators are connected wirelessly through ESP8266 module. There is a motor controlled laser gun to target the intruders depending upon the prevailing situation. The laser gun is controlled by a stepper motor which is inturn controlled by a motor hat. Buzzer is controlled through ESP88266 wifi module which is used to alarm the intruder if he trespasses.

II. LITERATURE SURVEY

[1] The author proposed a clever fringe security interruption location framework utilizing IOT and inserted frameworks, which utilizes a gathering of sensors, a lepton camera, this information is transmitted through LAN link to the control station. The control station at that point sends directions to the firearm constrained by the engines associated remotely to the controller. The firearm moves towards the target, when the target is distinguished, it requests the consent to the control room utilizing the node red programming which uses MQTT protocol to connect with the raspberry pi controller, node red software is available in the library of the raspberry pi programming software. This product is additionally used to control the shock activator, which is associated remotely to the controller. Until the consent is given by the control room administrator using the node red software to electrify the entryways.

[2] In the proposed arrangement of astute security framework for protection, huge number of heterogeneous gadgets are utilized which incorporates cameras ,sensors and portable stations .Here the strategy utilized for recognition is by getting the sign at simple to advanced converter stick in the arduino board. The IR sensors are put in static situation along the outskirt. Utilizing data from sensor hubs, moving way, normal speed and course development of a gatecrasher is predicted.

[3] In the automated border security system the security system GSM interface is used to inform the authorized person A passive IR sensor is used to detect the human movements within a vicinity of 20 feet these sensors use the concept of black body radiation .Thermal imaging camera is used to detect human movements at night and transmit signal to nearest receiver station. This paper has a drawback of utilizing GSM, as getting the system inclusion close to the borders is troublesome.

[4] This paper deals with the raspberry pi as the central system with its input being PIR sensor, IR sensor, camera and its output being the buzzer, motor controlled laser gun, stepper motor controlled gun. The camera module is placed on the robot, which might be a web camera, this camera module will

transmit the video coverage of the path and this path will be taken by the rescue team. A buzzer is used to alert the intruder. A stepper motor also is used, which rotates the camera for 360 degrees. The module also consists of an IR sensor which has transmitter and a receiver used for obstacle detection. Apart from the IR sensor a PIR sensor is also used to detect a motion of a living thing and revert back whenever a motion is detected. The raspberry pi used in this paper is a 32 bit microcontroller, which is used to make the application of interactive objects more accessible.

[5] This paper presents an idea to know about the implementation of sensors to secure the border in a simple and reliable way. The paper also aims in providing a system that helps Border Security Forces in controlling all kind of illegal moments near the border. It deals with the detection and locating of intruders crossing the border using PIR sensor and uses camera to streamline the image of any unwanted changes across the border and sends it to the base station for further processing. This paper also uses the concept of Internet of Things(IoT) to connect different sensors using communication modules.

[6] This paper discusses about a system which consists of an IR sensor to detect motions of the intruders. The system also uses a PI camera used to capture the images of the intruder, then this image is compared with the database, which contains the images of all the authorized people. If the captured image does not match with any of the images in the database then the robot will shoot at the person automatically. The robot consists of a gun controlled by the motor which is in turn controlled by a motor driver. In addition to this the system also consists of a small dc gear motor provides armature bearing support and a sealing provision through which the integral rotor or shaft pinion passes. This system uses a 32bit raspberry pi microcontroller as it's central system to control all the peripherals.

[7] In the android based intelligent robot for border security the proposed model consists of PIR sensors, android phone and DC motors .the microcontroller employed in this system is.The PIR sensor detects IR radiation emitted from object .Two mobile phones are used here in which one is used for controlling the movement of robot and other is used to provide video surveillance. The communication about the intruder is done using Bluetooth module in microcontroller. From this paper we have taken the idea of motor.

[8] In the fringe security framework utilizing arduino the framework utilizes strategy called echolocation, RF communication and IR innovation which is independently constrained by various arduino sheets, which controls various

sensors, engines and line following robot which is controlled by utilizing the code executed on arduino sheets.

[9] The primary target of this paper is to verify outskirt zones utilizing Robotics. As one of the patterns in the improvement of computerization in war hardware in 21st century, has been examined and created. The point of this paper is to diminish human exertion on Border zones, reflex time of reaction, accuracy to focus on a removed item. Up to this point the fringe security was absolutely reliant on warrior. In profoundly verified region the fighter identifies the adversary and targets him. Yet, in the event that the warrior was not ready to identify the foe, the foe could without much of a stretch enter the verified region. So for expanding the security level microcontroller based programmed shot framework is presented. The essential thought of this programmed shot. Current framework is proficient to recognize any radiation in the scope of fringe and consequently focus on its position. The proposed framework depends on Ultrasonic sensor.. The ultrasonic sensor gives 2cm to 400cm of non contact estimation usefulness with a running exactness that can reach up to 3mm. Each ultrasonic module incorporates a transmitter, a recipient and a control circuit.

[10] These framework offers a total robot activity which configuration to keep the foe distant from line of control. That is the thing that it spares the most commendable human life. Presently a days our officers constantly watch the fringe of nation despite the fact that it is an ordinary day or during a war. what's more, they watches any of d fear minute on the air conditioner actual line of control. be that as it may shockingly the framework isn't ok for warriors life and there are odds of misstep and risks. the proposed framework is fundamentally configuration to give remote availability utilizing remote innovation for land troopers on war zone .

[11] The main purpose of the project is to enhance the border security electronically with automation and with that to reduce the work load and responsibility of the soldiers that continuously take a look on border 24x7. This project will not fully remove the responsibility of soldiers but shares the maximum responsibility and will reduce human efforts on the border. Using this concept we can easily identify how many strangers or terrorists are entering the border.

[12] The framework is about remotely overseen Door openness and voice alarming through Smart Phone and get caught picture of guest at Door as Email alert. Brilliant home security control framework has turned out to be irreplaceable in everyday life. The structure and improvement of a home security framework, in view of human movement discovery and remotely observing innovation, to affirm guest character

and to control Door availability has been accounted for in this paper. This paper depicts about the usage and organization of remote control framework and availability in to a home domain for verified individuals as it were. A PIR movement sensor and Camera module are utilized to identify movement and catch pictures separately are dedicatedly make the security framework alive as per the solicitation. Electromagnetic entryway lock module work the entryway openness, has been planned and created. The proposed framework utilizes controller interface framework with Raspberry Pi which is minimal effort and expend littler measure of control. At the point when guest movement recognized at Door, Camera module interfaced to Raspberry Pi catch pictures, spare it on framework and send it as Email alert by means of TCP/IP. The concerned authority can control the framework and view video stream of camera module through Smart cell Phone. The framework additionally gave concerned power to utilize Smart Phone to send direction for voice ready when interloper distinguished. Clients can screen guests also, control the entryway lock on dynamic SSH (Secure Shell) page planned on android stage and upgraded with JavaScript. This framework finds a wide application in regions where physical nearness is unimaginable constantly. The whole control framework is constructed utilizing ARM11 microcontroller and tried for real use in home condition.

[13] In this paper we structure and actualize a security framework with a ultrasonic sensor module to upgrade the framework's dependability. The ultrasonic sensor contains a transmitter and a recipient and the module is put in a pivoting engine. It is accepted that a ultrasonic sensor is set in a turning engine to cover a wide range. The Ultrasonic transmitter occasionally radiates ultrasonic sign into an open region. A pivoting engine is utilized to enable the sensor to cover entire 360 degrees. In the event that the sign ever hits any physical items, it will be reflected back and the beneficiary piece of the sensor will at that point catch it. The microcontroller unit (MCU) will continually check for the collector yield of the ultrasonic transmitter. In the event that the recipient yield is high, the MCU will perform separation investigation of the article from the sensor utilizing the way that ultrasonic waves travel in air at 340m/s. The time taken for the waves to hit the article and return can be determined as the time taken for the collector yield to be high after the transmitter has been started to send ultrasonic waves. When the separation is determined, MCU checks whether the article is inside the range limit indicated inside the MCU for starting the caution. On the off chance that the article is inside the range edge, the MCU starts a sound caution and furthermore the worldwide framework for versatile interchanges (GSM) modem to send short message administration (SMS) or call to the concerned individual.

[14] Our paper gives the security in Indian military. Two segments are given in the circuit.

1. Close to the outskirt which is completely controlled robotized
2. Security station which can be worked physically

An extraordinary kind of human sensor is PIR (latent infrared) used to distinguish the person around 20 feet separation. This sensor utilizes the idea of Black Body Radiation. In the event that anybody attempts to cross the fringe implies the sensor recognizes and it sends a sign to the microcontroller switch on the camera which catches the picture of the individuals and it transmit the sign to the close to security station. In the recipient circuit is utilized which gets the sign from the outskirt and presentations the picture caught on the screen. In the wake of detecting the picture, the authority can send control sign got by the collector circuit in the fringe side the smaller scale controller enact the transfer driver which drives the heap, for example, programmed capacity firearms, voice caution. Our paper is progressed and great precision with different determinations.

[15] The paper expects to create people to come remote sensor systems called as Smart residue systems. Smart dust is a speculative arrangement of numerous minor Micro Electro Mechanical Systems (MEMS, for example, sensors, robots, or different gadgets, that can recognize, for instance, light, temperature, vibration, attraction or synthetic substances; are typically organized remotely; and are disseminated over some zone to perform assignments for guard industry and country security applications. It has a wide scope of interloper recognition framework that can be conveyed at basic areas ashore, to empower speedy, exact and secure limitation of a danger. Smart dust remote sensor bit is a little size; quickly deployable hub utilized for interruption recognition purposes explicitly in outskirt, combat zone and mechanical border observation frameworks. The brilliant residue remote sensor bit recognizes and orders into vehicles, people and gatherings.

[16] Picture averaging is proportional to low-pass sifting and can evacuate the deceptive shadows or impediment. This paper acquaints the picture averaging system with video-based face acknowledgment. The picture averaging system gives a proficient approach to perform basic leadership over the testing outlines in video-based face acknowledgment. Moreover, the normal surface picture is transformed back to the first shapes and the restored appearances determine which evacuate the deceptive data for acknowledgment somewhat. Filling in as display pictures, the restored faces improve the acknowledgment exactness. The exploratory outcomes affirm the effectiveness of the proposed calculation.

Table 1: Literature Survey

Author	Year	Technique	Advantage/Scope
Dawoud ALshukri	2019	MQTT	Use of software to control the peripherals
Tushar Sonar	2019	PIR sensor,ESP transreciever	Long range(>100km)
Prof.P.K.Nakade	2018	Thermal imaging.	Use of FLIR camera for night vision
Ajinkya V.Deshpande	2018	Audio indication.	Using buzzer to alert the intruder
Biswarup Deb	2018	Using IOT	Using the server through IOT.
Pooja S N	2018	Motor control	Using motor controlled gun.
Annu Maria Alex	2017	Electrification	Electrifying the border fence wirelessly
Amit Kumar	2017	RF communication	High baud rate communication using nrf module.
Lubna Afza	2017	Motor maneuvering	Using H bridge.
Prajakta	2016	I2C communication	SPI is advantageous over I2C
Ajay B Devkatte	2016	Sensor placement	Reduces space to large extent
Shaik Anwar	2016	Database storage	Uses EEPROM to store photos
Shinu N Yoannan	2013	Serial communication	Uses UART
Karthikeyan.A	2012	Alarming	Buzzer system
K.S.Tamilselvan	2012	Electro magnetic sensor	Uses MEMS sensor
Peng Jia	2012	Image processing	Uses image processing to distinguish faces

III. CONCLUSION

In this paper, an examination of different approaches to perform the task of border security intrusion have been introduced .This proposed system is an automatic system which tries to prevent entries of intruders or persons without prior permissions of the military. From the above papers it can be concluded that this system is capable of detecting intrusions across the borders and warn the person and eventually take necessary actions if the person tries to advance further in even after this warning. All these actions can be monitored and controlled by the control room.

IV. FUTURE SCOPE

In spite of the fact that each and every paper referenced in this survey sounds convincing, an intelligent framework is required which consolidates different advances to make a progressively exact and effective frameworks. The drawbacks found in these papers are that the range of sensors is quite minimal, this area can be focused on in the future which can incorporate high range sensors and lasers to increase the range of detection. One more drawback observed in this survey is that intrusions through the tunnels across the borders has not been focused on. This challenge can be overcome by using sound sensors or any other future techniques. Apart from this, metal detectives and different advances can be set up to further expand security levels. Also the techniques to bring down the costs can be focused on.

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