



IOT BASED BORDER SECURITY INTRUSION DETECTION USING GSM AND ESP32 CAMERA

¹Sarvesh Akash Rai, ²Dr. P. Sree Lakshmi, ³Mr.A. Sandeep Kumar Reddy

¹M.tech Scholar, Dept. Of ECE, Audisankara College of Engineering and Technology, Gudur, Andhra Pradesh

² Associate Professor, Dept. Of ECE, Audisankara College of Engineering and Technology, Gudur, Andhra Pradesh

³ Assistant Professor, Dept. Of ECE, Audisankara College of Engineering and Technology, Gudur, Andhra Pradesh

Abstract

Borders are highly prone to intrusion. It is difficult for the soldiers to monitor the border areas consistently and tirelessly. Hence it is essential to build a system which will reduce the effort of a soldier. Life of a soldier is precious and fragile and should be treated as such. This proposed system aims at reducing the workload of armed forces. The proposed portable model has a buzzer that self-activates to alert the intruder that they are in a restricted area, cameras that will detect the intruder's movement and notify the control station, and a passive infraRed sensor (PIR). The whole networks of sensors are connected through Internet of Things (IOT) in the border site. Live streaming and face recognition allow the administrator to precisely classify authorized and unauthorized personnel and make decisions. In addition, the system has a gun and an electric fence that can be operated manually to stop intruders. The setup will collaborate with human soldiers to provide assistance, ensuring border security.

I.INTRODUCTION

When it comes to envisioning new innovations in military settings, the military is unquestionably the primary customer of new advancements in strategy

and the sponsor of new improvements. Industrial robots are now being used to advance a number of basic military technologies that have been deployed out of the blue. In any case, military autonomy and modern mechanical autonomy still hold very different significances. The military has special, robotic equipment while, in modern terms, the robot is a larger amount of a smart, adaptable, large-scale manufacturing machine. Later, the use of modern robots for military applications will always be imaginable. Cost and development of the specialized capacity of the innovative robot will build the enthusiasm of the military customers. We will demonstrate that the inspiration for the utilization of robots, inside the military and inside industry, is the substitution of people. The explanations behind this substitution are, as per the following: quality, cost and acculturation; be that as it may, utilizing an alternate methodology in each field, obviously Presently, the monitoring of International fringe zones is exceptionally overwhelming errand. The security forces observe the outskirts under antagonistic conditions. Officially assembled reconnaissance cameras provide assistance, but they only cover extremely restricted areas. Because we are unable to alter the camera's dynamic appearance, the cameras

that are successfully mounted in a settled position are of little use. Additionally, because the trees block the camera's view, it is impossible to set up the cameras in timberland areas. Securing the boundaries from intrusion of illegal man or an unauthorized human across borders using minimal human resource at an affordable cost is the need of the hour. It can be exhausting for a soldier to constantly check the borders for suspicious behavior. Additionally, the climate and geography might not always be ideal for humans. The existing system uses Bluetooth enabled communication which may limit the range. a motor that can be turned 180 degrees to scan an area but doesn't give a full view of the area. The monitoring center is in charge of a warning facility that may not always be reliable. The existing model is not movable.

The proposed robot is mobile due to its wheels. Our system consists of a 360-degree rotating camera that will detect any motion and notify the control center. It also employs PIR sensor; data from the sensor is sent to the control station through internet. In order to alert the intruder that they are in the restricted area, a self-activating buzzer emits a sound. The robot also has live streaming feature which provides continuous media delivering to the controller site via internet. The application of a face detection feature aids in classifying individuals as authorized or unauthorized. There is a motor controlled gun which is manually controlled from the control station. An electric fence is incorporated and is activated on receiving orders from control station.

II.LITERATURE SURVEY

Investigations into border security intrusion detection were extensive. Most of the proposed works are based on PIR sensors and Raspberry Pi. The survey on wireless sensors network for border surveillance as well as intruder detection aims to devise the multi-sensing system. It is created by combining a variety of surveillance methods, such as movement on a flat surface or in a water body. Infrared, hydrophone, geophone, and surveillance cameras are some of the various sensors used for human intruder detection [1]. Bhadwal proposed a model for detecting intrusion at border site using a surveillance camera, infrared sensor and PIR sensor [2]. Video surveillance is provided for the operating site. The angle of

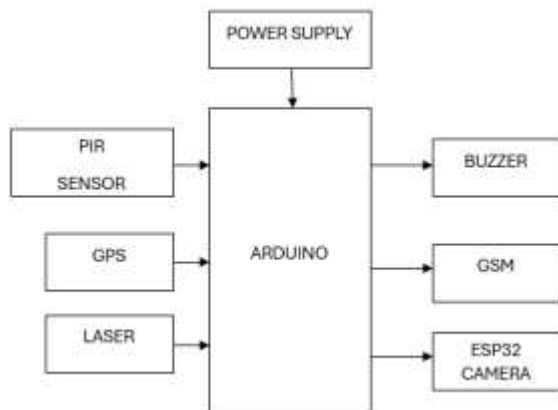
surveillance is achieved using multiple motors connected to RaspberryPi. The image of the border site is sent to the controller system screen when an intruder is detected. The system consists of a warning system and an auto-combat system for achieving security at border and military base stations. The drawback of this system is that it is a stationary model, which reduces the working area of model. [3] Proposes a trespasser detection system that has a PIR sensor and video surveillance. It uses two mobile phones for operating the system. Two DC motor will be used for positioning the laser gun and providing movement to the model. Bluetooth model sends essential information to control site which is present in microcontroller. Information obtained is used for taking further decision and firing at the intruder if necessary by control room. The robot system uses PIR sensor for identifying trespasser and sends alert to the security personal through sms using GSM Module [4]. The current model didn't have any module for streaming video continuously and it is a static module. An architecture based on the Raspberry Pi and the ESP8266 initiates communication and sends a notification [5]. It has two sites, namely border site and control site. The window has multiple control operations to control machine gun, turn on and off electricity, controlling the movement by manipulating horizontal and vertical motors. The system's flaw is that the intruder cannot be detected by continuously streaming video from the border site. For analyzing even minor site motion, a more advanced system is required. The reprogrammable robot with multiple sensors for detecting metal and bombs, smoke sensor for detection of smoke, and various other sensors for detection of electromagnetic field and fire [6]. The robot has a camera on it that can stream video. The robot has the ability to carry weight and RF transmitters and are used at predefined frequency. In [7], a method for applying image processing to the detection of faces and signboards for use in a home security system is proposed.

III.PROPOSED SYSTEM

The PIR (Passive Infrared) sensor is used to detect movement based on body heat in a border security intrusion detection system, and the laser beam acts as a physical barrier, triggering an alert when an intruder

crosses the border. This creates a dual-layered security system for monitoring and identifying potential breaches in a restricted area.

BLOCK DIAGRAM:



VI. MODULE DESCRIPTION:

A. Arduino Uno Microcontroller:

Based on the 8-bit ATmega328P microcontroller, the Arduino Uno is a microcontroller board. Along with ATmega328P, it consists other components such as crystal oscillator, serial communication, voltage regulator, etc. to support the microcontroller. The Arduino Uno has a reset button, six analog input pins, a USB connection, a Power barrel jack, an ICSP header, and 14 digital input/output pins, six of which can be used as PWM outputs. Arduino can be used to communicate with a computer, another Arduino board or other microcontrollers. The ATmega328P microcontroller provides UART TTL (5V) serial communication which can be done using digital pin 0 (Rx) and digital pin 1 (Tx). An ATmega16U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer. There is no need for an external driver because the ATmega16U2 firmware makes use of standard USB COM drivers. However, on Windows, a .inf file is required. The serial monitor included in the Arduino software makes it possible to transfer straightforward textual data to and from the Arduino board.



Fig 1:Arduino UNO controller

B.GSM MODULE:

The SIM900A is a readily available GSM/GPRS module, used in many mobile phones and PDA. The module can also be used to create embedded applications and IOT (Internet of Things). SIM900A is a dual-band GSM/GPRS engine that works on frequencies EGSM 900MHz and DCS 1800MHz. SIM900A features GPRS multi-slot class 10/ class 8 (optional) and supports the GPRS coding schemes CS-1, CS-2, CS-3 and CS-4.



Fig 2:GSM module

C.ESP8266 Wi-Fi Module

An ESP8266 Wi-Fi module is a SOC microchip mainly used for the development of end-point IoT (Internet of things) applications. It is referred to as a standalone wireless transceiver, available at a very low price. It is used to make it possible for embedded systems applications to connect to the internet.

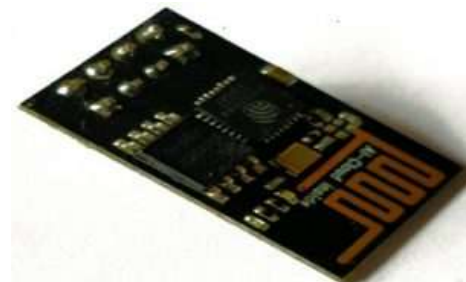


Fig 3:ESP8266 Wi-Fi Module

It can work as either a slave or a standalone application. If the ESP8266 Wi-Fi runs as a slave to a microcontroller host, then it can be used as a Wi-Fi adaptor to any type of microcontroller using UART or SPI. If the module is used as a standalone application, then it provides the functions of the microcontroller and Wi-Fi network.

V.RESULTS:

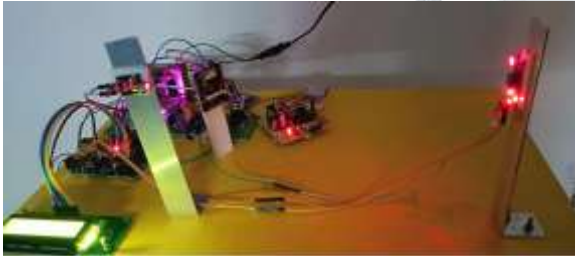


Fig 4:Hardware implementation



Fig 5:LCD Display

V.CONCLUSION

The nation's security is a major and primary concern. But at the same time the lives of men safeguarding at the borders must be protected. Warfare necessitates a sophisticated weapon system in addition to manpower. The advancement in our technology are quite helpful in providing security without causing threats to our soldiers. The concepts mentioned above not only secures border effectively, but also avoid life threats. We need to accept these technologies and keep out of border areas where the terrain is difficult. However, in

order to effectively manage borders, this combination of technologies requires additional research and refinement.

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