

The Adroit Security System

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Abstract—The aim of this paper is to present the design and development of a scalable security system that utilizes laser technology for intrusion detection. The proposed system is intended to address the need for reliable security solutions for individuals and organizations that are responsible for protecting large areas, such as warehouses, properties, farms, and more. Traditional security measures for such areas can often be unreliable and inadequate, making the development of a more effective solution necessary. The proposed system utilizes laser technology to detect intrusions and immediately alert the user, providing a quick response to potential threats. The system is scalable, meaning it can be adapted to different land sizes and shapes, and is easy to install and use. The use of laser technology also allows for the system to be energy efficient, as the cameras are only activated during an intrusion. Overall, the proposed system offers an efficient and reliable solution for securing large areas.

Keywords—Laser, Security, LDR

I. INTRODUCTION

In recent times, security has become a fundamental requirement for individuals and organizations. The sense of safety and protection provided by effective security measures is crucial for maintaining peace of mind and a sense of well-being. The security system described in this paper is designed to provide such protection and can be used in a variety of locations to achieve this goal. The system utilizes laser technology to detect intrusions and alert the user. A laser transmitter module continuously emits a laser beam, which is reflected by mirrors to create a boundary around a specified area. If an intruder attempts to enter the protected area, the laser beam is disrupted and the system immediately captures real-time images and video of the intrusion. These images and video are then sent to the designated owner via a Raspberry Pi board. This security system has the ability to effectively safeguard a given area and provide the necessary peace of mind for those who use it. It is a reliable and efficient solution for addressing security concerns in a variety of settings.

A. Background of Study

The need for security has become more pressing in recent times as technology has enabled thieves to devise new ways

to commit crimes, resulting in a surge in criminal activity and illegal behaviour. This increase in the crime rate can be alarming and makes it challenging for people to continuously monitor and safeguard their homes, possessions, farms, crops, businesses, and other valuable resources. Therefore, it is essential to put in place efficient security measures that can help prevent and identify criminal activity.

B. Problem Statement

- Security has become a critical concern in today's world.
- People worry about the safety of their neighbourhoods and homes.
- Farmers are also concerned about the condition of their crops and farmland.
- The protection of their goods is a major concern for the owners of warehouses.
- Securing large areas is very difficult and also unreliable as the greater the area more expensive and difficult it is secure it.

II. LITERATURE REVIEW

This chapter provides a comprehensive overview of all the research that was done for the proposed project and reviews the general conclusions that were made in order to help us carry out our tasks more successfully and effectively. The reader will be assisted in understanding the many issues highlighted by the study on various security systems by this research overview.

A. Technical Paper Review

1) Paper 1: Institute of Electrical and Electronics Engineers

Author Name: Yanbo Zhao, Zhaohui Ye

The literature review on the wireless home network system for emergency response identified several significant issues. One concern is the security of GSM/GPRS-based solutions, which often rely on DTMF tones as passwords that can be easily compromised. Another issue is the limited operating range of GSM systems, which is typically around 10 meters,

which may not be sufficient in certain emergency situations. Additionally, it was noted that victims of physical attacks or other emergencies may be unable to physically access the SOS button on the system to send out a distress signal, leading to delays in receiving help and potentially worsening the outcome for victims.

2) Paper 2: IEEE Students' Technology Symposium

Author Name: Zamshed Iqbal Chowdhury, Masudul Haider Imtiaz, Muhammad Moinul Azam, Mst. Rumana Aktar Sumi

This paper evaluates the development of a Low-cost security system using small PIR (Pyro electric Infrared) sensor built around a microcontroller. There are several limitations that can be made of the proposed security system using PIR sensors and a microcontroller. The proposed security system using PIR sensors and a microcontroller has several limitations, including low output signal strength, a tendency to produce false alarms, difficulty detecting humans in stationary states, and limited range. Improving these limitations could enhance the performance and reliability of the system in detecting and responding to security breaches.

3) Paper 3: International Conference on Informatics, Electronics and Vision (ICIEV)

Author Name: Sopan Sarkar, A. Islam

A literature review of the proposed LASER-based security system for inland aquaculture in Bangladesh found that it effectively used LASERs to detect intruders and communicated with a wireless sensor network through nRF24L01 trans-receivers. The system utilized LDRs attached to an Arduino board to determine the number of LASERs obstructed and programmed to take appropriate actions, such as sounding an alarm or calling a designated mobile number through a GPRS/GSM network.

III. PROPOSED WORK

A. Requirements

A laser security system is a type of security system that utilizes a laser, a detector, and a sensing circuit to detect and alert of potential intrusions. The laser functions as a concentrated light source that produces a single colour of light in a narrow beam. The detector, which is sensitive to light, generates a voltage when it is struck by the laser beam. The detector is connected to the sensing circuit, which monitors for any changes in the voltage output of the detector. If the laser beam is disrupted and cannot reach the detector, the circuit recognizes the change and generates a warning signal. This signalling can be used to alert security personnel or trigger other security measures.

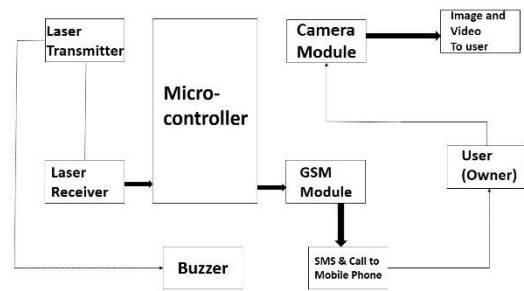


Fig.3.1 Proposed System

B. Application Architecture

The proposed system is designed to be both flexible and scalable. It involves the use of poles placed around the perimeter of a piece of land. These poles are equipped with receivers and transmitters that continuously send and receive signals to create a closed loop. This allows the system to monitor and protect the land from all directions. Additionally, each pole has a camera mounted on top to record any intrusions. The use of multiple poles allows the system to be scalable and adaptable to different land sizes and shapes.

The proposed system is activated upon detection of an intrusion. When an intruder cuts or crosses the transmitted beam, the system sounds a buzzer as an immediate alarm for any nearby security personnel. To conserve energy, the cameras installed on the poles are activated only during an intrusion and record video footage that is then sent to the owner of the land or property. This allows the system to function using backup energy sources in the event of a power outage.

One advantage of the proposed system is that it utilizes higher quality cameras and more targeted footage recording than traditional CCTV systems. This makes it easier to identify intrusions and individuals in the recorded footage. In contrast, continuous recording with CCTV can make it difficult to locate specific instances of intrusion and accurately identify individuals. The footage from the proposed system can also be easily stored and transmitted to the owner.

IV. RESULTS AND ANALYSIS

A. Software Results

In this study, Proteus and Fritzing were utilized for the software implementation of the proposed circuit. These tools were selected for their capacity to simulate and model electronic circuits, enabling design testing and optimization prior to physical construction. The circuit programming was performed using Python 3 and the Raspberry pi platform, with the latter being a low-cost, credit-card sized computer that interfaces with a monitor or TV and a standard keyboard and mouse, making it a suitable platform for development and testing. Results from simulation in Proteus software indicated that the proposed design met intended outcomes and specifications, providing a foundation for further development and testing.



Fig. 4.1 Motion detection using raspberry pi simulation

The above figure illustrates the output generated upon interruption of the laser beam. The display message 'Motion Detected' indicates the presence of an intrusion, while the message 'No Motion Detected' connotes the absence of intrusion and security of the premises.

B. Hardware Results

In the hardware component of the system, the interruption of the line laser beam by the laser transmitter triggers the activation of the camera, initiating the video recording for a pre-determined period. Subsequently, the recorded video is transmitted along with a "Motion Sensor Triggered" notification to the Telegram application of the designated user or authorized individual. The Telegram application allows for real-time monitoring and notification of any intrusions, enabling prompt response and necessary action to be taken.

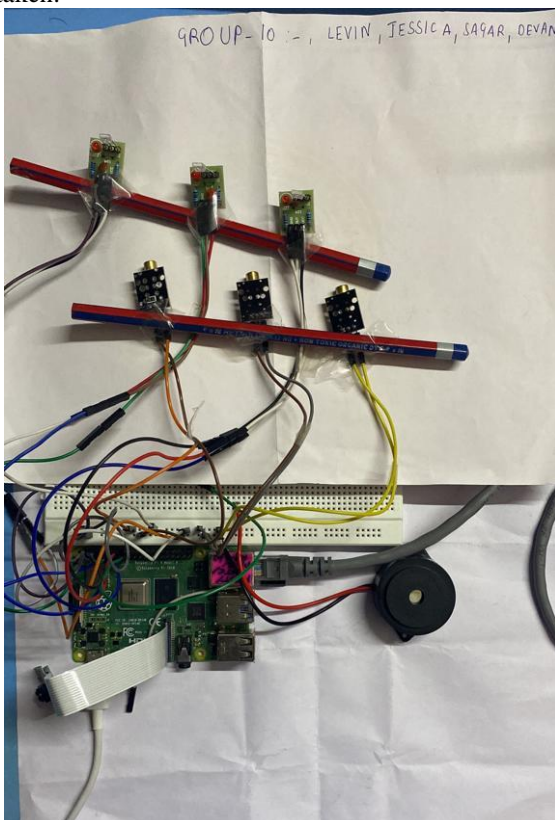


Fig. 4.2 Hardware Module

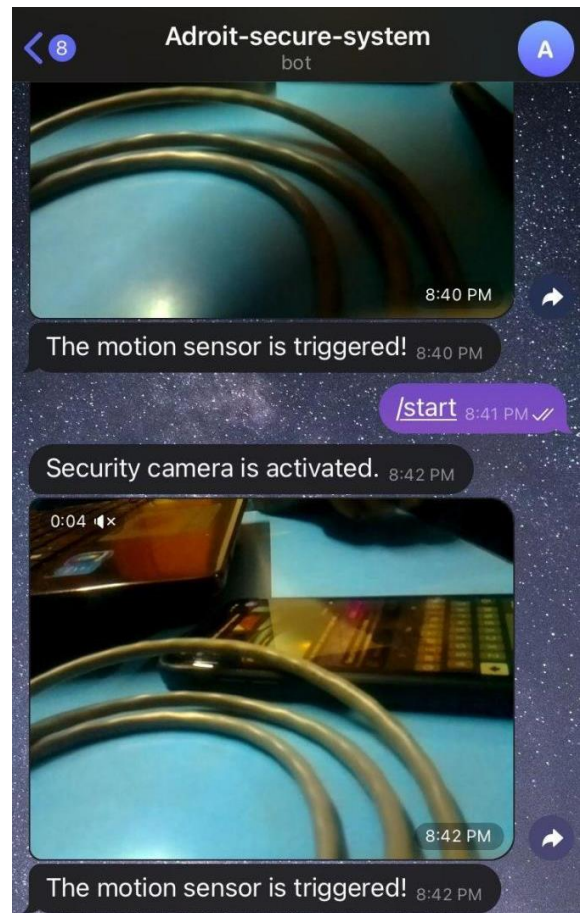


Fig. 4.3 Alert of Intrusion on Telegram

The use of Telegram as a communication platform facilitates the efficient dissemination of information regarding potential security breaches to relevant users. The implementation of a Telegram bot serves as an automated mechanism for detecting and responding to intrusions in real-time. Upon detection of an intrusion event, the bot is activated and sends a notification message to the user, providing immediate awareness and allowing for prompt action to be taken. This utilization of the Telegram application and implementation of a bot streamlines the process of communicating intrusion events and improves the overall security posture of the system.

V. CONCLUSION

In conclusion, the proposed project is designed to provide security for large areas. It is an affordable, reliable, and user-friendly system that utilizes various electronic components to function. The system can be installed and utilized in various locations such as industrial zones, homes, offices, and other restricted areas. While initial results are promising, there is potential for further improvements and refinements to increase the overall effectiveness and accuracy of the system.

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