

INTERNET OF THINGS-BASED PRISON BREAK MONITORING AND ALERT SYSTEM

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ABSTRACT:

At present, the prison has the surveillance camera and few security guards are employed to monitor the illegal movement of prisoners approaching near perimeter wall with the intention to escape from prison. These approaches were easily botched by prisoners to deviate the officials to move away from their positions. Prisoners makes use of this opportunity to flee away from prison. To control this undesirable situation, techniques like implanting pressure sensors in the perimeter wall, CCTV surveillance with image processing based solutions, Drones etc. are available. Deployment of these techniques incurs high cost, does not give exact location of the prisoner. Hence, IOT based prisoner escape detection technique has been proposed in this work. In this work, two approaches were discussed:

1. Light source based approach-Deploying laser and PIR sensor module to detect intrusion near the perimeter wall,
2. Geo fencing based approach.
3. Prisons perimeter wall coordinates are geo fenced and any attempt to reach the perimeter wall would alert the prison officials through repeated alert systems will be activated

Keywords:Internet Of Things,Geo fencing.

I INTRODUCTION

In day today's life, monitoring the prisoners in prison environment, tracking the movement of patients with mental illness, patients in hospital etc., needs assistive technology to replace the security guard work and prevent prisoner from escaping from prison. In this work, escape detection in prison environment is detected using Geofencing with IoT based solution. As the security officials were easily botched by prisoners by means of deviating the officials to move away from their positions, it is again considered as additional offense to during his/her imprisonment. Internet of Things (IoT) is an enabling technology to connect different physical objects/sensors which monitor the environment. It allows the sensors to exchange the information with other sensors and allows to act accordingly. Virtual fence/Barrier is created based on set of coordinates on geographical area which are mapped through GPS or WPS. Geofencing enables remote monitoring of prisoners surrounded by virtual fence. If a prisoner tries to leave the pre-established geofence area, Geofencing triggers the appropriate action and immediately prison officials will be notified by Call/SMS through GSM module. Many Geofencing applications incorporate Google Earth or

Google Maps to allow the administrators to define the boundaries to set up the virtual fence. Geofencing action triggers can be categorized into three types: static, dynamic and peer to peer. Geofencing can be deployed for real time location tracking of prisons during different situations:

- Track a prisoner during parolee
- Allow prisoners to carry out their job with in a defined geofence
- Geofencing home area to monitor and notify the police officials if the offender leaves home without obtaining authorized permission (from judge)
- Detection of speeding situation except driving
- To detect if the offenders enters in forbidden region.

The prison system in India, as known to everyone, is not as good as we see in the films. It is quite shocking to know that in a digitally modern country like India, the prison system is quite orthodox. So in such an orthodox system the jail breaks are very common and most usual thing to happen. There is no such count but prison escapes keep happen, either at large scale or in smaller scale. A thought of these inmates still roaming around within us is itself very scary.

The changes required in the today's prison system is that, that the system should be a bit digitalized rather than using human force to guard the inmates. The digital system to be used can be made reliable that it can't be under cyber-attack. There are some more aspects that can be used to make this system more reliable against cyber-attack. This project targets on the condition that if the prisoner tries to escape from the jail his/her movement can be detected as soon as his/her presence is not been found in the cell or the area he/she is supposed to be in. Geofencing has been done and Laser is used to fail the idea of escaping. This paper gives a review on various Prison Security and Safety devices that are based on Wi-Fi, Bluetooth for Internet as communication mode. But both of these systems have their own restrictions. Wi-Fi and Bluetooth devices have a primary flaw of limited range. Poor internet connectivity can be an issue in densely populated areas and multistory buildings. Organization of the paper: This paper is branched into five sections- Section 1 illustrates the literature survey depicting about existing modules in the market and their pros and cons. Section 2 interprets the functioning of these currently available systems. Section 3 clarifies the points that should be examined to design an efficient

setup. Whereas Section 4 concludes the paper and proposes a new problem statement based on the overlook of the currently used systems and Section 5 outlines the future aspects of the strive.

II. LITERATURE SURVEY

1.A Generic Approach to Real Time Location based Tracking System Authors: ManishabenDahyabhaiDabhi.

Digitization has changed the way of thinking as well as the life style of people. With the eve of rapid invention new technology, Real time location tracking and monitoring of physical object become essential where authorized access is needed to some geographical area and unauthorized access should be restricted. Nowadays different measures for Real Time Location System (RTLs) are available. Among them the concepts mentioned in this paper is Geofencing, a virtual barrier around geographical area which allows mobile app or physical object to work on the basis of real time data provided by it. Geofencing can be implemented either with GPS or BEACONS or RFID. This paper includes the definition of Geofencing, working of Geofencing, comparisons of technology used to implement concept of Geofencing, Geofencing uses and advantages. As

mentioned in this paper user can select either GPS or RFID or BECONS to implement the concept of Geofencing on the basis of requirement.

2.WSN and RFID Integration to Support Intelligent Monitoring Authors: F. Alshahrany, M. Abbod and I. Moualek.

The real time monitoring of environment context aware activities is becoming a standard in the service delivery in a wide range of domains (child and elderly care and supervision, logistics, circulation, and other). The safety of people, goods and premises depends on the prompt reaction to potential hazards identified at an early stage to engage appropriate control actions. This requires capturing real time data to process locally at the device level or communicate to backend systems for real time decision making. This research examines the wireless sensor network and radio frequency identification technology integration in smart homes to support advanced safety systems deployed upstream to safety and emergency response. These systems are based on the use of hybrid intelligent decision support systems configured in a multi- distributed architecture enabled by the wireless communication of detection and tracking data to support intelligent realtime

monitoring in smart buildings. This paper introduces first the concept of wireless sensor network and radio frequency identification technology integration showing the various options for the task distribution between radio frequency identification and hybrid intelligent decision support systems. This integration is then illustrated in a multi-distributed system architecture to identify motion and control access in a smart building using a room capacity model for occupancy and evacuation, access rights and a navigation map automatically generated by the system. The solution shown in the case study is based on a virtual layout of the smart building which is implemented using the capabilities of the building information model and hybrid intelligent decision support system.

3. Monitoring System for Prisoner with GPS using WSN Authors: B. PoojaPatil, D. SnehaChapalkar, NehaDhamne and M Niharika Patel.

In day today's life security is a very important thing in the world. For better achievement of security advanced technology have been undertaken in correctional facilities. Various security devices like CCTV, Tracking bracelets, ID

barcode scanning and other devices have contributed to the improved and secure management. The aim of this paper is to invent a security system against prisoner by using RF Transmitter and receiver technology. It is based on RF Transmitter and Receiver technology on ultra-high frequency range which can be applied to use in access control by using RF Transmitter and Receiver tag. The RF Transmitter and Receiver tag contains a unique set of number as a code, so it can be identified. The RF Transmitter will act as the bracelet and the RF Receiver will be at the server side. For keeping the track of prisoner Global Positioning System (GPS) is used. This technology can be used for monitoring the prisoners in the jail, patients in the hospitals or mental asylums who basically try to escape or run away from jails and mental asylums. It tracks the particular person wearing the bracelet within its range and as soon as it's outside the range the GPS connected to the bracelet gets activated and we can track that particular person with the help of GPS on the bracelet. It's also very useful in the schools for students and the staff, colleges, employees in the offices and etc. where we need to keep track of someone's presence. There is no need of keeping continuous watch due to this

technology, for example if the prisoner runs away from the jail a message will be sent to the jailer and buzzer will ring. Due to this technique it will be easy for monitoring purpose.

4. Testing in prisons and parolees for the greater good Authors: MirkoAkrap

At present, the prison has the surveillance camera and few security guards are employed to monitor the illegal movement of prisoners approaching near perimeter wall with the intention to escape from prison. These approaches were easily botched by prisoners to deviate the officials to move away from their positions. Prisoners makes use of this opportunity to flee away from prison. To control this undesirable situation, techniques like implanting pressure sensors in the perimeter wall, CCTV surveillance with image processing based solutions, Drones etc are available. Deployment of these techniques incurs high cost, does not give exact location of the prisoner. Hence, IoT based prisoner escape detection technique has been proposed in this work. In this work, two approaches were discussed: i) Light source based approach-Deploying laser and GSM module to detect intrusion near the perimeter wall, ii) Geofencing based approach Each prisoner would be

having a wearable, non-detachable component which has GPS, GSM and microcontroller. Prisons perimeter wall coordinates are geo fenced and any attempt to reach the perimeter wall would alert the prison officials through repeated phone calls and alert systems will be activated. Even if the prisoner is away from prison, his physical location can be tracked using latitude and longitude information. Main challenge in deploying this module is battery life. Since the device is retrieving the latitude and longitude information quite often, battery power would be drained.

III SYSTEM ANALYSIS

EXISTING SYSTEM

IOT is simply the network of interconnected things/devices which are embedded with sensors, software, network connectivity and necessary electronics that enables them to collect and exchange data making them responsive. More than a concept Internet of Things is essentially an architectural framework which allows integration and data exchange between the physical world and computer systems over existing network infrastructure.

PROPOSED SYSTEM

This paper gives a review on various Prison Security and Safety devices that are based on Wi-Fi, Bluetooth for Internet as communication mode. But both of these systems have their own restrictions. Wi-Fi and Bluetooth devices have a primary flaw of limited range. Poor internet connectivity can be an issue in densely populated areas and multistory buildings. Organization of the paper: This paper is branched into five sections- Section 1 illustrates the literature survey depicting about existing modules in the market and their pros and cons. Section 2 interprets the functioning of these currently available systems. Section 3 clarifies the points that should be examined to design an efficient setup. Whereas Section 4 concludes the paper and proposes a new problem statement based on the overlook of the currently used systems and Section 5 outlines the future aspects of the strive. This project targets on the condition that if the prisoner tries to escape from the jail his/her movement can be detected as soon as his/her presence is not been found in the cell or the area he/she is supposed to be in. Geo-fencing has been done and Laser is used to fail the idea of escaping. This paper gives a review on various Prison Security and Safety devices that are based on Wi-Fi,

Bluetooth for Internet as communication mode.

fences can trigger alarms if tampered with. The system can even leverage cameras with servo motors for pan-tilt surveillance. Importantly, real-time alerts can be delivered to a mobile app like Blynk, allowing for immediate response from authorities. This network of intelligent devices offers a promising solution to strengthen prison security.

IV METHODOLOGY

BLOCK DIAGRAM:

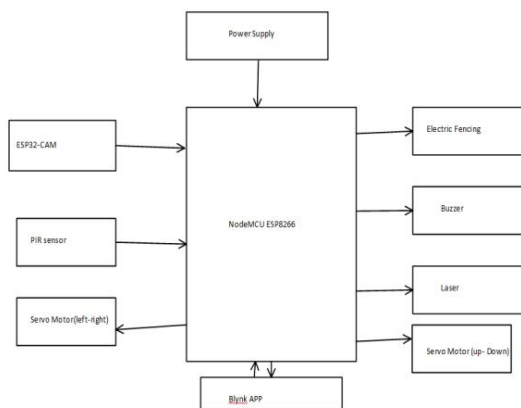


Fig-1. Block Diagram of Proposed System

This IoT-based system tackles prison breaks through a network of sensors and automated alerts. A central microcontroller unit (MCU) like the ESP32-CAM can be programmed to receive data from various sensors and control other devices. Passive infrared (PIR) sensors can detect movement near fences or doorways, while tripwire lasers and electric

While this system offers a significant boost in security, it's important to consider additional factors. For instance, redundancy in critical components like MCUs or communication pathways is essential to ensure the system remains operational in case of failure. Additionally, robust security measures must be implemented to prevent hacking or tampering that could compromise the entire system. Finally, a balance needs to be struck between security and privacy. While the system can deter escape attempts, it shouldn't infringe on prisoners' rights to privacy in nonessential areas.

NodeMCU

Development Kit/Board consists of an ESP8266 Wi-Fi chip. ESP8266 chip has GPIO pins, serial communication protocol, etc. features on it. It has ESP 8266 32 bit microcontroller, 80MHz of clock speed,

4MB of flash ROM, 64KB of RAM, 11 digital I/O pins. A regulated power supply provides a constant, stable output voltage or current. It is essential for powering sensitive electronic devices, preventing voltage fluctuations, and ensuring consistent performance. Regulated power supplies are widely used in various applications to maintain reliable and uninterrupted power delivery.

Buzzer

A buzzer is an audio signaling device that produces a distinctive sound when activated. It is often used for alarms, notifications, and indicators in various electronic and industrial applications. Buzzer sounds can range from simple beeps to more complex tones, and they play a crucial role in providing auditory feedback to users or alerting them to specific events.

Light-Emitting Diodes (LEDs)

Semiconductor devices that emit light when an electrical current passes through them. They are highly energy-efficient and have a longer lifespan compared to traditional incandescent bulbs. LEDs are commonly used in lighting, displays, indicators, and various electronic applications. They come in a range of colors and are a key technology

in modern lighting and visual display systems.

Blynk is a mobile application

Enables users to control Internet of Things (IoT) devices from their smartphones. It provides a user-friendly interface to create custom dashboards for monitoring and controlling connected hardware. Blynk supports a wide range of microcontrollers and IoT platforms, making it a versatile tool for home automation, robotics, and more. The app's drag-and-drop interface allows users to design their own control panels and visualize data from their IoT projects in real time. A Passive Infrared (PIR) sensor is a type of motion detector that measures infrared radiation emitted by objects within its field of view. It operates on the principle that warm objects, including humans and animals, emit infrared radiation. When there is a change in the infrared radiation pattern, the PIR sensor detects motion and triggers a response, such as turning on lights or activating an alarm.

PIR sensors

Commonly used in security systems, automatic lighting, and energy-efficient applications, providing a cost-effective and reliable solution for detecting movement in

various environments. Their passive nature, low power consumption, and simplicity make them widely employed in smart home devices and commercial applications.

Electric fencing in a prison break monitoring and alert system serves as a formidable deterrent and containment measure. The electrified perimeter acts as a robust physical barrier, discouraging escape attempts and enhancing overall security. Integrated with monitoring technology, the electric fencing system can detect breaches, triggering instant alerts to security personnel. This proactive approach allows for swift response to potential prison breaks, minimizing the risk of successful escapes. The combination of electric fencing and advanced monitoring contributes to a comprehensive and highly effective security infrastructure within correctional facilities.

Flow Chart

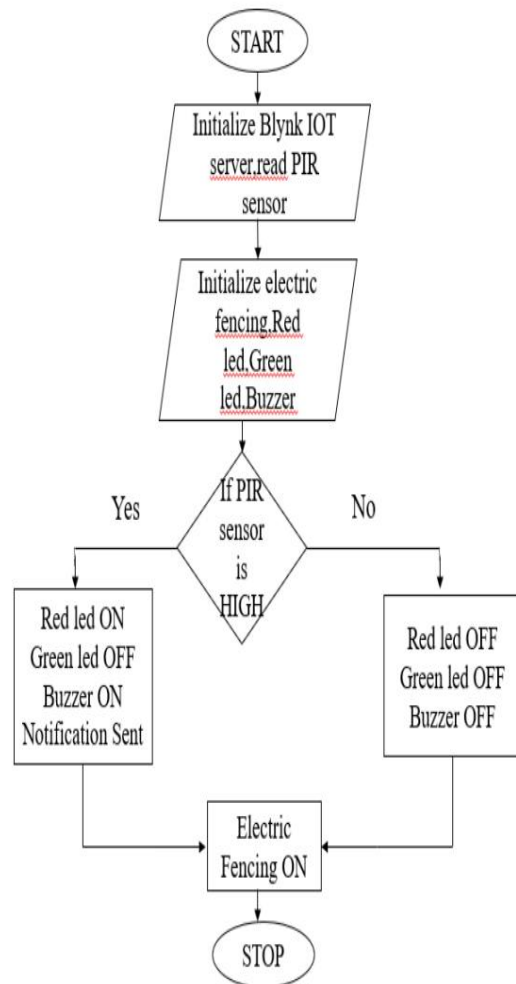


Fig-2 Flow Chart

V RESULT AND DISCUSSION

Implementing an IoT-based prison break monitoring and alert system represents a significant step forward in fortifying the security infrastructure of correctional facilities. Through the integration of electric fencing, PIR sensors, a buzzer, LEDs, and the Blynk app, the system creates a multi-layered defense mechanism. The electric

fencing serves as a formidable barrier, while PIR sensors meticulously monitor movements within key areas. Local alerts, manifested through a buzzer and LEDs, provide immediate on-site notifications, complemented by remote alerts delivered via the Blynk app. This combined approach ensures swift responses to potential breaches, minimizing response times and maximizing security efficacy. The Blynk app acts as a centralized control hub, offering security personnel a userfriendly interface for real-time monitoring and management. Differentiated alerts, such as varying buzzer patterns and LED colors, enable quick identification of the severity of a situation, aiding responders in assessing and addressing security threats. The wireless communication protocol facilitates seamless connectivity between sensors and the app, ensuring that the system operates cohesively and can be adapted to the dynamic needs of the prison environment. The integration of power-efficient modes not only optimizes energy consumption but also guarantees uninterrupted system operation, essential for maintaining the integrity of the security infrastructure on a 24/7 basis.

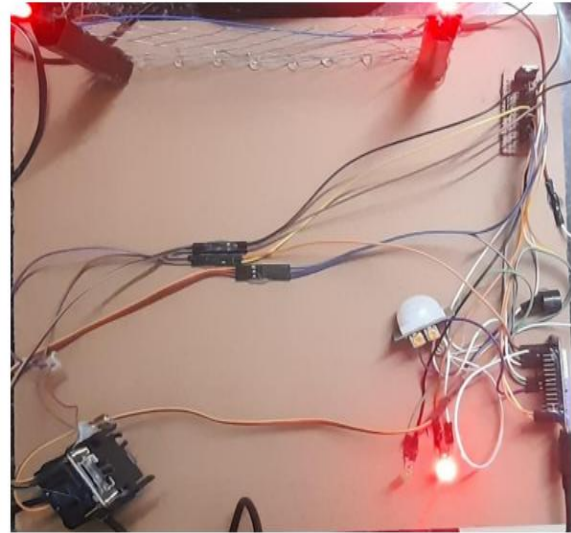


Fig-3 Prison break monitoring and alert system

By prioritizing security, legal compliance, and scalability, this project provides a comprehensive solution to enhance overall prison security. Its success hinges on meticulous testing, collaboration with security experts, and adherence to ethical standards. The system's documentation and user-friendly design contribute to its long-term viability, allowing for effective security management and potential future expansions. In summary, the result is a technologically advanced, reliable, and adaptable prison break monitoring and alert system that significantly strengthens the security posture of correctional facilities.

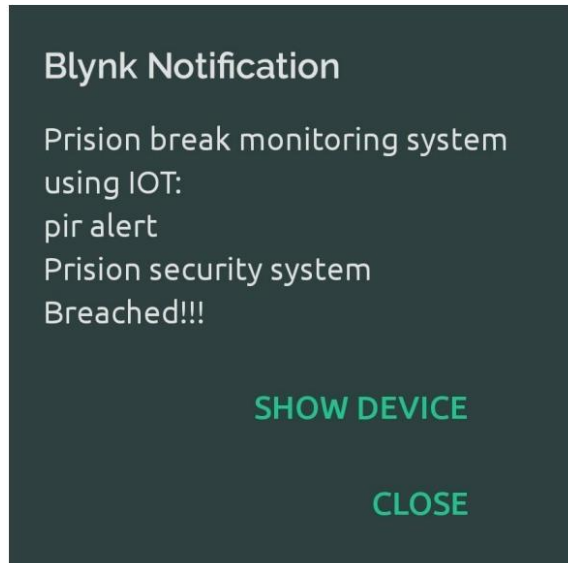


Fig-4 Notification from Blynk app

The implementation of an IoT-based prison break monitoring and alert system represents a paradigm shift in the landscape of correctional facility security. Beyond the traditional physical barriers, this system leverages cutting-edge technology to create a dynamic and responsive security infrastructure. The electric fencing, equipped with sensors, acts as an intelligent barrier that goes beyond mere deterrence. It provides real-time feedback on its integrity, instantly notifying security personnel of any attempts at breach. This level of proactive monitoring not only enhances the physical security of the facility but also instills a sense of confidence in the overall security measures in place. A critical aspect of the success of this project lies in its adaptability

and responsiveness to various scenarios. The PIR sensors, strategically placed, are designed to detect nuanced movements, distinguishing between routine activities and potential security threats. T

he system's ability to differentiate between different types of alerts, signaled through the buzzer and LEDs, ensures that security personnel can quickly assess the severity of a situation. The Blynk app adds a layer of remote control and monitoring, enabling authorities to stay connected to the security status of the facility even when not physically on-site. This adaptability positions the system as a forward-thinking solution, capable of evolving alongside emerging security challenges. Beyond its technical functionalities, the IoT-based prison break monitoring and alert system also underscores the importance of ethical considerations in implementing advanced security measures. Striking the right balance between surveillance for security purposes and respecting the privacy and rights of individuals within the prison environment is a delicate task. Through meticulous design and adherence to legal standards, this system ensures that its monitoring capabilities are used responsibly, minimizing the risk of overreach and upholding the ethical

standards expected in cerebral environments. This ethical foundation is paramount in building trust among stakeholders, including prison staff, inmates, and the broader community, fostering a sense of security without compromising fundamental human rights.

VI CONCLUSION

In conclusion, the IoT-based prison break monitoring and alert system stands as a transformative solution, elevating correctional facility security to new heights. Through the integration of electric fencing, PIR sensors, and the Blynk app, the system provides a multilayered defense, promptly detecting breaches and offering real-time alerts. Its user-friendly interface and differentiated alert mechanisms ensure efficient monitoring, empowering security personnel to respond swiftly to varying threat levels. The adaptability of the system to different scenarios, combined with ethical considerations in its design, underscores its responsible deployment. This technological advancement not only fortifies physical security but also fosters a balance between surveillance and privacy, contributing to a more secure and ethically sound correctional environment.

FUTURE ENHANCEMENT

The future scope of the IoT-based prison break monitoring and alert system is promising, with potential advancements in sensor technology for even more precise threat detection. Integration with artificial intelligence (AI) algorithms could enhance the system's ability to distinguish between normal and suspicious activities, reducing false alarms. Further developments may involve the incorporation of drone technology for aerial surveillance, providing an additional layer of security. Enhanced connectivity and interoperability could allow seamless integration with other smart prison systems, creating a comprehensive and interconnected security ecosystem. The use of advanced biometric sensors could add an extra layer of identity verification, ensuring accurate tracking of individuals within the facility. Future iterations may also explore the implementation of block chain technology for secure and tamper proof data storage. Continuous research and development in these directions hold the potential to make

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