Enhancing Prison Security with GPS Technology Along with The Health Monitoring system

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Abstract

In today's world, ensuring the safety and security of prisons is of the utmost importance. Traditional security systems of prisons mainly consist of surveillance cameras, security personnel and drones. Some major issues with this type of system are CCTVs blur imaging at night, flickering videos, human errors at guarding levels, and disrupted power supply. Also maintaining the system is very costlier. Through this paper, we proposed an idea to design an advanced and reliable system that uses GPS technology to overcome the above-stated drawbacks along with health monitoring at the individual level, which is cost- effective and requires less maintenance.

Keywords: *We would like to encourage you to list your keywords in this section*

1. Introduction

The goal of managing and supervising offenders in modern criminal justice systems is a constant problem. The effectiveness of traditional correctional surveillance techniques in promoting public safety, guaranteeing compliance, and assisting successful reintegration into society is frequently compromised. On the other hand, the advent of technical solutions presents viable paths to overcome these obstacles. Today's assistive technology is necessary to replace security guard labor in monitoring inmates in prison environments, tracking the movements of patients with mental illnesses, patients in hospitals, etc. And prevent convicts from escaping from prison. In this work, geofencing using an IOT-based system is used to detect escape in a prison environment [1].

Another method used in [1] is the Light Source approach in which the jail perimeter wall in this configuration can be divided into multiple zones, each of which has a laser module installed on one side and an LDR on the other to detect laser beams. The laser beam would break if the prisoner tried to approach the wall, sounding an alert, signaling the siren, and transmitting brief signals to authority. RFID technology integration with the light source module can improve this strategy.

The IoT, is a technology that makes it possible to link various physical devices and environmental sensors. It enables information sharing amongst sensors so that they can respond appropriately. A virtual fence or barrier is constructed using a set of GPS or WPS-mapped coordinates on a given geographic area. Remote monitoring of inmates encircled by a virtual fence is made possible by geofencing. When a prisoner attempts to exit the predefined geofenced region, geofencing sets off the necessary events, and prison staff are promptly alerted via SMS or call via the GSM module. A lot of geofencing apps use Google Earth or Maps so that the administrators may draw the limits and create a virtual fence. Three forms of geofencing action triggers are distinguished: peer-to-peer, dynamic, and static.

The main drawback of this strategy is battery consumption. GPS uses a lot of battery power since it must constantly retrieve the spatial coordinates from satellites. The following strategy can be used to reduce the energy that the module uses. Accelerometers allow GPS to be retained in sleep mode and to be triggered when a person moves.

Improvements in several sensing-related fields have been made possible by wireless sensor networks, or WSNs. WSNs have a wide range of uses, including those related to the military [10], the monitoring of the global climate [11], underwater networks [12], structural health monitoring [13], and more. The development of health monitoring systems based on patient-worn sensor modules has been a significant component of WSN.

2. LITERATURE SURVEY

The author aims to showcase [2] the benefits and drawbacks of UWB systems compared to other traditional systems.

a. High Data Rate Transmission: Owing to the extremely broad bandwidth of several GHz, UWB systems are capable of supporting data transmission rates exceeding 500 Mb/s within a 10-meter range, hence opening up a plethora of new services and applications.
b. High Precision Ranging: UWB systems can facilitate the capacity to find and monitor applications for sub-centimeter resolution and have strong time-domain resolution.
c. Low Loss Penetration: Because UWB systems can pass through obstructions, they are functional in line-of-sight (LOS) as well as non-line-of-sight (NLOS) situations.
d. Fading Robustness: UWB systems can solve multipath components even in densely populated multipath situations and are impervious to multipath fading. Leveraging the fading robustness can help reduce the transceiver's complexity. The system performance can be improved by combining the resolvable pathways.
e. Coexistence: The global positioning system (GPS), wireless local area networks (WLAN), cellular systems, and other services may all coexist with the UWB system due to its low power spectrum density.
f. Scalability: Because UWB systems' common design allows computer code to be redefined, allowing them to dynamically trade-off high-data turnout for variation, they are incredibly adaptable.
g. Low Cost Transceiver Implementation: High data rate transmission can be achieved using a low-cost transceiver solution thanks to UWB. Instead of using a carrier, UWB devices communicate with a pulse train. Because UWB is carrier less, transceiver circuitry may be made simple and low power without the need for intermediate oscillators and mixers.

Though UWB is known for its precise location tracking capabilities and has applications in various domains, when it comes to using it for prison security systems there are some challenges and limitations that do occur. Following are some

a. Cost and infrastructure: - The UWB Base Implementation of the prisoner security system will require significant investment in infrastructure, which includes installing UWB transceivers, antennas, and other necessary components throughout the prisoner premises.
b. False negative and False positive: - The UWB system measures the distance between the transceiver and UWB enable devices. While Measuring False positives (Incorrectly identifying an event as a security breach) and False negatives (Failing to detect actual breach) Which will hamper the accuracy of the system.
c. Interferences and obstacles: - Though UWB signals penetrate obstacles like walls and furniture it still affects the accuracy of the system. Physical obstacles like cells, metal bars, etc. do have a heavy impact on signal propagation.

d. Maintenance and Calibration: - The system will require periodic maintenance and calibration which might be neglected by security personnel and could lead to compromised security.
e. Jamming and spoofing: - UWB signals are susceptible to jamming and spoofing maliciously. Someone could interfere with UWB communication or create counterfeit UWB signals to deceive systems.
f. Timing Acquisition and Synchronization: - Timing and synchronization in UWB systems are critical due to the extremely short pulse duration and low transmission power.
g. UWB Networking: UWB-based networks are still in their infancy when it comes to features like MAC layer protocol, best routing algorithms, resource management, and mobility management. For instance, there is disagreement over whether multi-hop or single-hop networks are better suited for indoor networking applications. These are still crucial for additional research. There have been reports of more and more work in this field recently.

Table 1 Comparison of various parameters among different wireless technology

System	Transmission Power	Bandwidth	Power Spectral Density	Range
Bluetooth	**100 mW**	**2.4 GHz**	**2.4**	**10 mt**
2G cellular	**10mW**	**8.33 kHz**	**1.2**	**35 km**
Wlan(802.11a)	**1W**	**20 MHZ**	**0.05**	**45 mt**
UWB	**1mW**	**7.5 GHZ**	**0.013**	**100 mt**

Table 1, shows a comparison of various parameters of wireless technology. Factors that differentiate all these wireless technologies from each other are frequency bandwidth, range and data rate. Each of these wireless technologies operate at standard radio frequency and coverage. Bandwidth in wireless communications encompasses the range of frequencies that a wireless signal occupies. The wider the frequency range the higher the potential of increase in the data transfer rates. The capacity for a wireless communication channel, or the quantity of data that can be delivered over the channel in a specific amount of time, is what is known as the data transfer rate. Usually data transfer rate is measured in bits per second.

An architecture for a GPS tracking system that combines the Global Positioning System (GPS) and the GSM (Global System for Mobile Communications) cellular network to track the location is discussed in paper the [3].

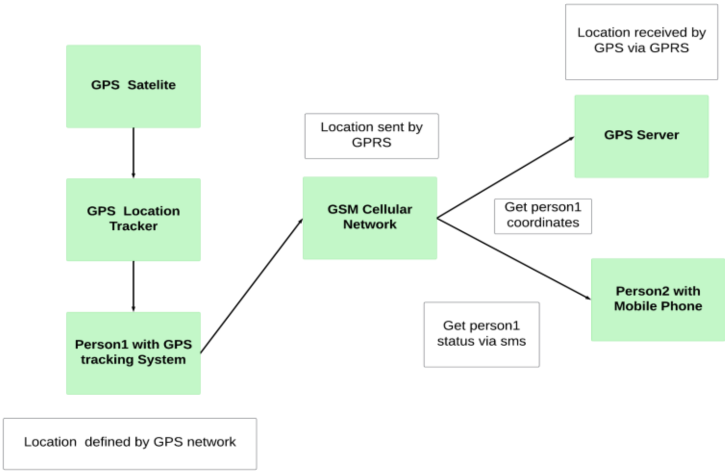

Fig 1. Interaction of modules [3]

The above figure's workflow is discussed below:

a. GPS Satellite: GPS devices can receive location data transmitted by the GPS satellite.
b. Person 1 with GPS tracking system: Through the GPRS (General Packet Radio Service) network, person 1's GPS tracking equipment obtains location information from the GPS satellite.
c. GPS Location Tracker: Using information from GPS satellites, this gadget determines Person 1's exact location.
d. Location sent via GPRS: A GPS Server receives the location information that the GPS Location Tracker has collected and sends it to them via the GPRS network.
e. GPS Server: The GPS Location Tracker sends location data to the GPS Server, which receives and processes it.
f. GSM Cellular Network: This network is utilized to send SMS (Short Message Service) updates and location data.
g. Obtain Person 1's coordinates: Using a mobile device, Person 2 can ask the GPS Server for Person 1's location coordinates, and the server will respond through the cellular network. Through the cellular network, Person2 can also send and receive status updates regarding Person1 via SMS.

To summarize, the system tracks, transmits, and shares location data and status updates between devices and users via SMS, GPRS networks, cellular networks, and GPS technologies.

Paper [3] focuses on the safety and security of the soldiers. The following elements are integrated into the suggested system: GPS tracking to track soldiers' whereabouts i.e. the location coordinates over time, and ESP32 modules are being used to provide wireless communication between the base station and soldiers. Mobile Computers, medical sensors, and communication technologies are examples of M-Health technologies that are used for health monitoring. Intelligent sensors, such as temperature and heart rate monitors, are used to continuously gather soldier's important signs. Bomb detectors and panic buttons are used to identify emergencies. The process includes: utilizing the smart sensors to gather the soldier's vital signs, such as their temperature and heart rate to provide noise-free signals, edge computing is used to process the sensor data on a nearby personal server wirelessly sending the processed data to a cloud-based base station for accessibility and analysis delivering prompt notifications in the event of medical emergencies or enemy contacts to the base station and adjacent troops. GPS tracking soldiers' whereabouts and movements in real time designing the system with real-time data transfer, cost-effectiveness, and efficiency in mind. The usage of ESP32, wireless connectivity, cloud-based software, and sensor integration is highlighted in the study as ways to improve soldier security and safety during combat operations.

The authors propose the installation of an electronic monitoring system to maintain and watch the prisoners' health conditions [4]. The problems detected by the author are the growing number of people incarcerated and the duty of prison guards to constantly supervise, secure, and ensure the safety of the prisoners.
The possibility of prisoners trying suicide, harming themselves, or abusing drugs or alcohol as a result of physical or mental abuse. variety of sensors, including accelerometer, temperature, heart rate, and alcohol sensors, to track the whereabouts, activities, and health of prisoners in real-time. These sensors are part of a system that gathers data in real time and sends it to higher authorities for monitoring and intervention via a Wi-Fi transmitter. along with that author has used a PIC microcontroller for processing the data.

The primary aim of the Paper [5] study is to use a mix of GPS and RSSI (Received Signal Strength Indication) technology to track the whereabouts of inmates and stop them from escaping. The technology tracks the prisoner's location within the prison by using RSSI from a ZigBee wireless network. This is both economically viable and offers a quick reaction. GPS is utilized to track the prisoner's whereabouts based on latitude and longitude in the event that they attempt to escape. Additional aspects of the system allow it to use a neurostimulator to render the prisoner unconscious and to sound an alarm in the event that the prisoner tampers with the Internet of Things (IoT) technology that is used to continuously monitor and update the control room with the prisoner's whereabouts.

The primary issue that the writers from the Paper[6] address in the sources that are supplied is the need to improve patient monitoring and healthcare delivery by leveraging cloud computing and Internet of Things devices. This entails tackling problems such as patients being confined to beds and hooked up to big monitoring machines, the need for physicians and caregivers to be physically present at the patient's bedside, and the unbalanced doctor-to-patient ratio in India. In order to transform healthcare delivery by enabling proactive prediction, diagnosis, and remedies, the suggested solution entails implementing an Internet of Medical Things (IoMT) framework that makes use of a variety of IoT devices and sensors to continuously monitor patients remotely, transmit data to the cloud, and provide real-time access to healthcare providers. Due to its antiquated and remote nature, the current healthcare system suffers from a number of problems, including poor data collecting and processing, misunderstandings, delayed replies, and communication breakdowns. The given solution consists of several components:

A. Textile-based Wearable System Technology: attaching sensors to clothes to track vital indicators continuously.
B. Intelligent Medical Boxes: Using smart gadgets to organize daily drug intake.
C. Cloud Computing Architecture: Making use of cloud computing to provide proactive healthcare services and real-time data interchange.

Paper [7] focuses on the e-Health Monitoring Architecture-based Patients Health Management System offers a number of benefits, drawbacks, and a thorough methodology Approach: E-Health Monitoring Structure: The three tiers of the system's architecture are the E-Health Application and Service Layer (outsourcing services), the Middleware and APIs Layer (cloud storage), and the Perception Layer (sensors).
The perception layer is made up of wearable environmental and medical sensors that gather data in real time. This data is then sent to a processing device and passed through a gateway to the next layer. Several types of sensors utilized in the e-health monitoring system are mentioned in the paper: The patient has medical sensors affixed to measure essential parameters: heart rate inclinometer, Oximeter, sensor for blood pressure, Module for ECG, and thermometer. Also, there are environmental sensors installed in the patient's room and surrounding areas which are Gas detection sensors to ensure the right amount of oxygen, temperature sensors to monitor and regulate the

temperature of a space, piezoelectric sensors in the room and on the bed to identify falls or collapses and to determine whether the patient is in bed. The patient wears a central transceiver unit that receives raw data wirelessly from these sensors. This unit converts the unprocessed data into useful metadata, which includes the unit of measurement, timestamp, feature of interest, and parameter type. After processing the metadata, the central transceiver unit transmits it to the room's central base station, which serves as a gateway to deliver the data to the cloud storage in Layer 2 of the architecture.

The Middleware and APIs Layer is the backbone of the system. It consists of cloud storage for patient data storage, APIs for creating and analyzing profiles, and data relays to the E-Health Service Capability module.

The benefits that were highlighted by the author were:- Real-Time Monitoring: Using wireless networks of sensors and intelligent gadgets, the framework enables real-time patient health monitoring, Remote monitoring makes it possible for medical professionals to keep an eye on patients from a distance, allowing for prompt interventions and ongoing care, Enhanced Diagnosis: This technique expedites the diagnosis of illnesses by concurrently monitoring several factors, which improves diagnostic accuracy and efficiency, Privacy and Security: To ensure data confidentiality and security, the system gives an option to access the data on cloud storage by only patients and their belongings selectively, Cost-effective: Lowers system costs overall by using cellphones to transmit data over the internet. E-Health Application and Service Layer: Provides patients with services such as E-Health Advice, which is a medical advice and prescription service based on data collected from sensors. Security Measures: To protect patient data and system integrity, the system uses digital signatures, encryption, and secure communication protocols to assure confidentiality, integrity, authenticity, and non-repudiation.

Moreover, the author has listed some of the drawbacks of their model that are:- Complexity i.e. it can be difficult to strike a balance between the quantity of parameters to monitor, cost, complexity, and system reliability, Resource-Intensive: On-server processing is better suited for some applications because it necessitates large amounts of memory, throughput, and processing time, Security Issues: Maintaining the integrity of the system and preventing unwanted access to patient data require end-to-end security.

Reference s number	Problem statement	Solution	Result and conclusion	Outcomes
1.	the study on Ultra-Wideband (UWB) systems	emphasises the technological difficulties, benefits, limitations, and potential uses of UWB technology in a variety of applications.	UWB has several advantages over conventional systems, including high data rates, low power, low cost, robustness to multipath fading, and ability to coexist with other wireless technologies	While UWB technology is still maturing, it holds many challenges and drawbacks for implementing it in the proposed system.
2.	To build IOT based solution for prisoner escape alert and prevention system	paper proposes two IoT-based approaches a.Light source based approach using laser and LDR sensors b.Geofencing using GPS	the Light source-based approach does not provide exact spatial coordinates while gps approach does provide precise coordinate	The paper concludes that the geofencing approach using GPS is more feasible as it provides the prisoner's location even if they escape the prison
3.	designing an effective remote health monitoring system	enable remote monitoring of patients, through sensor integration, to improve diagnosis and provide faster emergency response. It uses smart devices as gateways to reduce costs and is designed to be suitable for rural areas with limited healthcare infrastructure	The architecture presented in the sources offers a comprehensive remote health monitoring system with a focus on functionality, services, security, and real-life applications to enhance patient care and emergency response.	Use of proper sensors and integrating it with the cloud enhances more features at the server side as well as helps in making a cost effective model.
6.	To design Patient Health Management System using e-Health Monitoring Architecture	It utilised a multi-layered approach that integrated various components to enable remote health monitoring and emergency response services.	Through this paper Integration of services like Real Time Health Advice and Action (ReTiHA) and Parent monitoring for people with their family living abroad.	Overall the architecture provides a cost-effective and efficient solution for monitoring patients in various scenarios, enhancing diagnosis, emergency response, and patient care.
7.	The problem addressed in the paper is the difficulty in marketing wireless sensor and actuator networks (WSANs) for healthcare applications.	The paper discusses the concept of telecare kits, such as Tunstall's ADLife, which consist of sensors and devices that can be connected wirelessly to a control box.	discusses the concept of autonomous sensor networks and their applications in various fields, particularly in healthcare.	the need for continuous technological advancement, robust legal and ethical frameworks, user-friendly device design, tailored protocols, and innovative applications to realize the full potential of Body Area Networks in healthcare and beyond.

3. PROPOSED SYSTEM & METHODOLOGY

On the basis of the conclusions of the literature survey, we have proposed a system. The systems' overview is displayed and briefly explained. The block diagram shows the intricate design of the system, with a central processor serving as its key component and supporting modules including GPS, GPRS, and GSM in addition to antennae. The GPS module offers exact location monitoring, while the CPU acts as the brain that plans and directs activities. The GPRS and GSM modules work together to facilitate smooth wireless connectivity and real-time data sharing. This network of networks, which is supported by antennae, ensures strong connectivity and efficient operation in a range of domains, offering dependable performance and simplified functionality in a wide range of applications.

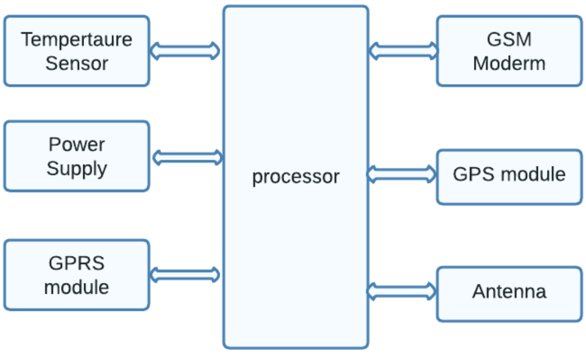

Figure 2: proposed system Block diagram

The proposed system for Prisoner Health and Position Tracking entails a comprehensive hardware setup to facilitate precise tracking, wireless communication, and real-time health monitoring of prisoners within correctional facilities. The methodology involves the integration and utilization of specific hardware components to achieve the system's objectives effectively.

The hardware setup begins with the inclusion of the Neo 6M GPS Module within the wearable devices assigned to each prisoner. This module serves as the cornerstone for location tracking, receiving signals from GPS satellites to determine the exact geographic coordinates of the wearer. By continuously updating the position data, it enables accurate monitoring of prisoner movements within the facility.

The technology integrates a GSM Module into the wearable devices in addition to the GPS module. Through its connections to cellular networks, this module enables wireless communication and the smooth transfer of data to the central monitoring system. Real-time updates on the status and whereabouts of prisoners are provided by the transmission of location and health data packets via the GSM module.

The LM35 Temperature Sensor is integrated by the system into the wearable devices to monitor the convicts' health indicators. The inmates' body temperatures may be continuously monitored thanks to this sensor's real-time temperature measurements. Through the acquisition of this crucial health information, the system guarantees prompt action in the event of any irregularities or crises.

In addition, the hardware configuration comprises antennas that are necessary for appropriate communication with cellular networks and GPS satellites. By maximizing signal reception and transmission dependability, these antennas guarantee continuous data transfer between the wearables and the central monitoring system.

All in all, the process involves the painstaking incorporation and application of hardware elements in order to achieve a strong Prisoner Health and Position Tracking System. Ensuring efficient surveillance and control of convicts within correctional facilities is made possible by the system's exact location tracking, wireless connection, and real-time health monitoring.

A. Software setup

The program's starting is indicated by the "Start" block at the top of the flowchart. The Arduino then initiates communication with three devices in the "Setup" block: the GSM module itself, the GPS module (which receives commands via the GSM module), and the serial monitor for debugging. This guarantees that data flows between these components correctly. After setup, the software goes into an endless loop. Here, a decision block determines whether the GPS module has any data accessible. If data is available, a "Read data from GPS module" block is used by the programme to retrieve it. In a subsequent decision block, this data is analyzed to determine whether it starts with "$GPGGA," a particular code that denotes accurate GPS data. In the event that the data begins with "$GPGGA," the application moves into a processing section. Here, the incoming data string is divided into smaller sections using a "Split data into an array" block, with commas used to separate various GPS details. The particular latitude and longitude values are then extracted from this array using separate blocks. After we extract the data from the GPS module we will have to read the data from the heart sensor. The data which we have got from the heart sensor is sent via an SMS. A Heart rate sensor is used basically for health monitoring and can be further used for monitoring the actions of the prisoner in case he removes it from his band.

The programme calls the "Send SMS" block after gathering the required data (latitude, longitude, and heart rate). This function, which is simplified to a single block, probably requires multiple steps. It may set up the GSM module to transmit SMS, compose a message string with the information it has obtained, and use the GSM module's features to send the SMS to a specific phone number. After the message is sent to the user, check whether the coordinates received are of the prison area, if not alert the central server with the same.

The software eventually reaches an "End" block, which denotes the end of a loop cycle, following the SMS's sending. The software then starts over at the beginning of the loop, analyzing and maybe delivering SMS updates if there is new GPS data that is available.
The program's logic is broken out step-by-step in this flowchart, which makes it simpler to comprehend how it gathers GPS data, measures heart rate, and delivers SMS updates with this combined data.

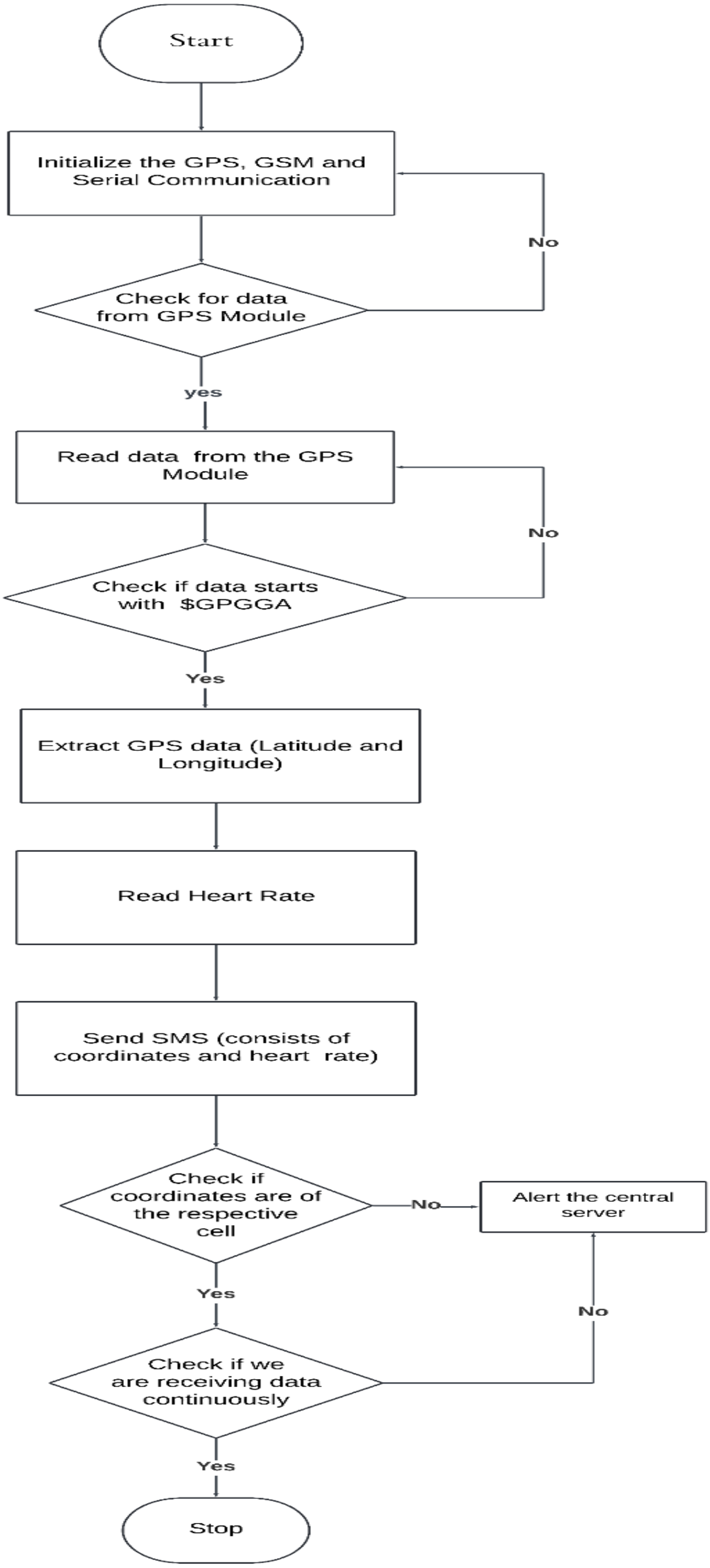

Fig 3. Flowchart of code

4. RESULT AND DISCUSSION

Several advantages come with implementing a prisoner monitoring and tracking system, such as heightened safety, increased operational effectiveness, and greater regulatory compliance. Through the use of GPS technology and real-time monitoring tools, authorities are able to enforce restricted areas, locate prisoners with accuracy, and react quickly to any unauthorized movements. These systems also give authorities beneficial knowledge for analysis and decision-making, allowing them to better allocate resources and enhance overall security and oversight in correctional facilities. However, in order to guarantee the effective deployment and adoption of these systems, issues like privacy concerns and technological constraints need to be resolved.

Table 2 Overall analysis of the GPS Module

Parameter	Performance
Accuracy	85%
Update rate	90%
Signal Strength	-125dBM
Coverage area	5-6 m

The degree to which the measured position on Earth's surface corresponds to the genuine position is known as accuracy in GPS. Accurate position data is essential for any GPS-enabled gadget since it directly affects the device's dependability and efficiency. Numerous elements, including atmospheric conditions, satellite geometry, signal multipath, and receiver quality, can have an impact on GPS accuracy. By employing a stationary ground station to provide correction signals to neighboring GPS receivers, differential GPS (DGPS) approaches can improve accuracy by lowering mistakes brought on by elements such as atmospheric distortion. Consumer-grade systems typically have accuracies within a few meters, although high-precision applications like surveying may need centimeter-level accuracy. Currently, the model that we have used has an accuracy of 85%.

Update Rate is the frequency with which the GPS module determines and transmits the device's position is referred to as the update rate, sometimes called the refresh rate or sample rate. It establishes the frequency at which fresh location data is released and is measured in Hertz (Hz). For applications like fleet management, sports monitoring, or navigation that demand real-time or dynamic tracking, a faster update rate translates into more frequent position updates. It's crucial to balance the update rate with the limitations and requirements of the device, though, as raising the update rate can have an adverse effect on processing speed and power consumption. The update rate for this model is 90%.

Signal Strength is the strength of the GPS signals that the gadget receives from satellites as indicated by the signal. It has a significant impact on GPS performance because precise and consistent location requires a strong signal. A number of variables, including the quantity and location of satellites that are visible, the state of the atmosphere, and obstacles like trees or buildings, can affect signal strength. Signal strength may be lower in populated areas or places with a lot of foliage, which could result in poorer GPS performance or a loss of signal lock. Signal strength measurements are commonly shown by GPS receivers, allowing users to evaluate the quality of satellite reception and make well-informed judgments regarding positioning accuracy. Generally -80 to -89 dBm is considered a good signal, -90 to -99 dBm is considered an average signal, -100 to -109 dBm is considered poor signal and -110 to -120 dBm is considered a very poor signal. The GPS module that has been used here has a signal strength of -125dBm

The geographic area within which a GPS module can receive signals from GPS satellites and identify its position is referred to as its coverage area. With a clear line of sight to a sufficient number of satellites, GPS operates globally, offering coverage almost anywhere on Earth. However, the terrain and surroundings might have an impact on how well GPS performs. GPS reception is usually very good in open spaces with good sky visibility, providing precise location. On the other hand, GPS signals may be weaker or blocked in indoor spaces, densely forested areas, or urban canyons, which could result in decreased accuracy or signal loss. By supplying more data, improvements like augmented systems and assisted GPS (A-GPS) can increase coverage and accuracy in difficult conditions. The coverage area of this module is 5-6 m.

By entering the coordinates in the Arduino IDE and selecting the relevant GPS package, a virtual fence may be formed. Spatial coordinates are extracted using the GPS get position() function and validated with a gated region.

The prisoner remains within the prison if the retrieved coordinates are inside the gated area's perimeter. If not, officials would be alerted as soon as a prisoner attempted to escape by providing their ID and present location. The solution based on geofencing is seen as beneficial as it offers location data even in cases where the inmate has escaped from custody.

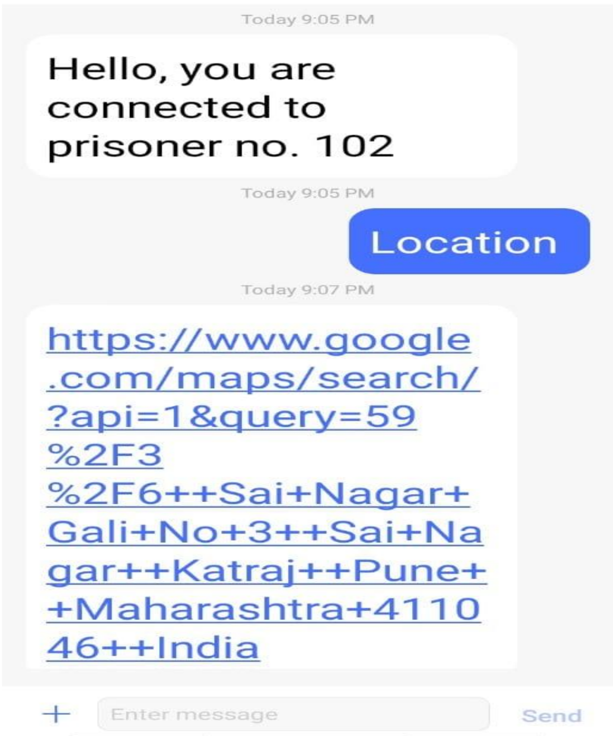

Fig 4. Message received at server side

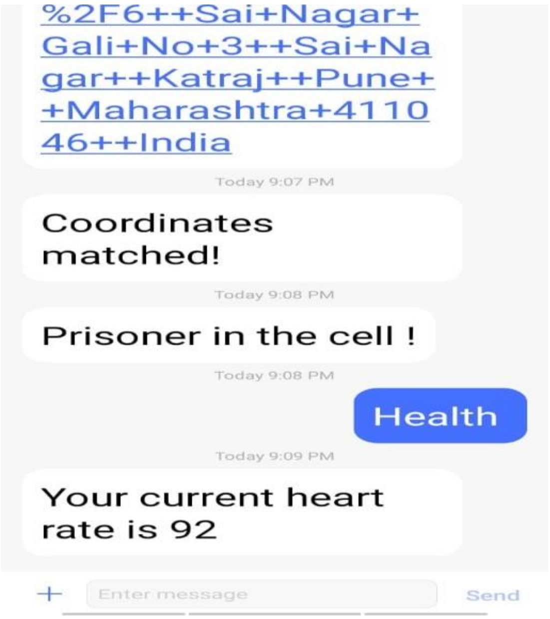

Fig 5. Heart rate of the prisoner received at the server

The outcome of the model that we proposed in our paper is shown in Fig. 4. We initially received a notice about the prisoner and central server establishing a connection. Subsequently, the server will transmit a location message in order to obtain the prisoner's coordinates. Following that, we obtain the prisoner's Google Maps coordinates. Subsequently, if the coordinates are calculated correctly, we are notified that the prisoner is within his cell and that the coordinates match (Fig. 5). Finally, we are given the prisoner's heart rate.

5. Conclusion

To sum up, the Prisoner Health and Position Tracking System offers an all-inclusive way to improve security, supervision, and health monitoring in prisons. By incorporating temperature sensors, GSM communication, and cutting-edge GPS technology, the system successfully tackles the difficulties related to prisoner management. The outcomes show how well the system can track inmate movements in real-time, giving exact location information and facilitating quick action in the event of unauthorized activity. Furthermore, the technology provides smooth wireless connectivity, guaranteeing constant transfer of critical location and health data to the central monitoring system. The addition of temperature sensors also makes it possible to continuously monitor the health characteristics of the convicts, which makes it easier to identify health problems early and take prompt action. Across the future, the system may undergo additional optimization and improvement, which could increase its possible uses across a range of correctional settings and improve its capabilities. Also, advancements can be made to the processing unit for more processing power and to maintain its performance at scale. Also, there is scope to reduce the size of the tracking module with the usage of compact and durable modules of GPS and GSM. The Prisoner Health and Position Tracking System, which uses technology to expedite communication and monitoring procedures, is an important tool for updating and enhancing the care of those who are detained.

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