

# A SMART GSM BASED HANDCUFF ALERT SYSTEM

KATHIRVEL.M.V<sup>1</sup>, KAILASH.J.B<sup>2</sup>,

JOTHISWARAN.A<sup>3</sup>, HARIKRISHNAN.G<sup>4</sup>

GUIDE: SUMATHY.V | [sumathy.v@rajalakshmi.edu.in](mailto:sumathy.v@rajalakshmi.edu.in)

Department of Computer Science and Engineering  
Rajalakshmi Engineering college, Thandalam, Chennai.

[kathirvel.mv.2017.cse@rajalakshmi.edu.in](mailto:kathirvel.mv.2017.cse@rajalakshmi.edu.in) | [kailash.jb.2017.cse@rajalakshmi.edu.in](mailto:kailash.jb.2017.cse@rajalakshmi.edu.in) |  
[jothiswaran.a.2017.cse@rajalakshmi.edu.in](mailto:jothiswaran.a.2017.cse@rajalakshmi.edu.in) | [harikrishnan.g2.2017.cse@rajalakshmi.edu.in](mailto:harikrishnan.g2.2017.cse@rajalakshmi.edu.in)

## ABSTRACT

*In today's world, with the rapid urbanization on one side and the deteriorating poverty line on the other, the crime rate is on a steady hike. Be it a petty criminal, a white-collar criminal or a dangerous criminal, each of them deserves their own corresponding punishments. It's usually said that "Even a thousand criminals can escape, but a righteous person should not be convicted." But why to let those thousand criminals to escape too? The proposed paper will give a way using the handcuffs to send immediate alerts to the police control room if a criminal has fled from them. The control room can also immediately send a fax of the criminal's details to the nearby police station under whose jurisdiction the escapee's current GPS location is. The escapee's pulse rate is monitored using the Heartbeat sensor and once the pulse rate exceeds the predefined threshold rate, 180 bpm, the criminal is declared as escaped and his location is transferred in constant intervals to the control room.*

**Key terms:** Handcuff, Alert system, GPS tracking.

## 1. INTRODUCTION

In recent years, there has been a fair jump in the escape of criminals from police custody. There was 319% increase in the escape of the accused people just in 2013[1]. With 1169 prisoners hoodwinking men in khaki in 2013 the year has seen more than thrice the number of criminals escaping from police custody as compared to 2011 and 2012[2]. In 2012, the number stood at merely 279

while in 2011 it was 322.

According to latest data from National Crime Records Bureau, NCRB, almost 80% of these escaped while being taken to court or in transit from one police station to another [3].

The long-term objective of this proposal is to eradicate or immediately track down this 80% of the criminals who escape from the police during these intermediate journeys [4]. Hence, to maximize the benefits of using communication systems to track them down that can be achieved through the integration of sensors to on-board of their handcuffs [5]. The infrastructure should be supported by intelligent systems capable of estimating the proximity of the escapees and automatic deployment of actions [6]. The criminals who escape would have escaped from the already convicted crime and may be responsible for more crimes down the road and this can be prevented in the earliest stage by the automatic detecting and alert system [7, 8]. In this paper, we take advantage of the GSM technology and IoT concepts to collect precise information about accused's current location that is immediately passed on to the cops to hunt him down. The following disadvantages are overcome by the implementation of this proposal:

- The lethargy in re-arresting the escapees
- The resources spent in finding the dangerous criminals who fled

The work is intended to estimate the fast and accurate location of the guilty, based on the precise information with the help of proposed prototype on off-the-shelf devices and validate it at the Police Modernization Division, under the Home Ministry of India, which does

- Standards-based testing and conformity assessment
- Comparative evaluations.

## II. SYSTEM ARCHITECTURE

The sensors installed in handcuffs collect data available when criminals start to run. The collected data are structured in a packet which is forwarded to a remote control unit through wireless communication. The work determines the most suitable set of resources in the arrest back operation to estimate his proximity immediately and is limited by the data automatically retrievable, omitting other trivial information. Fig. 2.1 shows the system architecture. Advantages of proposed system are

- A fast and accurate estimation of the proximity of the escapee.
- The immediate re-arresting of the escapee.

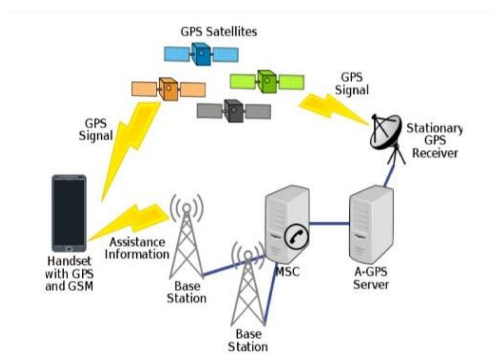
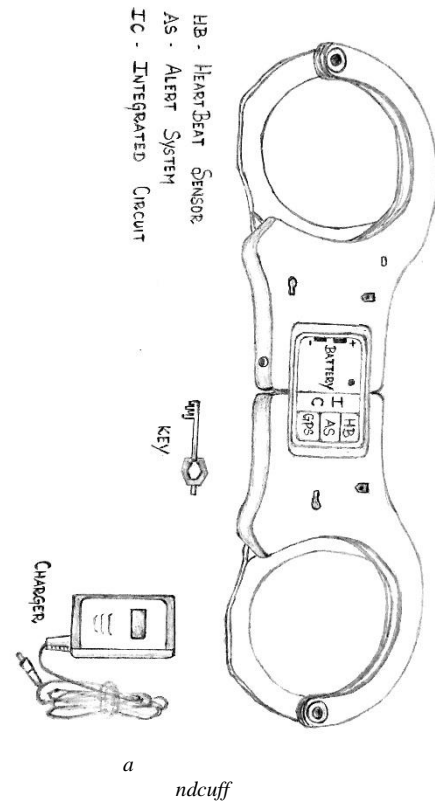


Fig. 2.2. Information flow diagram



## 2.1 MODULES

### 2.1.1 RECEPTION/INTERPRETATION

When the criminal convict escaped from the police, the first step of the handcuff is to track the location using GPS tracking sensor and send the location to control room and nearby jurisdiction, then the heart beat rate of the criminal is automatically send to control room by using heartbeat/pulse detecting sensor.

### 2.1.2 GPS SENSOR

In general, when police authorities and law enforcement agencies need to monitor movement of some accused person or when an accused or a criminal is prohibited from moving out of a particular geographical system, it is very difficult to keep a constant watch on the accused. The GPS receiver is used to receive the current position of the user and the GPS system uses the satellites to find out the position of the device. The positions are sent in the form of latitude and longitude.

### 2.1.3 HEARTBEAT MONITORING SENSOR

Here, we see how the heartbeat sensor measures the pulse of the criminal. Our heartbeat sensor consists of a light emitting diode and a detector like a light detecting resistor or a photodiode. The heart beat pulses cause a variation in the flow of blood to different regions of the criminal body. When a tissue is illuminated with the light source, i.e. light emitted by the led, it either reflects (a finger tissue) or transmits the light (earlobe). Some of the light is absorbed by the blood and the transmitted or the reflected light is received by the light detector. The amount of light absorbed depends on the blood volume in that tissue. The detector output is in form of electrical signal and is proportional to the heart beat rate. The heart beat sensor is integrated with the alert system, so the heartbeat sensor transmit the data to alert system.

### 2.1.4 BATTERIES USED IN HANDCUFF

The 12 volts battery (lithium-ion) is integrated with the alert system. A rechargeable battery in which lithium ions moves from negative electrode to the positive electrode during discharge and back when charging.

It has energy density of 250-693W-h/L and nominal cell voltage is 3.8V. And it has specific energy of 100-265W-h/Kg. Battery life is depend upon the number of full charge-discharge cycles before significant capacity loss. Inactive storage may also reduce capacity.

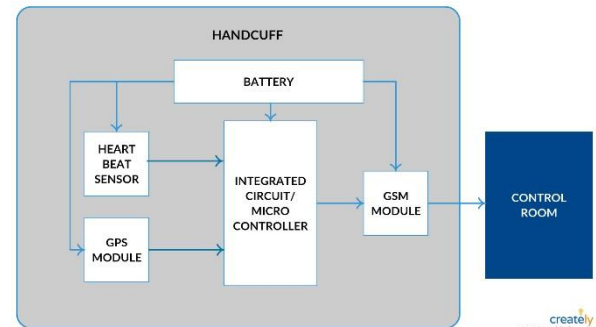


Fig. 2.3 Internal Architecture

## 3. ALERT WARNING SYSTEM

The heartbeat sensor present inside the handcuff monitors the heartbeat of the criminal all day long. It also contains a threshold limit monitor that checks for the heartbeat inside the threshold limit. Here the threshold limit is 180bpm. Once the heartbeat crosses the limit, it immediately triggers the alert system. The alert system in turn triggers the GPS sensor to fetch the current location from the nearby cell phone tower to which it is connected and returns the latitude and longitude coordinates which is forwarded to the control room via the GSM module. The location is updated every two minutes and the details are forwarded immediately so as to not lose track of the criminal in case of any system failure.

Also, this GPS sensor will be monitoring the change of locations until it is manually triggered to low. From the Control unit, the details of that particular criminal is sent immediately as fax to nearby police stations which is analyzed by the coordinates from the signal.



*Fig. 3. Alert to control room*

### **3.1 GSM MODULE**

GSM module is used to send / receive messages and make / receive calls as a mobile phone a SIM card from network source. The module uses the SIMComm function. It is able to communicate easily with the module through AT commands. GSM library contains several methods of communication with the module. The GSM modem can work with any GSM network operator SIM card like a mobile phone with its own unique telephone number. The advantage of this modem is the RS232 interface can be used to communicate and develop integrated applications. Control applications such as SMS, data transmission, remote monitoring and recording can be easily developed with this. The modem can be connected directly to the serial port of the PC or to a microcontroller via MAX232. It can be used to send / receive SMS and make / receive voice calls. It can also be used in GPRS mode to connect to the Internet and run many recording applications and data control. With a simple configuration, it can be used in almost all space requirements in their application, especially for the application of slim design and small size.

### **3.2 GPS RECEIVER MODULE**

Global Positioning System (GPS) is a satellite-based system that uses satellites and ground stations to measure and compute its position on Earth. GPS receiver needs to receive data from at least 4 satellites for accuracy purpose. GPS receiver does not transmit any

information to the satellites. GPS receiver uses a constellation of satellites and ground stations to calculate accurate location wherever it is located. These GPS satellites transmit information signal over radio frequency (1.1 to 1.5 GHz) to the receiver. With the help of this received information, a ground station or GPS module can compute its position and time. GPS receiver receives information signals from GPS satellites and calculates its distance from satellites. This is done by measuring the time required for the signal to travel from satellite to the receiver.

## **III.CONCLUSION & FUTURE WORK**

Thus, this novel intelligent system which is able to detect the guilty automatically if they escape from the cops and notify the control room right away based on the concept of proposed inference system is developed and tested successfully. Our system considers the most relevant variables that can characterize the escape (the proximity of the escapee, the nearest police station, the charge in the handcuffs, etc.).

The proposal can be implemented on a large scale, in every police station across the state, country and eventually across the globe. The thickness of the handcuffs in the middle portion can be more refined and optimized for a slimmer version of this handcuffs. The expenses can be further brought down in the upcoming years by using cost effective sensors and batteries. The handcuffs can be deployed immediately after proper testing.

## **ACKNOWLEDGMENT**

This research was supported/partially supported by Kumar. C, Head of Department, Computer Science. We thank our colleagues from Rajalakshmi Engineering College, Chennai, who provided insight and expertise that greatly assisted the research, although they may not agree with all of the interpretations/conclusions of this paper. We thank Sumathy. V, Assistant Professor, Rajalakshmi Engineering College, Chennai for assistance for comments that greatly improved the manuscript.

## REFERENCES

1. <https://timesofindia.indiatimes.com/india/319-jump-in-criminals-escaping-from-police-custody-in-2013/articleshow/38287729.cms>
2. El-Medany;Al-Omary ; Al-Hakim, "A cost Effective Real Time Tracking System Prototype Using integrated GPS Module", Wireless and mobile Communications (ICWMC), 2010 , 6th International conference. Sept 10. International Journal of Computer science, Engineering and Application (IJCSEA) vol.3, no. 3, June 2013.P.Currian, C. de Silva, and B. Van de Walle, "Open Source Software for Disaster Management," Comm. ACM, vol. 50, no. 3, 2007, pp. 61–65.
3. Notten, P., Hetzendorf G.,Riemschneider K.-R.:Arrangement and Method for Monitoring Pressure within a Battery Cell; EP1856760B1,US2008097704A1,W O2006 077519A1, N100533845C u.a.
4. LIU Zhengyao,Qilu, DAI Jiakun, LI Yang, "Research on Li-ion Battery Management System", Acta Scientiarum Naturalium Universitatis Pekinensis, no. 42, pp.71- 76,Dec.2006.Takawira J.Mumanga, Rodolfo M.Martinez and Michael F. Grobler ,” Smart Emergency Response Interface for Fire Detection”, IEEE Xplore, AFRICON,2015

