

Access Control & Security Alarm System for BTS Management with Microcontroller

W.S.R.M.Charls Karawita^{#1}, Dhishan Dhammearatchi^{*2}, Rajeewa De Silva^{*3}

[#]*Department of Information Technology, CINEC Campus
Millennium Drive, IT Park, Malabe, Sri Lanka*

¹ckarawita@gmail.com

²dhishan.dhammearatchi@cinec.edu.

³rajeewa.dr@gmail.com

Abstract — This paper describes the design of Microcontroller based security and Access control system for use in Mobile base station premises. The system combines Microcontroller technology and Mobile Network to accomplish the required task. When the Visitor sends Short Message Service (SMS) to the centre office, the Centre office detects a mobile number, and then the system captures the user image and scans the database for a match. If both the Database image and captured image belong to a registered user, access is granted. When an unauthorized user opens the base station door without permission from centre office system turns on the alarm and the system captures the unauthorized user image. That system captures and sends the unauthorized user image to the centre office and the system turns on the alarm.

Keywords— Mobile Base station, Access control, Microcontroller, Camera, Email

I. INTRODUCTION

More than ever, the security of your facilities is essential. In the past, door locks and alarm systems were the only options to keep your property safe. After handing over the keys to the employees, the maintenance, and sanitation staff, everyone accessed the building 24/7. Each time the keys were lost, the business owner had to pay the cost of recovering the locks.

Accessibility is an efficient and affordable option to ensure its installation. With an access control system, it is possible to avoid unauthorized visitors, manage the accessing of employees and, restrict access to certain areas of your property. Access control systems can be adapted to the 41 needs of your business in terms of performance, flexibility, and cost. You can determine the level of security based on the right balance between safety and convenience for you and your employees.

With access control protection, you will know who enters your business, when they enter, and what door they used. Using the reporting interface, the viewer will receive detailed reports and reports of all activities within your facilities. In addition, you can designate protected areas and make them available only to authorized employees.

To overcome this security threat, a security system using microcontrollers and GSM technology has been proposed. This system is an access system based on a controller so that only the authorized person can access the locker using microcontroller technology.

II. LITERATURE REVIEW

The protection of telecommunications systems is an important case study for several reasons. First, many

distributed systems rely on the underlying fixed or mobile phone network in ways that are often not obvious.

Mobile network operators are spending millions of rands on replacing stolen batteries and on security following a spate of vandalism at their cell phone tower sites. Tower vandalism is a significant issue affecting not only operators but also consumers whose service may be cut off completely in some areas. Each theft incident can result in the network in that area being down for days and can severely affect businesses and individuals. “If a battery has been stolen, there is no backup, and when sites are broken into, the vandalism often means that it increases the repair time. There is a risk that if the thefts are not contained, the additional costs incurred could be passed on to the consumer, as the cost of battery replacement and tower repairs continues to escalate. Operators say battery theft is an issue of national concern, but certain areas appear to be hot-spots for criminal activity.” [1] [2].

One of the technological ironies of our time, in the research group opinion, is the fact that nearly every person in the world now owns a cell phone and desires good cell phone coverage when they want to make a call, send a text or connect to the Internet.

Recommended Cell Tower Security Steps

- **Camera Surveillance:** All cell towers should be monitored remotely by camera; intelligent software and backup live personnel should be used.
- **Power and Battery Monitoring:** Similar to the situation with generators above, cell towers are critical infrastructures, which also require battery backup in the case of a power outage. These backup batteries and power to the cell station itself should be monitored remotely to ensure continuous operation of the cell tower.
- **Perimeter Defense and Access Control:** Last but not least, it is very important to include several layers of physical security to monitor and protect these important assets. A general perimeter intrusion system is required, as well as additional measures that monitor and secure the most attractive and vulnerable assets such as batteries, fuel supplies, and generators. A high-tech padlock solution such as the High-tech Access control system can add significant confidence that your most important assets are accessed only by authorized

personnel, as well as adding the capability of tracking and reporting on such access on a long-term basis.

A literature survey was carried out to gain information and knowledge. Before starting with the analysis and design of the project, many research papers, manuals, documents related to the concept of the project were referred. [3] [4]

III. METHODOLOGY

Remote site customers must ensure that the service is available when mains power is lost. The availability of services in the event of major power outages is already achieved through the use of 12V lead-acid batteries, which are attractive to criminals because of their resale value and lead recovery.

To avoid this problem, we can use this access control system.

- Can identify who has open the BTS door
- Can build up access database with Date & Time
- Can access denning unauthorized person

A. Identifying Business Values

Crime syndicates are increasingly targeting the bases of South African mobile operators, stealing or destroying critical infrastructures such as batteries, copper cables, and diesel. Hundreds of millions of mobile operators were lost due to theft and destruction of this infrastructure. Destructive and theft rates, especially several recurring events, sometimes forced operators to give up key locations due to the cost of compensation, which in some areas adversely affects network availability or quality.

Because cell towers are attractive targets for thieves and vandals, sophisticated technology must be used to track attacks and generate real-time alarms that trigger these events. There are many reasons why cell tower security should include strict physical security measures. There is a lot of diesel theft, vandalism, copper wire theft, and battery rod, especially in emerging markets. Therefore, it is important to protect wireless access points and cell towers with remote camera cameras, remote security personnel, and other measures. Intelligence detection software can be used for tracking.

B. Feasibility Analysis

The need to develop a cost-effective surveillance system through innovative technology immensely influenced the development of this project. This project will design and implement a security system based on the Raspberry Pi microcomputer. When the visitor opens the BTS door, activate a camera to take a picture and then send an alert to the facility owner through electronic mail plus an image attachment.

The next step is to assess whether some devices are more vulnerable than others. Another factor to consider is whether you think you are suffering from employee theft or theft by outside employees. This can affect employee performance device decisions. Your general geographic location may also influence the technology and machinery that best suits you.

C. Operational Feasibility

In this Telecommunication Mobile Site, a security system has been designed that has a special feature and which make a notification. This project deals with the design & development of a theft control system for Mobile Telecommunication Site, which is being used to prevent and Access control. The developed system makes use of an embedded system (comprises an open hardware microcontroller and a GSM modem) based on Global System for Mobile communication (GSM) technology. [5] [6]

D. Analysis and Requirement Gathering

A basic analysis of your situation will help you determine what kind of equipment you have and how and where you use it. If your equipment or parts are too far away for attachment, such as highway maintenance, stealing most equipment on weekends or at night, your solution should focus on both equipment and the workplace. The techniques discussed in this series are typically used in equipment rather than in premises.

The next step is to assess whether some devices are more vulnerable than others. A good thief target is a moving and relatively valuable asset, and Battery Bank Steers is a good example and is at the top of the 10 most stolen products. Another factor to consider is whether you think you will be the victim of employee theft or theft from outside employees. This can affect employee performance device decisions. Your general geographic location may also influence the technology and machinery that best suits you.

E. Design

The main idea of designing the microcontroller based digital lock locking system is to provide many modern security features than the mechanical lock.

The software application and the hardware implementation help the microcontroller read the messages sent by the user from a mobile phone or send messages to the mobile phone through the modem and accordingly change the status of the required Door lock (IN/OUT).

It works as following. [7]- [8]

1) Access Control using AT Commands: (Authorized Person)

- Send SMS to the center office using "IN" commands.
- Check the SMS & compare with the database. After that, Open the Door.
- Center office open Door using AT commands.
- Send Door open notification using Door sensor.
- Take a picture from Hide camera
- Save the picture at SD card & send to center office mailbox using 3G Dongle.
- After work is done, sends SMS to center office using "OUT" commands.
- Check the SMS & compare with database. After that, Close the Door.

2) Without Access permission (Unauthorized Person):

- Send Door open notification using Door sensor.
- Take a picture from Hide camera

- Save the picture at SD card & send to center office mailbox using 3G Dongle.

The data process has been indicated through Fig. 1 and the architecture design has been indicated in Fig. 2.

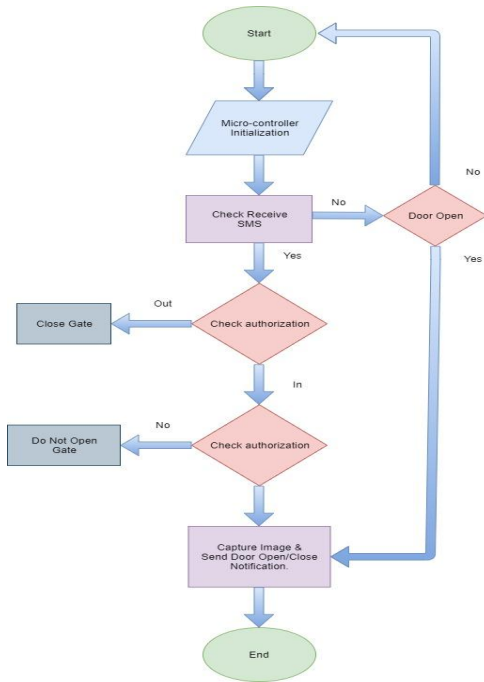


Fig. 1 Designed System

Access control systems are played a major role in telecom or IT environment where network equipment is run reliably for years over years. It has protection against Battery thieves.

In this Telecommunication Mobile Site, a security system has been designed that has a special feature and which make a notification.

This project deals with the design & development of a theft control system for Mobile Telecommunication Site, which is being used to prevent & Access control. The developed system makes use of an embedded system (comprises an open hardware microcontroller and a GSM modem) based on Global System for Mobile communication (GSM) technology.

- Control visitors using Authorized & Unauthorized.
- Image capturing who enter the Mobile base station.
- Any theft attempt Door Alarm Notification & Image capturing.
- Mobile base station Door Alarm notification.
- Create who enters the mobile base station & Site access Database.

The implemented circuit and the access control have been indicated through Fig. 3 and Fig. 4.

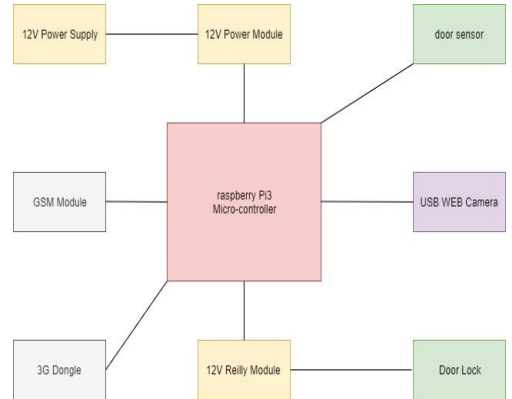


Fig. 2 Architecture Design

F. Implementation

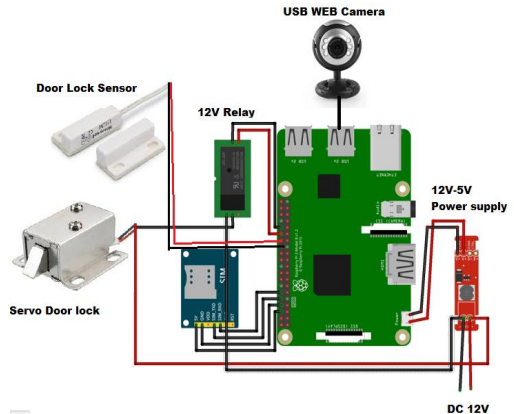


Fig. 3 Implementation Circuit Diagram



Fig. 4 Installation of the Access control system.

G. Testing

Authorized Employee access the base station.

- Mobile Telecom employees visit the Mobile base station & send the IN command using the mobile Application.

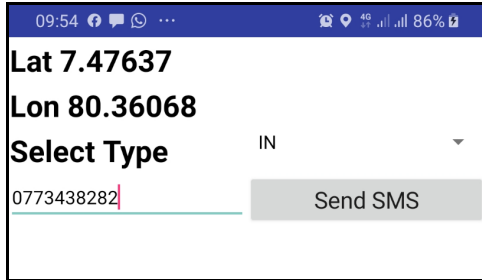


Fig. 5 Send IN Command using mobile application

- Mobile application sent the message to centre office and check the authentication with centre office database

EMP No	Employee Name	Mobile number	Picture
1	Charls Karawita	714177803	
2	Supun Pabasara	719302398	
3	Ishanka Dilshan	714541044	

Fig. 6 – Employee register database

- Servomotor will open the lock when employees register with the database.
- Magnet door sensor will send the door open signal to the raspberry web camera capture the visitor image.
- After work is done, Mobile Telecom Employee Mobile base station & send the OUT command using the mobile Application.
- Servomotor will lock the door.
- Magnet door sensor will send the door close signal to the raspberry Web camera capture the door lock image.

When an unauthorized visitor opens Mobile base station, Magnet door sensor will send the door open signal to the raspberry Web camera capture the visitor image.

H. Result and Discussions

According to project activities after constructing the circuit, testing was done.

Magnet door sensor will send the door open signal to the raspberry Web camera to capture the visitor image.

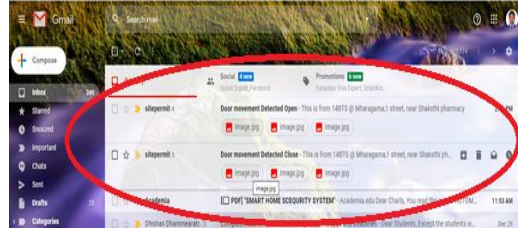


Fig. 7 Incoming Mail Alert or URL fully in Regular font

Magnet door sensor will send the door close signal to the raspberry Web camera capture the door lock image.

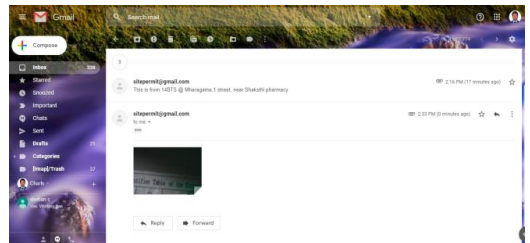


Fig. 8 Captured door close image

When an unauthorized visitor opens Mobile base station,

- Magnet door sensor will send the door open signal to the raspberry Web camera capture the visitor image.

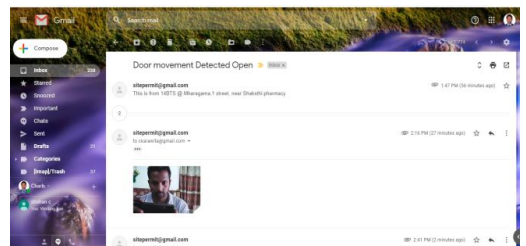


Fig. 9 – Captured Unauthorized visitor image

IV. FUTURE WORKS AND CONCLUSION

As per the future enhancements of this project, the research group hopes to develop several areas.

- Intend to use more cameras for different features and emotions.
- In the future, try to connect a live stream from a raspberry microcontroller.
- The project the group looks forward to developing this item to be available in the market and start a business of it avoiding the failures had in doing the project.

ACKNOWLEDGEMENT

First, the research group extends the heartfelt gratitude to the supervisors who gave the guidance and advice to carry out the project step by step to finish it successfully. The group also is thankful to the Head of the Department of IT Ms. Suranji Nadeeshani for the support given in all the administrative matters and providing all necessary facilities which enabled us to reach completion of the project. The group expresses my special thanks to Mr. Thilak De Silva for the encouragement and the valuable instruction given throughout the final year project.

Finally, the group expresses our gratitude and appreciation to family members who assisted me in numerous ways to achieve the goal successfully.

REFERENCES

- [1] Rafid karim. 2013. www.semanticscholar.org. [Online]. [15 December 2019]. Available from: <https://pdfs.semanticscholar.org/d5a1/1f52cab6273213093318cac39d7d996e61b5>, pp. 1-8.
- [2] Cosy agubor. 2013. www.researchgatenet/. [Online]. [15 December 2019]. Available from: https://www.researchgate.net/publication/301649544_Security_Challenges_to_Telecommunication_Networks_An_Overview_of_Threats_and_Preventive_Strategies, pp. 5-19.
- [3] Ijcsit. 2013. www.ijcsit.com. [Online]. [15 December 2019]. Available from: <http://www.ijcsit.com/docs/Volume%209/vol9issue5/ijcsit2018090503.pdf>, pp. 132-135.
- [4] Neelam majgaonkar. 2013. www.ijedr.org. [Online]. [15 December 2019]. Available from: <https://www.ijedr.org/papers/IJEDR1601082.pdf>, pp. 1-5.
- [5] Ajao lukman. 2018. www.researchgatenet. [Online]. [15 December 2019]. Available from: https://www.researchgate.net/publication/326991167_A_Smart_Door_Security-Based_Home_Automation_System_An_Internet_of_Things, pp. 1-9.
- [6] Ogri james ushie. 2013. www.researchgatenet. [Online]. [15 December 2019]. Available from: https://www.researchgate.net/publication/303404174_DESIGN_AND_CONSTRUCTION_OF_DOOR_LOCKING_SECURITY_SYSTEM_USING_GSM, pp.2235-2240.
- [7] Tasnem_tilok. 2019. www.createarduinocc.com. [Online]. [15 December 2019]. Available from: <https://create.arduino.cc/projecthub/ASimon/email-3g-gprs-camera-72c3da>
- [8] Microtomic technologies. 2019. www.projects0f8051.com. [Online]. [15 December 2019]. Available from: <https://www.projects0f8051.com/sms-based-bank-locker-security-system-using-gsm-technology>.