# Automation Smartlock for Implementing Smarthome Security Using Location Based Service

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*Abstract*— **Currently, the development of technology is very rapid. Technology is used to assist humans in carrying out daily activities. One of the advances in technology is the development of tools that can control over long distances or remotely (the Internet of Things). IoT applications are for remote monitoring and smart home appliance controlling. We propose a mobile-based door security model. At present, there are many door security models, but in this study, we propose security at doors using Location Based Services (LBS). The door will automatically open and close. The user's location is based on the cell phone user's location. If the user's location is outside the door area of the house, the door will be closed automatically. Instead, the door will open if the user has entered the house. With the security door model using LBS, the house will be secured. The door will automatically be locked when the owner is outside the house within a radius of 1 meter. With the application of Internet of Things (IoT) technology, residents will feel safe without worrying when traveling. The IoT technology used in this study is ESP 8266, as a Wifi module and as an opening tool that can move smart lock, to open and lock the door. The results of this study are the accuracy of the performance of the smart door lock system with location-based service by 70%.**

*Keywords*— **mobile, smart door lock system, smart home appliance, location-based service, Internet of Things**

***Abstrak— Saat ini perkembangan teknologi sangat pesat. Teknologi digunakan untuk membantu manusia dalam menjalankan aktivitas sehari-hari. Salah satu kemajuan dalam teknologi adalah pengembangan alat yang dapat mengontrol dalam jarak jauh (Internet of Things). Banyak aplikasi IoT adalah untuk memantau jarak jauh dan mengendalikan peralatan rumah tangga (smart home appliance). Kami mengusulkan model keamanan pintu berbasis mobile. Saat ini, ada banyak model keamanan pintu, tetapi dalam penelitian ini, kami mengusulkan keamanan di pintu menggunakan Layanan Berbasis Lokasi (LBS). Pintu akan secara otomatis membuka dan menutup. Lokasi pengguna berdasarkan yang diperoleh dari pengguna ponsel. Jika lokasi pengguna berada di luar area pintu rumah, pintu akan ditutup secara otomatis. Sebaliknya, pintu akan terbuka jika pengguna sudah masuk rumah. Dengan model keamanan pintu menggunakan LBS, rumah akan diamankan. Pintu akan otomatis terkunci ketika pemiliknya berada di luar rumah dalam radius 1 meter. Dengan penerapan teknologi Internet of Things (IoT) ini, penghuni rumah akan merasa aman tanpa khawatir jika bepergian. Teknologi IoT yang digunakan dalam penelitian ini adalah ESP 8266, sebagai modul wifi dan sebagai alat pembuka yang bisa menggerakkan smartlock, untuk membuka dan mengunci pintu. Hasil dari penelitian ini adalah akurasi kinerja aplikasi smartlock dengan location-based service sebesar 70%.***

*Kata Kunci*— ***piranti bergerak, sistem kunci pintu pintar, smart home appliance, layanan berbasis lokasi, Internet of Things.***

## I. INTRODUCTION

In recent years, information and communication technology has developed in the Internet of Things (IoT). Home automation based on IoT is a multifunctional and popular application. For home automation, all equipment is connected to the Internet and can be accessed without humans [1].

Home security systems have become important research where the latest technology has been used to secure systems for homes. A home security system uses wireless networks. Wireless networks are one of the technologies that have been used to provide remote and control for smart home appliances [2].

There are many methods to support home security that is implemented in a smart home. One of is research [3] that uses support to access, fight, and control door locks using wireless and an android application. The system is implemented using the cloud network to make a security coding of information sources, update alarms and issued transfer, open and send encrypted commands to the request, and unlock the door according to user requests that are activated in real-time. All systems are implemented for home security and controlled from far outside the house.

The use of innovative technology will increase security until the technology becomes open to all. In research [4] provides door control access and security using IoT server. The recommended system is an implementation with biometric scanners, passwords, and security questions with IoT. Door access done remotely by IoT with a smart indication.

Home automation can provide control equipment at a house or automation system using an Android smartphone. Here we summarize and allow related works and discuss their limitation.

The study in paper [5] showed the implementation of a wireless access door, monitoring, and controlling. The system was implemented using complaint alarms, a status notification of opened/closed door to the users, and sending encrypted requests for transfer/open the doors according to the user's request in real-time. However, this research had not automation in the use of the smart lock.

In research [6] system was developed and implemented using Raspberry Pi and Android devices. The system was developed to control the movement of the door, to control the door lock system using a motion sensor, and to support every movement at the door. Guest information could be accepted. Their research had not automated so, still a security gap from the factor of human error.

The study [7] proposed a security system using the blockchain on the smart home. Using the blockchain, it could access several places around the house based on data sent from the sensor. But in their conversation, they were more focus on shipping around the house as a condition control around the house.

The study [4] proposed a door lock system using a PI3 Raspberry Pi-close button technology. The key provided a system that could notify the owner and offered the guest by providing user ID. The system was worked with a photograph through a camera code that was positioned on the door. The camera would be sent to the owner.

In the study [8], they took a study of security of the door locking system with two authentications and encryptions on RFID. They could activate, authenticate, and validate the user and could unlock the door to access a secure real-time.

In the study [3], they proposed an implementation using a biometric scanner, password, and security questions for door access control and security by using IoT server.

In the study [9], they used Location-Based Service (LBS) to reduce the power consumption of smartphones for the Wifi module. They developed a system of automation Android application that can control the use of Wifi using LBS.

In this study, ESP8266 technology is used as a Wifi module and as a cotter that can open and lock the smart lock.

## II. Methodology

### A. Problem Definition

In the application of security on the smart home, many have used a home door control system that can be accessed from anywhere, so that it can be controlled remotely. The control system can only control and access the door with command. If the door is close or opene, the user can control it remotely. This is the problem that will be discussed in this study. The door control system cannot be applied in an open and close automation door system. In this study, we propose a door automation system using Location-Based Service (LBS). The door will open and close based on the user's current location. If the user's position is far enough from the location of the door, the door will close automatically.

### B. Existing System

Nowadays IoT has made a lot of progress in the field of home automation. Many IoT studies develop smartphone devices that can control and communicate with devices in the home.

With the increasing problems related to security and safety in smart homes, home automation is the key to security in smart home, namely Smart Door Lock System. Currently, many smart door lock systems have developed with the door opening/locking process. They can monitor the conditions around the door using sensors and cameras, using face recognition processes for guests who come or are at the door.

However, the development of the existing smart door lock system is still vulnerable. It still often occurs human error. For example, humans are still vulnerable to negligent factors. They forget to lock the door coupled with the many human activities, so that the control system that already developed is still not effective. It has not been automated, the process of opening and closing doors.

The scheme of smart door lock system is shown in Figure 1. The smart door lock system is connected to the mobile application. It will track the location of the mobile user. If the location of the mobile user is more than 5 m away from the house, the system will automatically lock the door. If the mobile user is located less than 5 m away from the house, the door cannot be locked automatically.

Figure 2 shows the components that are in smart door lock system. They are Control Module, Door Lock Operator, Communication Module, GPS Module, and Data Storage. A Control Module is the CPU door. The Door Lock Operator controlled by the Control Module. The Communication Module uses a TCP/IP communication and Bluetooth/Zigbee. The GPS Module is to measure distance and as Data Storage.

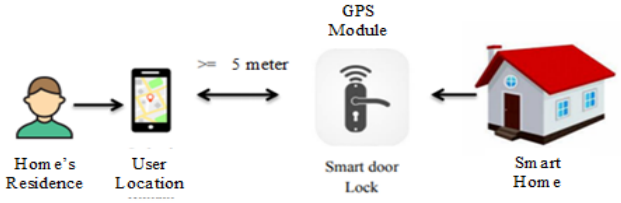


Figure 1 The proposed of the smart door lock system architecture

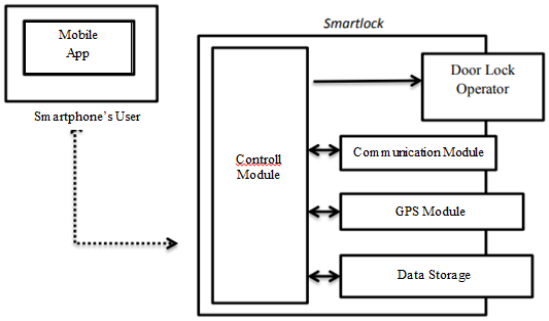


Figure 2 Block diagram of the smart door lock system

Mobile application using flow diagram Smart Door Lock, shown in Figure 3. In the Smart Door Lock Mobile application, the user must enter into the app's smart door lock using the username and password that is set beforehand. Once logged in, the user must enter into arrangements for setting a connection with the application of the smart door lock system on the door of the house.

Business process flowcharts Smart Door Lock as shown in Figure 4, the smart door lock system that is connected to the mobile application smart door lock, will track the location of a mobile user, so that if the mobile location the user is more than 5 m from the house door the door will automatically lock the doors, but on the contrary, if the mobile user is located less than 50 cm from the house (smart door lock), then the door can not be locked automatically.

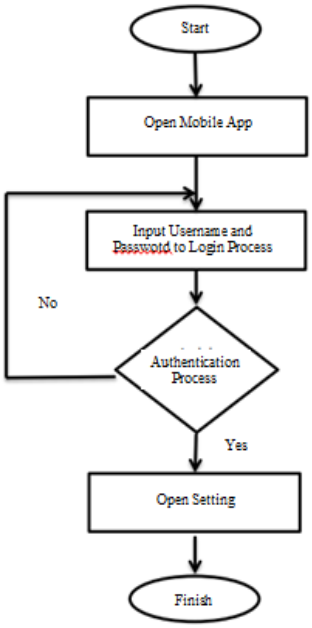


Figure 3 Flowchart of the smart door lock application

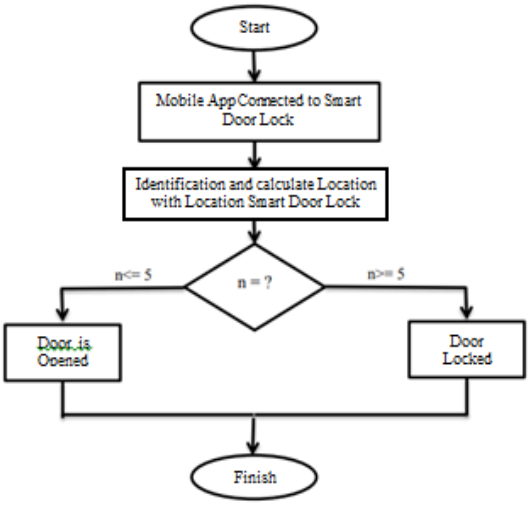


Figure 4 Flowchart of the smart door lock system using LBS

## III. Result and Discussion

The appearance of the Smart Door Lock Application shows in Figure 5. The app requires a user authentication to verify the user, so that no user can access the app.

The connectivity page in smart door lock application shows in Figure 6. It requires internet connection.

Figure 7 shows the condition when the door is locked. This information tells the user that the door is closed. There is also an "open the door" button. This button is to open the door remotely. It is as an alternative if there is an overwhelmed in the process of automating smart door lock using location-based service. Figure 8 shows the condition when the door is opened.

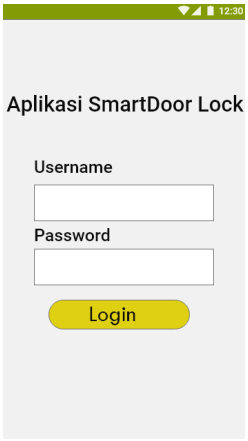


Fig 5. Authentication user in the app

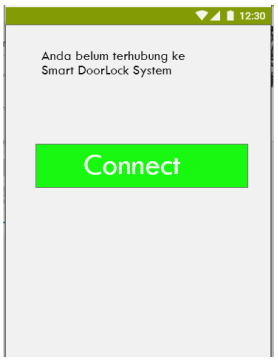


Figure 6 Internet connection setting

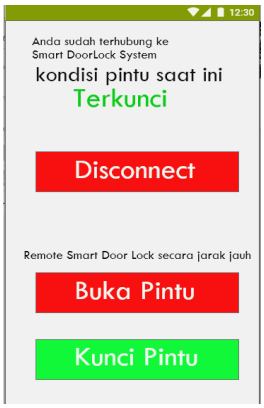


Figure 7 Smart door lock state when the door is close


Figure 8 Smart door lock state when the door is open

Application testing has been done with 10 conditions based on user's device distance. Table I shows the results of testing the app with 10 conditions. It includes a distance of less than 1 meter, a distance of 2 meters to 10 meters. The testing shows the accuracy of the app performance is. Its accuracy is 70% (three of ten times failed).

TABLE I
RESULT OF TESTING SMART DOOR LOCK APPLICATION WITH LOCATION-BASED SERVICE

| Distance (m) | Status | | |
|---|---|---|---|
| | Not Locked | Locked | F /V |
| <1 | ✔ | | Valid |
| 2 | | ✔ | Failed |
| 3 | ✔ | | Valid |
| 4 | | ✔ | Failed |
| 5 | ✔ | | Valid |
| 6 | ✔ | | Failed |
| 7 | | ✔ | Valid |
| 8 | | ✔ | Valid |
| 9 | | ✔ | Valid |
| 10 | | ✔ | Valid |

## IV. CONCLUSION

This study presents that smart door lock technology using location-based services (LBS) can be used for security of the smarthome. Smart door lock system will automatically open and close the door based on user's cellphone location. If the user's location is outside the door area within 1 meter of radius, the door will be closed automatically. Otherwise, the door will be opened if the user enters the house. This smart door lock model using LBS will make the house be secure, especially when the owner are travelling. This system has performance 70% of the accuracy.

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