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Android based Secure and Smart Home Application using IoT

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Abstract - *Recent advances in smart technology design with integration of smart sensors and embedded components have enhanced human life quickly in so many fields such as home automation, smart phones, smart cars, etc. Enhanced home security has become the need of the hour with the introduction of luxury residences and multi facility realty projects. Considering the increasing demand for home security and automation, an Android-based control system is proposed which can maintain residential security and provides an application which remotely controls all the functions and features of home appliances using Internet of Things (IOT). The details of the users and devices are stored in a database on the server. The central device connects to the internet and the application presents the user with a list of devices to interact with. The server manages the users and devices, and handles the communication between the application and the central device. . The system proposed will be economical and can be expanded as it allows connection and control of a number of different devices.*

***Key Words*: Home Security System, Home Automation, IoT, Smart App**

1. INTRODUCTION

Technology has become an important aspect of human life. It has a great influence in many facets of our day to day life and has also helped improved our environment. The introduction of technology in communication with the invention of mobile phones and the internet has caused many people to rely on it to improve their way of working and also provide easy way to use various applications to enhance their standard of living. This establishment of technology in one's life has enhanced not only the way people communicate or trade goods but also in a variety of fields such as medicine, agriculture, home security, etc. With the rise of luxury residential projects and an increase in the number of smart home products in the market, home security and home automation have become very popular.

A secure home system consists of a door lock system which has been one of the most popular consumer devices replacing many of the conventional locks because of sheer user convenience and affordable prices. Many wireless network solutions such as bluetooth, ultra wide band (UWB), wireless Ethernet and many more belong to the area of home networking [1]. From among these, bluetooth has become the most attractive technique in the research and commercial domain as bluetooth enables to develop various kind of wireless system via handsets or smartphones and also conduct research by using handset and actuator by remote operation of various electrical devices at home. Since bluetooth is so prevalent in mobile devices, it was seen as a simple, economical and secure solution for wireless network for connecting a mobile device to home network system.

Home automation system is a emerging field of computerized and intelligent network of electronic devices which are designed to monitor and control home appliances. Wired home networks were given importance in the earlier stages of home automation but as technology is emerging, people have started adopting technology to a greater aspects. Wireless system provides more flexibility and extensibility, its installation is free from construction works as it requires no cabling cost.

This paper proposes a novel system for access monitoring and control on digital door lock that uses bluetooth and server based technology. By adopting the system, users can be provided with a safe and convenient life. The objective is to develop a system with a wireless module and a digital door. Implementation of the prototype system would be good solution for access monitoring and control system.

2. LITERATURE SURVEY

A. App controlled smart locking system[1]

The proposed IoT based system facilitate the user hazard free, simple, robust and secure solution for home security and eradicate manual effort towards door lock – unlock issues. The owner can lock or unlock the door remotely through the secure app installed in a smart phone.

The app has additional feature to take exterior image or video for monitoring the activity going on outside the door. The system has the capability of sending a notification if the door - lock goes offline. Raspberry pi camera worked as main door camera and the locking function was programmed in such a way that whenever it receives lock string it rotate the stepper motor clockwise and when it receives unlock string it rotates the stepper motor anticlockwise.

B. A Smart Door Security-Based Home Automation System[2]

The smart home automation door security was implemented by integrating the smart embedded sensor system with android mobile application using eclipse IDE.

The embedded software coding was implemented in Arduino IDE using C language. When the system is power ON, it will initialize all the modules connected to it which includes servo motor, keypad, LCD display, buzzer, Bluetooth module, and GSM module. This will control the door opening (access granted) and send message to the home user for the security notification but if the password is invalid, it will deny the user access to the entrance of the building (denied access) and send messages for wrong password user trial.

C. Android based Security and Home Automation System[3]

The proposed Android application can be interfaced with 3 different systems home security, home automation, car security the system uses Bluetooth as the means of communication between the lock and the mobile application the security measures include the use of a username password system in the application and a keypad to turn on Bluetooth of the lock an alarm rings on multiple wrong attempts and SMS is sent to the user. The mobile application is also used to control the lights and fans of the house as well as the lock of the car.

D. Smart Door Lock System: Improving Home Security using Bluetooth Technology[4]

Using eye movement for controlling the computer, Ramsha Fatima [5] improves the experience of working with the computer as it is faster and gives the illusion that the computer is complying with the users' thought. It can be used either exclusively or in combination with other input technologies such as eye movement can be used along with a button so that it confirms the users' intentions for performing critical tasks and reduce the chances of error. It does not require any training and can thus be used by a layman. It can act as a boon for a person with motor disability as it does not require any motion but simple eye movements. It can give them a greater controlled over their surrounding and help them in interacting with the world.

3. PROPOSED WORK

The proposed system is keyless that is we will not be having an extra key such as the RFID tags. There are different mechanisms of security such as fingerprint scan, facial recognition, pin, password. The application will learn from the user behavior and increase security accordingly .The details of the user accessing the lock will be stored in the server along with date and time which can

be further used to predict the times when the user will enter the house and handle security accordingly .On locking the door, the lights that are on will automatically turn off .On unlocking the door the lights turn on accordingly. User can set vacation days and the system will be on maximum security till the user comes back. User can also set temporary keys (will be active for a set time) for domestic help or for guests.

3.1 Existing System Architecture

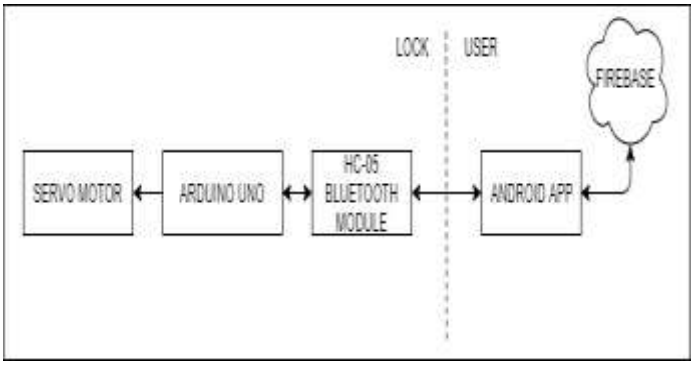

Fig. 1- Existing system architecture

The existing system uses simple devices and is not much secure and versatile and does not have the feature of video monitoring or home automation. The existing system uses simple architecture to provide a smart locking system.

3.2 Proposed System Architecture

The system architecture is given in Figure 1. Each block is described in this Section.

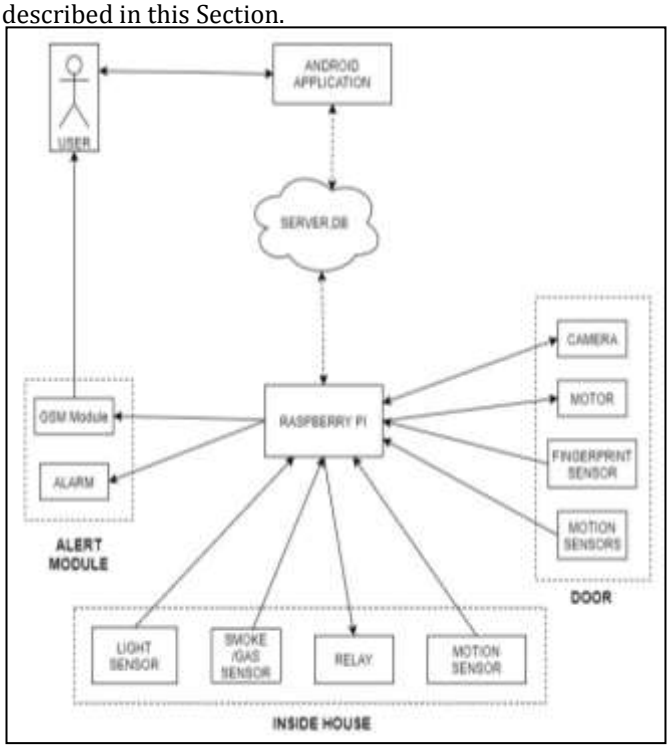

Fig. 2- Proposed system architecture

A. Control Module

- Android application**:** The application provides and interface between the user and the lock and it is used to control the lock and the other components of the system.
- Server, DB: The server is used to store the user activities and all the users that are allowed to access the lock and store the authorized users credentials such as login id or

password.
• Raspberry pi: Raspberry pi is the central controlling unit and is used to communicate with and control all the components used in the system.

B. Door/Window Module

• Camera: The camera is used to capture anyone accessing the lock and in case of an unidentified user the user is alerted about the same, the camera turns on only when there is someone near the door or the windows.
• Motor: The motor is the device that controls the latch.
• Fingerprint sensor: Fingerprint sensor is used to authenticate the user and provide a faster, secure and more efficient way to unlock the door.
• Motion sensor: The motion sensors monitor the activity in front of the door and near the windows the places that can be used to gain entrance in the house in case of movement near these places the camera is activated to record the person entering the house.

C. House Module

• Relay: The relay module is a separate hardware device used for remote device switching. With it you can remotely control devices over a network or the Internet. Devices can be remotely powered on or off with commands.
• Smoke/gas sensor: This sensor is used to check if there is a fire or a gas leakage in the house and alert the user and trigger the alarm if there is any.
• Light sensor: Light sensors check if the room needs artificial lighting when the user enters the house if the room is dark and the user enters the house the lights turn on automatically.

D. Alert Module

• Alarm: The alarm is used to alert the surrounding in case of an emergency such as fire, gas leakage or forced entry in the house.
• GSM module: The gsm module is a device that will be able to send sms to the user it helps in alerting the user even without an internet connection

3.3 Activity Diagram

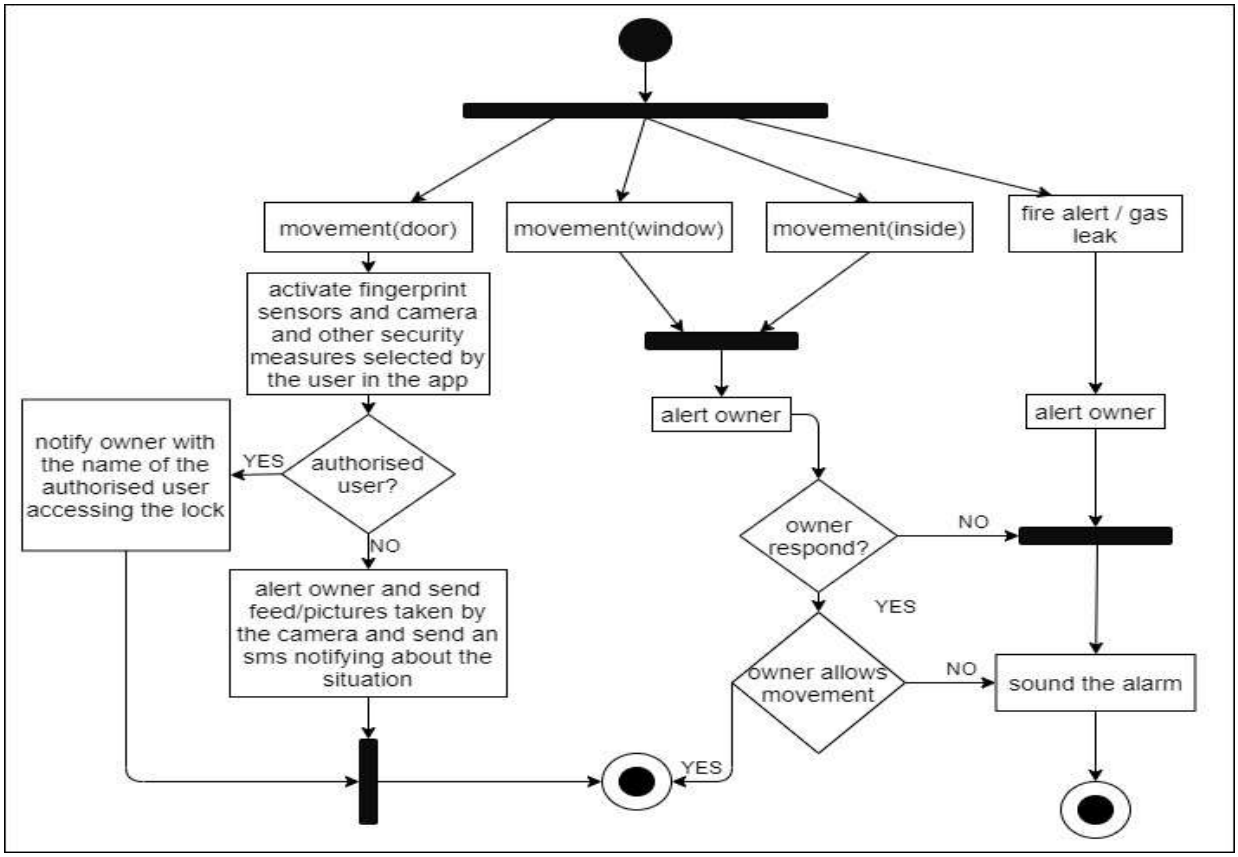

Fig. 3- Activity Diagram

4. REQUIREMENT ANALYSIS

All the modules present in the system communicate with one another so as to provide smooth functioning of the system. The doors and the windows have motion sensors that can sense movement in front of them in case someone approaches the doors or the windows the user is alerted and if someone breaks in and the motion sensors detect movement inside the house even though the lock was not accessed the alarm is sounded.

The user can unlock the door using the fingerprint sensor or if the user wants the door will unlock itself when the user comes near the door with the authorized device or can use the face unlock there are multiple methods of unlocking the door such as using a pin or a password that can be entered in the phone, can be setup by the authorized user and could keep more than one way to authenticate a person entering the house. The owner can also create temporary keys for the guest and add their fingerprints too this key is temporary as the owner can set the time till which the guest will be an authorized user.

The light sensors check the light intensity in the room and if it is dark the raspberry pi will turn on the lights using the relay board.

The mobile application tracks the user behaviour and in case of a different behaviour then the user usually exhibits the lock increases the security measures and also alerts the other authorized users. In case of a gas leakage or fire the alarm is sounded so as to alert the surroundings the gsm module alerts the user via an SMS in case the user fails to receive any app notification due to lack of internet connection .

4.1 Software

The software in the proposed system consists of a real time database which is firebase the lock is controlled by an android application thus the android operating system is required by the user the development of the application requires JAVA, Python, XML and the operating system used in the Raspberry pi is Raspbian OS.

4.2 Hardware

The hardware requirement for the proposed system are as follows: Servo motor to operate the lock , piCam to record and stream the happenings around the house, a fingerprint sensor that will help in user authentication a relay board to control the lights and fans ,Raspberry pi light sensor to detect the level of darkness an MQ2 smoke sensor for the purpose of detecting fire, Raspberry pi 3 acts as the control controlling unit and a GSM module to alert the user in case the user is not connected to the internet.

5. CONCLUSION

Home automation, being one of the most integral parts of the budding realty industry paves forth the need to establish a simple yet efficient system that through training, anticipates the user's actions and executes it for them. This paper presents a flexible and user friendly method to implement the same by integrating relays to Raspberry pi for controlling home appliances from a remote location in a real scenario. As an extension, authors propose a generic loT framework and use cloud computing infrastructure for connecting and managing remote devices and also store sensor data. The proposed system can be used in multiple scenarios like parking lots, cars, etc, apart from one's home.

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