

Smart Digital Door Lock System

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Abstract: Now a days, more care must be taken for home security because increasing number of thefts and criminal offences. But increasing the security often makes the security system much complex. Our aim is to make this complex security system easier to use while keeping the security level high. In this project, we propose a smart digital door lock system for home automation. A digital door lock system is equipment that uses the digital information such as a MAC address, WIFI network, and Mobile Device as the method for authentication instead of the legacy key system. In our proposed system, an Wifi module is embedded in digital door lock and the door lock acts as a central main controller of the overall home automation system. Technically, our proposed system consists of an Wifi module, Motor shield and a standard lock. The door lock system proposed here uses a Wifi network of the mobile devices for user authentication, where, wifi module is used for WIFI network connection, servo motor for opening and closing of the lock lever and standard key lock in case of any electronic failure. We will be using an android application for controlling the lock module. Advantage of this project are like it provide faster and convenient way to access door lock and it is more secure than traditional lock system.

Keywords: Wifi module, Servo motor, Internet of Things, Mobile Application.

1. Introduction

The internet of thing refers to the computing concept that describe the idea of the everyday physical object being connected to the internet and being able to identify themselves to other devices. In this era of computing the internet of things(IOT) is a technical platform for communicating with the electronics devices. Devices are that are controlled wirelessly have been gaining market and share across different fields such as home security and consumer electronics due to their flexibility and convenience. This type of systems is a part of field of internet of things .This technology represent a building block for many recently developed automation system including residential ,commercial and home automation systems.

The purpose of this project was to develop a smart door lock that can be installed easily on a variety of doors and can be controlled over the internet and trusted for the security. A prototype was developed that integrates a wifi module with a servo motor which is then connect to the lock for controlling its motion. A servo motor is a module that allows precise control of angular or linear position, velocity and acceleration. A wifi module used in this named Esp8266 is used to perform all the activity through the external application. In our project we used an external application named blynk for controlling the lock system. After configuring the blynk application lock will start opening and closing using a servo motor by a android smartphone. The blynk is an android application that is used for performing various types of operations in the field of internet of things.

2. Objective

The main objective behind this project is to develop a smart door lock which can be access remotely via mobile devices for home automation and increasing security of the house. As technology is advancing so houses are also getting smarter. Modern houses are gradually shifting from conventional switches to centralized control system, involving remote control switches. Remote control home automation system provides a modern solution with a smartphones. As the door lock is the first and last thing people come across in entering and leaving the home respectively, the home automation function in digital door lock system enables the user to conveniently control and monitor home environment. The biggest advantage of our proposed system over existing ones is that it can be easily installed when and where necessary without requirement of any infrastructure and proper planning.

3. System Analysis

1. Problem Definition:

Home automation system faces four main challenges, these are high cost of ownership, poor management and difficulties in achieving security. The main objective is that to design and implement a cheap and open source home automation system that is capable of controlling and automating most of the house appliance through an easy interface. In our proposed system it has a great flexibility by using wifi technology to connect its modules to home the server. The system will make use of secure wireless LAN connections between the hardware modules and server and secure communication protocols between users and server.

2. Proposed system feature:

In this proposed system the home automation system consist of server, hardware interface module (wifi module) .Server controls hardware interface module and can be easily configured. Here the server used is the blynk server which supports blynk application which can be operate through android smartphones. Wifi is choosed to improve system security and to increase system mobility and scalability. The main function of blynk server is to manage, control and monitor system components that enables hardware module to execute their assigned task.

3. System Requirements:-

The following list gives an overview of the most important requirements of our system-

- (1) User friendly interface: User can easily manage system remotely through easy blynk application interface.
- (2) Security and Authentication: Only authorized user can login to the system in order to manage, control and monitor.
- (3) System Scalability: Scalability is the ability of a system, network or process to handle growing amount of work in a capable manner or its ability to be enlarged to accommodate that growth.

Configuring Blynk application:

After installing the blynk app on the smartphone, an account has to be created in the app to access its services. First time when the app is opened, it will asks to either sign in or create an account. Create an account first and then add a new project to get started. Each project has its own authentication code. To establish connection with our components we need to add widget to our model. The app provides neat interface to add all the required widget and setting them as shown in the fig .The blynk needs to be running in the background for the user to get real time notifications.

One more important component of the project is the connectivity between ESP8266 (wifi module) and the blynk server. The system successfully connected to the blynk server using the authentication and the blynk libraries. As a result we were able get the notification on our smart phones. It was observed that the blynk app worked smoothly and carried out all communication between the hardware and app accurately.

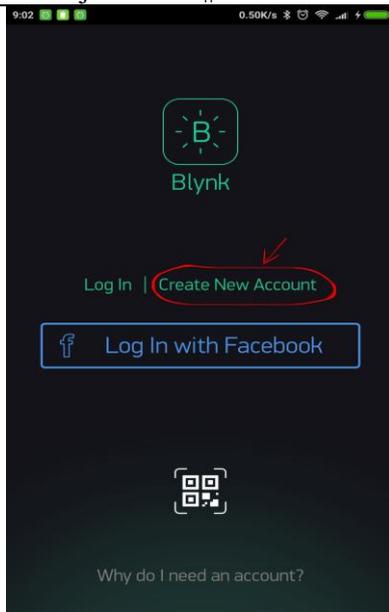


Fig.3.1.creating an account with blynk

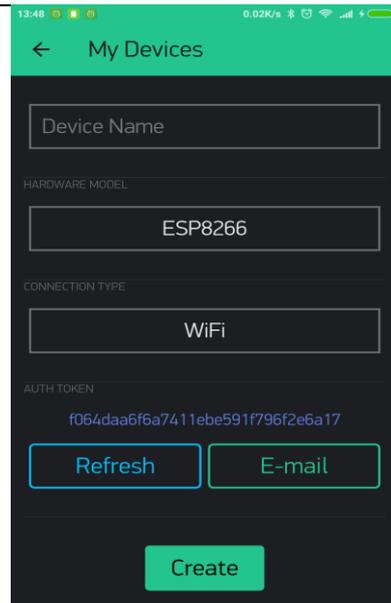


Fig.3.2.Setting new device

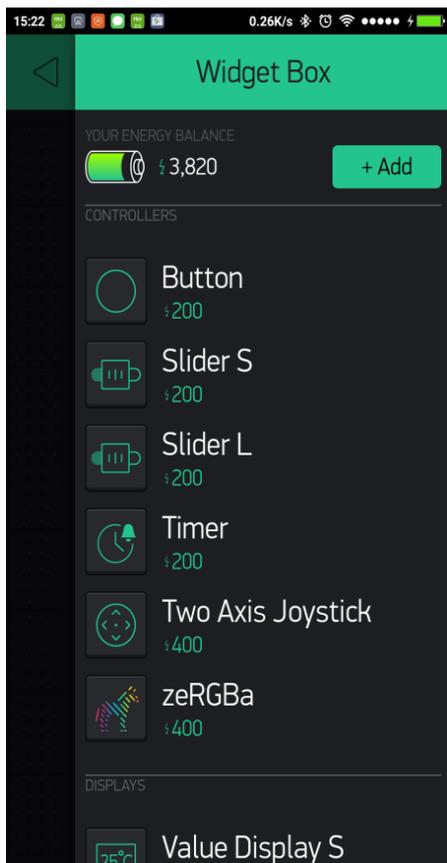


Fig.3.3. Adding widget to system

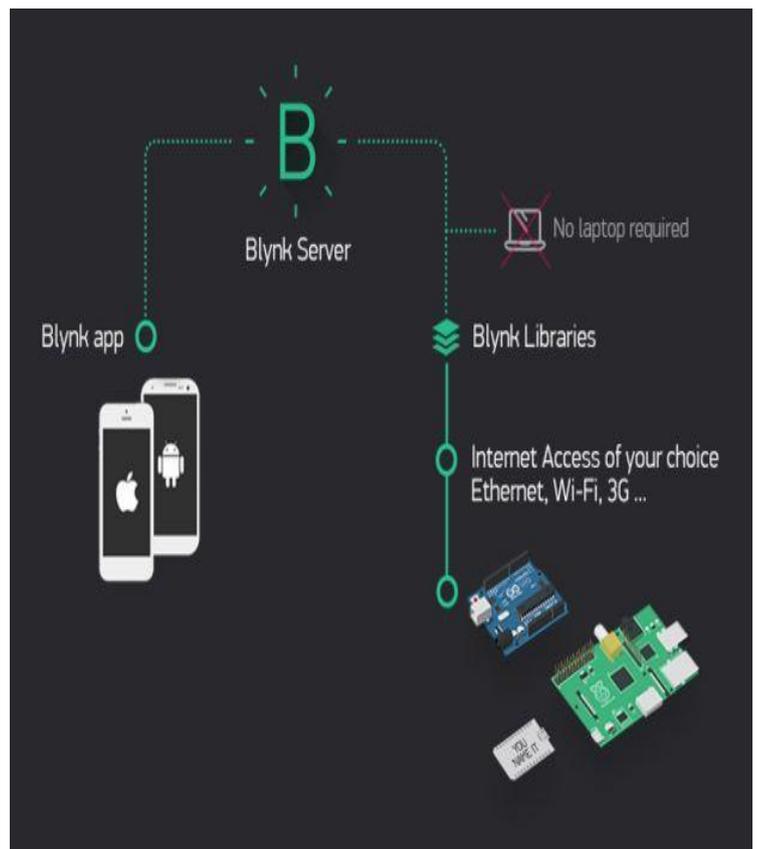


Fig.3.4. Blynk configuration

4. Implementation

In our project, we have implemented a door locking and unlocking system which can be controlled by a mobile application remotely. To do so, we have used a traditional lock, a micro servo motor and an ESP8266 module, all of these components, when assembled, forms the smart lock module (as shown in figure). For

controlling this lock remotely, we have used an android application Blynk, which is programmed to work with the specific lock module.

In the lock module, the motor pulls the lever of the traditional lock to perform the locking and unlocking operations. This motor is a 4 Volt Micro servo motor(model no), which is connected to the ESP8266 module with the motor's data wire connected on AD7 pin of ESP8266 and 4V supply and GND connections on their appropriate pins. ESP8266 module have an in-built Wi-Fi system which can be configured to get connected to the internet or by any network by writing and burning the specific program code. When the ESP8266 gets connected to the internet, the smart lock is online to accept commands from the user. To control and send commands to the lock, blynk app is used. Blynk application is a programmable android application which can be configured to work with Arduino module, ESP8266 module or Raspberry Pi module. In our case we are using ESP8266 module and so the blynk application is configured to send commands on the AD7 pin of the ESP8266 module. These commands serves as a guideline for the movement of servo motor's hand, which eventually locks or unlocks the traditional lock attached to the motor.

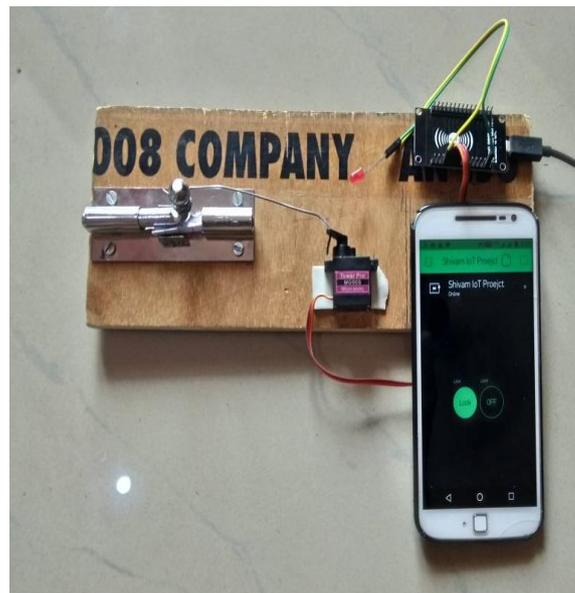


Fig.4.1.Lock Module

The figure shows lock module consisting of 4 volt Servo motor connected to the traditional lock using a metal string, this motor opens and closes the lock. The Servo motor is driven by ESP8266 module which commands the motor. The ESP8266 module is powered by a 6.6-volt DC input supply.

5. Conclusion

Smart locks don't always guarantee that they will be safer locks but they definitely provide more convenient way of locking and unlocking your doors. You will appreciate this purpose if you have ever walked up to your front door with your arms loaded down with grocery bags and forgot to grab you key first. With a smart lock all need to do is punch in an access code and you are in. This project describes the smartphones control the unlocking system and the way to develop this system, simply install on the door and configure it to communicate with the wireless network. The data transmission for this project is using wifi technology. In our opinion, Smart Lock System has great potential. It will allow users to forget about their traditional key and to use only their mobile device to get access to the needed area. To reduce the risks, all the possible security measures were taken, including the authorization to the mobile application. In case of loss of the mobile device, there will be option for the legacy key system, and thus giving access to the area.

6. Future Scope

In our project we designed an lock module in which there are few components which are carrying all the operation. But our major aim to provide the both self implemented software and hardware components. Here in this project we used blynk application which has its own private blynk server so that we don't have to develop our own server. Our idea is to to develop an lock module which can be access only through our smartphones MAC addresss. In future we will use a standard lock which operate via our whole module. For this we have to develop our own server which can saves our MAC address in its database. So

that the wifi module can identify this addresses via its interface. For that we have to build a code using arduino IDE to burn the code in the wifi module. We also have to develop a android application to control and monitor all operation instead of using blynk application. All these are our future plans to make this project major and more efficient to use in home automation and to provide increasing security to the houses.

7. Reference

- [1]. Rafid Karim and Haidara Al-fakhri, “smart door lock”, Bachelor’s thesis, School of Information and communication Technology(ICT) KTH Royal Institute of Technolgy Stockholm, Sweden.[TRITA-ICT-EX-2013:257]
- [2]. Anitha A, “Home security using Internet of Things”,School of Information Technology and Engineering, VIT University,Vellore632014,Tamil Nadu,India. IOP Conf. Series: Materials Science and Engineering 263 (2017) 042026doi:10.1088/1757-899X/263/4/042026.
- [3]. Hussain F. Alsaif, Mohammed A. Almaghrabi and Douglas E. Dow, “Portable smart door lock”, program in Electromechanical Engineering, College of Engineering Wentworth Institute of Technology, Available from: [https://www.researchgate.net/publication/303381392 Portable Smart Door Lock](https://www.researchgate.net/publication/303381392_Portable_Smart_Door_Lock).[accessed Apr 18 2018]
- [4]. Ohsung Doh1, Ilkyu Ha, “A Digital Door Lock System for Internet of Things with improved security and usability”, Kyungil University,Gyeongsan,Gamasil-gil50, 712-701, Republic of Korea. Advanced Science and Technology Letters Vol.109 (Security, Reliability and Safety 2015), pp.33-38 <http://dx.doi.org/10.14257/astl.2015.109.08>
- [5]. Hacker House, “Smartphone connected Home door lock”, <https://www.hackster.io/hackerhouse/smartphone-connected-home-door-lock-69944f>. [Published on June 23,2017].
- [6]. Mr. Pratik P Jesani, Prof. Tushar J Raval, Prof. Karishma A Chaudhary, “A Review on IOT Based Smart Home Using Blynk Framework”, Department of Computer Engineering, L D College of Engineering, Gujrat, India, IJARIE-ISSN(O)-2395-439 ,Vol-3 Issue-5 2017.
- [7]. Y.Choi, Y.Park, W.Back, D.Lee and J.Byun, “Development of Home Automation System Using Digital Door Lock based on Wireless Sensor Network,” in Proceedings of KIIT Summer Conference, Vol.2011, No.5, pp.189-193, 2011.