SMART DOOR LOCK SYSTEM USING ARDUINO

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ABSTRACT

The phrase "home automation" relates to a home that uses a home controller to connect the various home automation systems in the home. House security is becoming progressively important as the potential for intrusion grows by the day. In our research, we presented a component of smart home technology that uses Bluetooth in a mobile device to make it easier and more efficient to use. It is also based on the Android and Arduino platforms, which are both free and open source software. This research proposed and demonstrates a locking mechanism automation system using a bluetooth-enabled Android smartphone. The software development & hardware designed are described first, followed by the design of a mobile application based on bluetooth for locking and unlocking the door, the application will be password protected. The hardware implementation for the door-lock system that includes an Android smart phone as the task master, a Bluetooth module as the command agent, and an Arduino microcontroller as the controller, and data processing centre, and a solenoid acts as a door lock system.

Keywords: Arduino, Home Automation, Bluetooth, Solenoid, Lock.

I.   INTRODUCTION

Security has emerged as a key worry in the twenty-first century; everyone wants to feel safe in his or her own home, job, and overall environment. A smartdoor security system based on Arduino and a Bluetooth application is the goal of this project. Enhancing and advancing the safety and security of people's lives and property. The goal of this project is to create and execute a smart door security system utilising arduino and a Bluetooth application that will aid in the advancement of door security at home and in public buildings. Bluetooth technology in a smart phone today is used for more than just data and file transfer. In recent years, one of the implementation of bluetooth technology has been smart home automation. Bluetooth technology operates on an unlicensed frequency of 2.4GHz and can connect devices within a range of 10 m to 100 m at speeds of up to 3Mbps, depending on the classes of bluetooth devices. With these Bluetooth qualifications, we offer a door automation system based on Bluetooth technology, particularly in door automation systems..We can easily connect it to this smartphone. With a single click to lock or unlock the resulting door, we can utilise an Arduino (microcontroller) to make our homes and offices safer and more secure. The microcontroller will be positioned on the door, and it will communicate with the gadget via a Bluetooth module tethered to the microcontroller. The goal of this project is to create and execute a smart door security system utilising arduino and a Bluetooth application that will aid in the advancement of door security at home and in public buildings.In general, my project is more user-friendly and provides quick access to users. People with physical disabilities, such as cripples or partial paralysis, can open doors without the assistance of anyone, not even an attendant, as long as they are in having an android smartphone.

II.   LITERATURE SURVEY

The literature review focuses on related projects authored by other researchers, the challenges they encountered, limits, and changes that should be implemented. Some of the most important components employed in the project are explained in detail under the theoretical basis. Bluetooth and its applications Smartphones are considerably easier to adjust to and use. It provides you with more access to communicate with the door, and it also gives accfess to physically disaled people entry that may not have a finger to use for a biometric lock or may be unable to use RFID, but with regard, this project allows differently abled people to unlock their doors with a single click on a smartphone.

Adarsh v Patil in [2008] completed a same project, android-based smart door Locking system, which also used an Android phone, that is also a smart phone, and a gsm module to open the door.

Agbo David et al(2017) has completed a similarly related project based on a door locking mechanism utilising an Android application.

Shafarana A.R.F et al (2017) created an android-powered automation and security system for smart houses. Umar Muhammad el al (2020) created a similar project based on 'smartdoor security system using arduino and Bluetooth'.

Many additional 5 projects on smartdoor have been completed in other countries. They are all distinct in terms of design, features, devices, and algorithms. They are generally intended to meet specific purposes and to make use of components that are readily available in the relevant places. Some are inexpensive, while others are quite costly. Working requires the availability of both gear and software. After a lengthy search, I discovered a huge number of articles. While looking for publications on security, I came across some projects for door security. The majority of these are carried out in Western countries. Many Arduino or Raspberry Pi projects are solely for security purposes. Again, the ideas are limited to using Arduino or Raspberry Pi to control home appliances. The majority of earlier studies had issues with their design, particularly in terms of replicating by others and component availability.

III.   PROPOSED SYSTEM
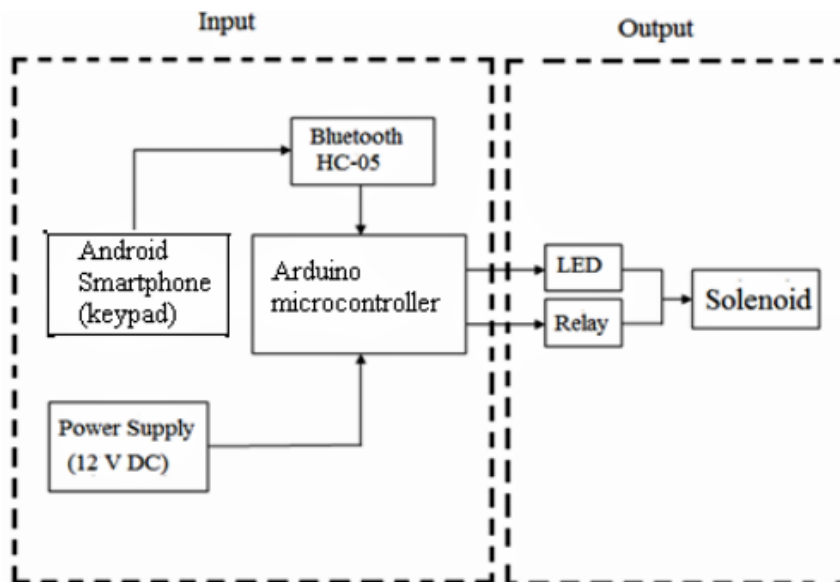
Figure 1: System Block Diagram

The systemblock diagram is basically a Proof of Concept (POC). The block diagram depicts the overall system. This system receives input from an Android smartphone via the Arduino software, the system necessitated the development of a programme that would be executed on the microcontroller. The Arduino microcontroller's programming language is C. To run the programme and integrate it into the microcontroller, software such as Arduino was required. The circuit is tested to ensure that it has been installed correctly. With an LED indicator that turns on in the microcontroller circuit to ensure that no components are damaged. To open and lock the output, a relay and a solenoid are used.

IV.   HARDWARE

[1]   Arduino UNO

The Arduino Uno is a microcontroller board based on the ATmega328p. It is a simple, low-cost, opensource prototyping platform that may be extended to include hardware and software. It includes 14 digital input/output pins (6 of the can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connector, a power connector, and a reset button. It includes everything needed to support the microcontroller. We must either connect it to a computer via a USB cable or power it with an AC-to-DC adaptor. The Arduino circuit acts as a link between the project software and the hardware components.

[2] Bluetooth HC-05

Bluetooth HC05 Bluetooth is a wireless technology standard for data exchange and personal account establishment over short distances (using UHF shortwave radio waves in the 2.4-2.485 GHz ISM band) between fixed and mobile devices. Network (PAN). The Bluetooth module we are using allows us to send and receive signals. It receives text from the Android phone and sends it to the Arduino Uno's serial port. The Bluetooth module used here is the HC 05 module, which is illustrated below. It is a simple Bluetooth SPP (Serial Port Protocol) module developed for setting up a transparent wireless serial connection. The HC-05 Bluetooth module is a master/slave module. The factory configuration is slave by default. Only commands can be used to configure the module's role (Master or Slave). The slave modules cannot create a connection to another Bluetooth device, but they can receive connections from other Bluetooth devices. The master module has the ability to link to other devices.
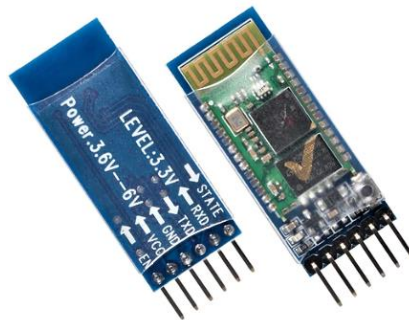
[3] Relay Driver Board

Computer boards featuring a variety of relays and switches are known as relay boards. They are meant to manage the voltage supply and have input and output terminals. For each of the onboard relay channels, relay boards enable separately programmable, real-time control. It's a single-channel 5V relay. Maximum load on the typically open interface of the relay: AC 250V/10A, DC 30V/10A. It has a 5mA trigger current and a DC 5V operating voltage. On each relay channel, a connector could be used to set a high or low level. If the control line is not linked, the relay will not move, which is a mistake architecture. Power (green) and 1-channel relay status indicators are included (red). The terminal block can connect all module size interfaces directly, which is handy and practical.

[4]   DC 12 V Solenoid lock

The solenoid lock will be controlled by the relay driver board, which will eventually allow or prohibit entrance to the restricted area to the person who has been authenticated. It is reliable, long-lasting, and energy-efficient, with a lengthy lifespan. The lock outperforms other types of locks in terms of anti-theft and shockproof design. The electronic lock can regulate the opening and closing of the door after the wires are connected and the electricity is supplied. When the solenoid's power supply is taken off, the plunger resets the latch, relocking the door.


V.   SOFTWARE

[1]   Arduino IDE

Arduino is made up of a hardware programmable circuit board (also known as a microcontroller) and software, known as an IDE (Integrated Development Environment), that runs on your computer that is used to create and implement Device code to the Physical Board.

[2]   C Programming

To run the Arduino microcontroller, we use the CProgramming Language. The Arduino microcontroller is programmed to use a relay as a switch to move the solenoid. After the user inputs an order, the relay's output pin 6 will be high and there will be a 1 second delay.

VI.   RESULTS AND DISCUSSION
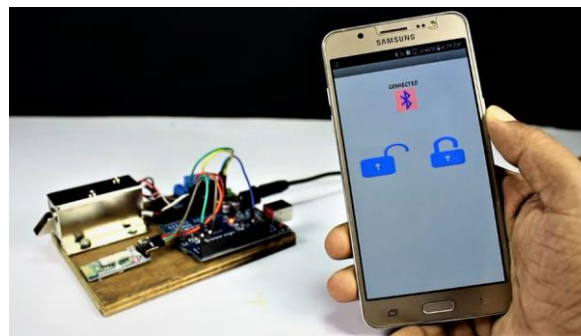
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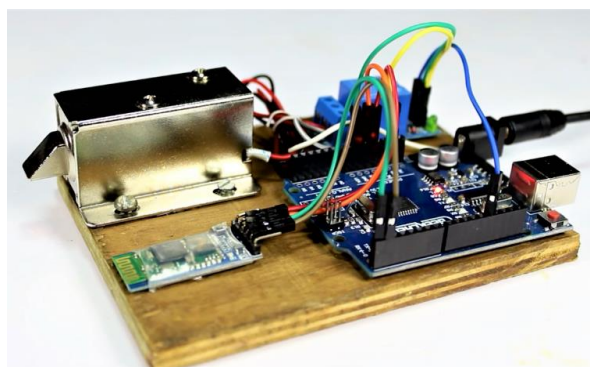
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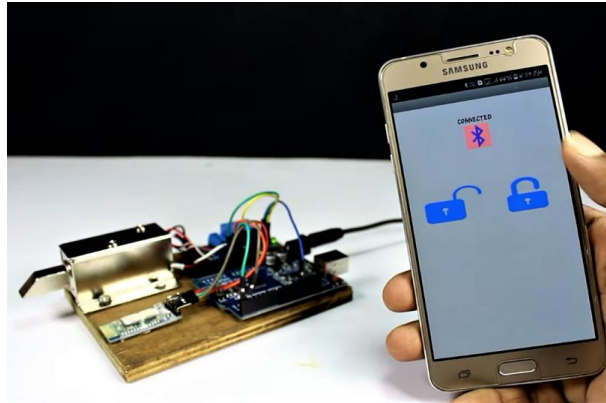
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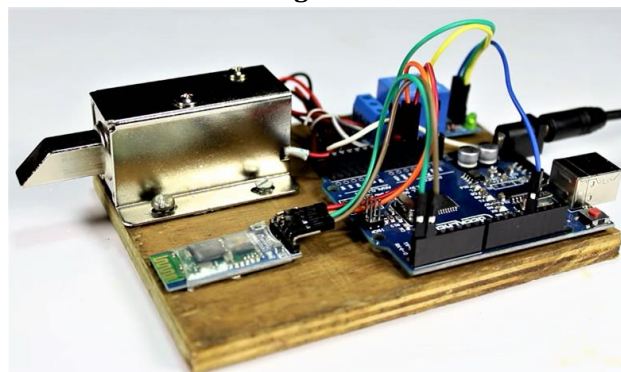
Figure 5

The person who has been authenticated will be able to use the application and lock or unlock the door with a single click. A test is performed to test the Arduino output in giving output on the LED and Relay for opening and closing the systems to check systems automatically lock/unlock door. The results show that when the solenoid is in the lock position, the green led blinks, while when it is in the unlock position, The red light blinks. When the lock is in the rest state, it remains locked.

VII.   CONCLUSION

Smart Door Lock system has a wide range of application. Specially in prohibited areas like workplaces, banks, malls, worker rooms, labs and homes. This paper explains how to control house safety for digital homes, specifically door key locks. As a prototype for an inside and outside key lock system, we use a solenoid door lock system. It also provides security and convenience for Android phone/tablet users. The completion of a wireless Bluetooth connection in a microcontroller allows for a more straightforward system installation. The system was designed and developed and tested successfully to Control the Door situation with an Android Bluetooth-enabled phone and Bluetooth modules via Bluetooth HC-05. In this paper, we discussed a simple prototype, but it can be expanded to most of the other regions in the future.

VIII.   REFERENCES

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