IOT BASED DOOR LOCK SYSTEM

A Major Project Report Submitted in partial fulfillment of the requirements for the award of Degree of Bachelor of Technology in Electrical Engineering.

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DECLARATION

We '**Mahesh Ahirwar,Shivam Tiwari, Shrangesh Rathore, Shreyansh Kumar Sahu, Sudhanshu Kumar**' students of **'Bachelor of Technology in Electrical Engineering ', session: 2020-2021,** Technocrats Institute of Technology (Excellence) Bhopal, (M.P), hereby declare that the work presented in this project work entitled **'IOT BASED DOOR LOCK SYSTEM'** is the outcome of my own bonafide work and is correct to the best of my knowledge and this work has been undertaken taking care of engineering ethics. It contains no material previously published or written by another person nor material which has been accepted for the award of any other degree or diploma of the university or other institute of higher learning, except where due acknowledgment has been made in the text.

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CERTIFICATE

This is to certify that the work embodies in this project work entitled **'IOT BASED DOOR LOCK SYSTEM'** being submitted by **'Mahesh Ahirwar 0191EE181043,Shivam Tiwari 0191EE181084, Shrangesh Rathore 0191EE181085, Shreyansh kumar sahu 0191EE181086 , Sudhanshu Kumar 0191EE181093**' for partial fulfillment of the requirement for the award of **'Bachelor of Technology in Electrical Engineering'** discipline to Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal (M.P.) during the academic year 2020-2021 is a record of bonafide piece of work, undertaken by him in the supervision of the undersigned.

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CERTIFICATE OF APPROVAL

The major project entitled **'IOT BASED DOOR LOCK SYSTEM'** being submitted by '**Mahesh Ahirwar, Shivam Tiwari, Shrangesh Rathore, Shreyansh Kumar Sahu, Sudhanshu Kumar** has been examined by us and is hereby approved for the award of degree "**BACHELOR OF ENGINEERING IN ELECTRICAL ENGINEERING**",for which it has been submitted. It is understood that by this approval the undersigned do not necessarily endorse or approve any statement made, opinion expressed or conclusion drawn therein,but approve the dissertation only for the purpose for which it has been submitted.

(Internal Examiner) **(External Examiner)**

Date: **Date:**

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LIST OF ABBREVIATIONS

- IDE Integrated development environment
- USB Universal Serial Bus
- IOT Internet of things
- GND Ground
- FHSS Frequency-Hopping Spread spectrum
- SDL Smart Door Lock
- DIT Do it Yourself
- IEEE Institute of Electrical and Electronic Engineering

ABSTRACT

Smart Home is the term commonly used to define a residence that uses a home controller to integrate the residence's various home automation systems. The most popular home controllers are those that are connected to a Windows based PC. In our research we presented a part of smart home technology which using Bluetooth in a mobile device, so it will easier and more efficient to use. It also based on Android and Arduino platform both of which are free open-source software. In this paper, a system called door locks automation system using Bluetooth-based Android Smartphone is proposed and prototyped. First the hardware design and software development are described, then the design of a Bluetooth-based Smartphone application for lock/unlock the door are presented. The hardware design for door-lock system is the combination of android smart phone as the task master, Bluetooth module as command agent, Arduino microcontroller as controller centre / data processing centre, and solenoid as door lock output. All of the tests indicate that all goes according to the initial design of this research.

Chapter -: 1

INTRODUCTION

Every living being wishes to be safe whether it is a safety related to his belongings or safety of his own precious life. We have been taking several measures in order to attain it to live a worry-free life. In this project we propose a smart locking system which is designed to work based on the Internet of Things to prevent unauthorized access and trespassing. Normally the common targets where unauthorized access takes place are Banks, Financial organization, Government offices and organization, and shops. Such activities are performed with an intention of stealing money, or any important documents for personal gain. The main aim of our project is to provide a useful and a feasible solution to many of such issues.

INTERNET OF THINGS

What is IOT??

The Internet of things (IoT) describes physical objects (or groups of such objects) that are embedded with sensors, processing ability, software, and other technologies that connect and exchange data with other devices and systems over the Internet or other communications networks.

Example: **Smart home**

IoT devices are a part of the larger concept of home automation

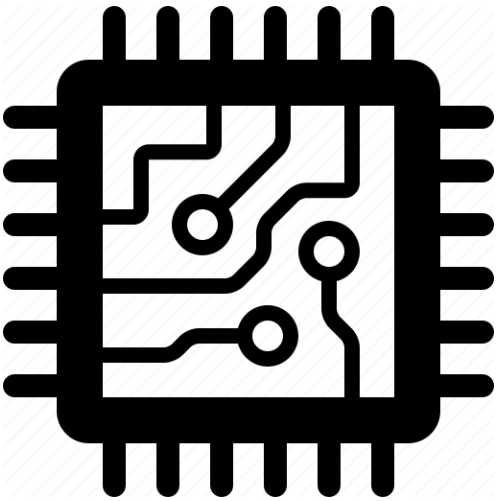
which can include lighting, heating and air conditioning, media and security.

A smart home or automated home could be based on a platform or hubs that control smart devices and appliances

For instance, using Apple's HomeKit, manufacturers can have their home products and accessories controlled by an application in iOS devices such as the iPhone and the Apple Watch.

EMBEDDED SYSTEM - An Embedded System is one that has computer hardware with software embedded in it as one of its important components.

Its software embeds in ROM (Read only Memory). It does not need secondary memories as in computer HARDWARE



```
SOFTWARE PROGRAM
 #include<Servo.h>
Servo my_servo;
char incoming_data ;
String data;
void setup() {
 Serial.begin(9600);
 my_servo.attach(8);
 my_servo.write(0);

}
```

Fig 1.1

History of Embedded Systems:

The origins of the microprocessor and the microcontroller can be traced back to the MOS integrated circuit, which is an integrated circuit chip fabricated from MOSFETs (metal-oxide-semiconductor field-effect transistors) and was developed in the early 1960s. By 1964, MOS chips had reached higher transistor density and lower manufacturing costs than bipolar chips. MOS chips further increased in complexity at a rate predicted by Moore's law, leading to large-scale integration (LSI) with hundreds of transistors on a single MOS chip by the late 1960s. The application of MOS LSI chips to computing was the basis for the first microprocessors, as engineers began recognizing that a complete computer processor system could be contained on several MOS LSI chips

The first multi-chip microprocessors, the Four-Phase Systems AL1 in 1969 and the Garrett AiResearch MP944 in 1970, were developed with multiple MOS LSI chips. The first single-chip microprocessor was the Intel 4004, released in 1971. It was developed by Federico Faggin, using his silicon-gate MOS technology, along with Intel engineers Marcian Hoff and Stan Mazor, and Busicom engineer Masatoshi Shima.

One of the first recognizably modern embedded systems was the Apollo Guidance Computer,developed ca. 1965 by Charles Stark Draper at the MIT Instrumentation Laboratory. At the project's inception, the Apollo guidance computer was considered the riskiest item in the Apollo project as it employed the then newly developed monolithic integrated circuits to reduce the computer's size and weight.

Why do we need embedded system?

Embedded systems are designed to do some specific tasks, rather than be a general-purpose computer for multiple tasks. Some also have real-time performance constraints that must be met, for reasons such as safety and usability; others may have low or no performance requirements, allowing the system hardware to be simplified to reduce costs.

Embedded systems are not always standalone devices. Many embedded systems consist of small parts within a larger device that serves a more general purpose. For example, the Gibson Robot Guitar features an embedded system for tuning the strings, but the overall purpose of the Robot Guitar is, of course, to play music. Similarly, an embedded system in an automobile provides a specific function as a subsystem of the car itself.

The program instructions written for embedded systems are referred to as firmware, and are stored in read-only memory or flash memory chips. They run with limited computer hardware resources: little memory, small or non-existent keyboard or screen.

Basic components of EMBEDDED SYSTEM

- **It contain hardware**

Δ Processor, Timers, Interrupt controller, I/O Devices, Memories, Ports,

Etc.

- **It contain main Application Software**

Δ Which may perform concurrently the series of tasks or multiple tasks

- **It has Real Time Operating System(RTOS)**

Δ RTOS defines the way the system work. Which supervise the application software. It sets rules during the execution of the application program. A small-scale embedded system may not need an RTOS.

Hardware classsification of EMBEDDED SYSTEM

1. SMALL SCALE EMBEDDED SYSTEM

As the name suggest, It is the smallest type of embedded system which has less complexities in their hardware and software .It requires a board level design. Usually, they are designed with 8- or 16-bit microcontroller. 'C ' language is mostly used while installing this software. It can be battery operated.

Fig1.2

2. MEDIUM SCALE EMBEDDED SYSTEM

It is designed using 16- or 32-bit microcontroller or DSPs. The software includes RTOS,Source Code engineering tool , Simulator , debugger and integrated development environment. These things make the software complicated. Software tools also used as solution to the hardware complexities.

Fig 1.3

TRENDS AND CHARACTERISTICS

The IoT's major significant trend in recent years is the explosive growth of devices connected and controlled by the Internet. The wide range of applications for IoT technology mean that the specifics can be very different from one device to the next but there are basic characteristics shared by most.

- **Intelligence**
- **Architecture**
- Complexity
- **Size considerations**

INTELLIGENCE

Ambient intelligence and autonomous control are not part of the original concept of the Internet of things. Ambient intelligence and autonomous control do not necessarily require Internet structures, either. However, there is a shift in research (by companies such as Intel) to integrate the concepts of the IoT and autonomous control, with initial outcomes towards this direction considering objects as the driving force for autonomous IoT. A promising approach in this context is deep reinforcement learning where most of IoT systems provide a dynamic and interactive environment.

ARCHITECTURE

IoT system architecture, in its simplistic view, consists of three tiers: Tier 1: Devices, Tier 2: the Edge Gateway, and Tier 3: the Cloud. Devices include networked things, such as the sensors and actuators found in IoT equipment, particularly those that use protocols such as Modbus, Bluetooth, Zigbee, or proprietary protocols, to connect to an Edge Gateway.

Decentralized IoT

Decentralized Internet of things, or decentralized IoT, is a modified IoT. It utilizes Fog Computing to handle and balance requests of connected IoT devices in order to reduce loading on the cloud servers, and improve responsiveness for latency-sensitive IoT applications like vital signs monitoring of patients, vehicle-to-vehicle communication of autonomous driving, and critical failure detection of industrial devices.

COMPLEXITY

In semi-open or closed loops (i.e., value chains, whenever a global finality can be settled) the IoT will often be considered and studied as a complex system due to the huge number of different links, interactions between autonomous actors, and its capacity to integrate new actors. At the overall stage (full open loop) it will likely be seen as a chaotic environment (since systems always have finality)

SIZE CONSIDERATIONS

The Internet of things would encode 50 to 100 trillion objects, and be able to follow the movement of those objects. Human beings in surveyed urban environments are each surrounded by 1000 to 5000 trackable objects .In 2015 there were already 83 million smart devices in people's homes. This number is expected to grow to 193 million devices by 2020.

The figure of online capable devices grew 31% from 2016 to 2017 to reach 8.4 billion *

1. Refence : * *Köhn, Rüdiger. "Online-Kriminalität: Konzerne verbünden sich gegen Hacker". Faz.net.*

CHAPTER 2

PROJECT DESCRIPTION AND BLOCK DIAGRAM

From connected cars to connected wearables to home security, the Internet of Things is rapidly marking its presence in every field. Now we have IoT enabled home automation and security devices that can be controlled from anywhere in the world using the Internet of Things. There are many kinds of Wi-Fi door lock available in the market which makes your home more secure and saves time in finding the keys. Here we are also building a similar door lock which can be controlled from the Smartphone.

So in this project, we are going to make an IOT based Door Lock System using ArduinoUno. Here the app “Arduino Bluetooth Controller - All in One” will act as the main controller and connect the user to the door lock system using the Internet. This allows the user to lock/unlock his home’s door lock by using a smartphone from anywhere in the world.

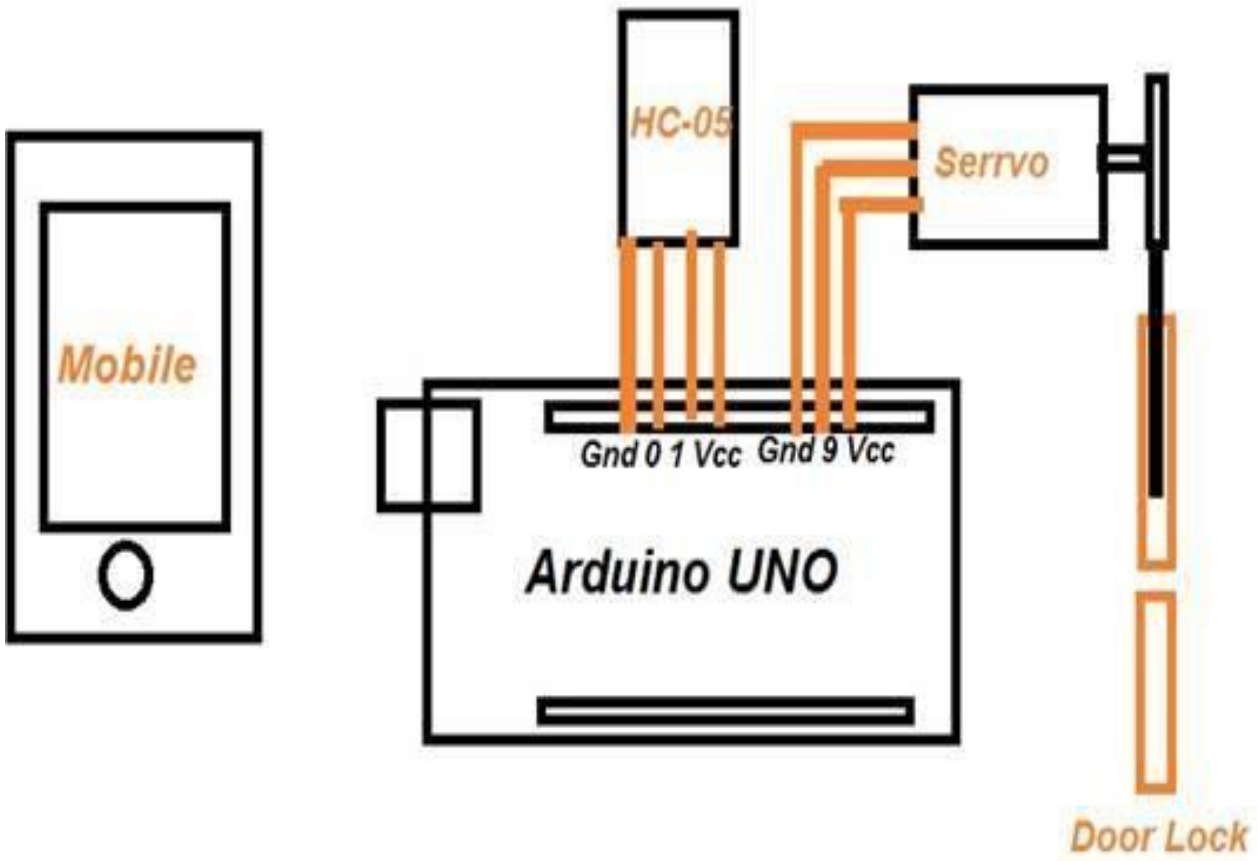


Fig. 2.1 Hardware Model

BACKGROUND AND RELATED WORK:

The first step to build a smart home is about the security and the door is the major device for security system. The device is a system to lock and unlock the door. Rather than using a key, it uses a command that is delivered digitally via Bluetooth on Smartphone and other mobile devices. The use of electronic lock using Bluetooth on Android smart phones in addition to providing ease of use, also provide better security than conventional key.

The system designed to simulate an electronic key, which is controlled through a Bluetooth-enabled smart phone. Controlling conducted by sending a command via Bluetooth to the Arduino circuit that acts as a connection between Android smart phone and servo motor.

SERVO MOTOR DOOR LOCK:

A servo motor operates on a system based on sending three different pulse widths to the unit to produce movement that ranges from 0 to 90 to 180 degrees. A 1 ms pulse width will position the motor to the extreme left (0°), a 2 ms pulse width will position the motor to the extreme right (180°), and a 1.5 ms pulse width will position the motor in between these two extremes (90°).

HARDWARE ARCHITECTURE AND IMPLEMENTATION:

Arduino microcontroller serves as the brain of the whole series. The microcontroller can be linked with other circuits to perform certain functions. The Arduino microcontroller using IC ATMega328P-PU and works by entering the program that has been created and ready for instantly use. Bluetooth module used in this circuit is the type of HC-05, which requires a 3.3 V DC power drawn

from the Arduino microcontroller circuit (pin 3.3 V), Pin (TX 1) is a pathway transmit / send data on the Bluetooth module HC-05 with microcontroller and Pin (Rx 0) as the receive path / receiver data on the HC-05 Bluetooth module with microcontroller while the path GND (Ground) is a path connecting the data between HC-05 Bluetooth module with microcontroller circuit.

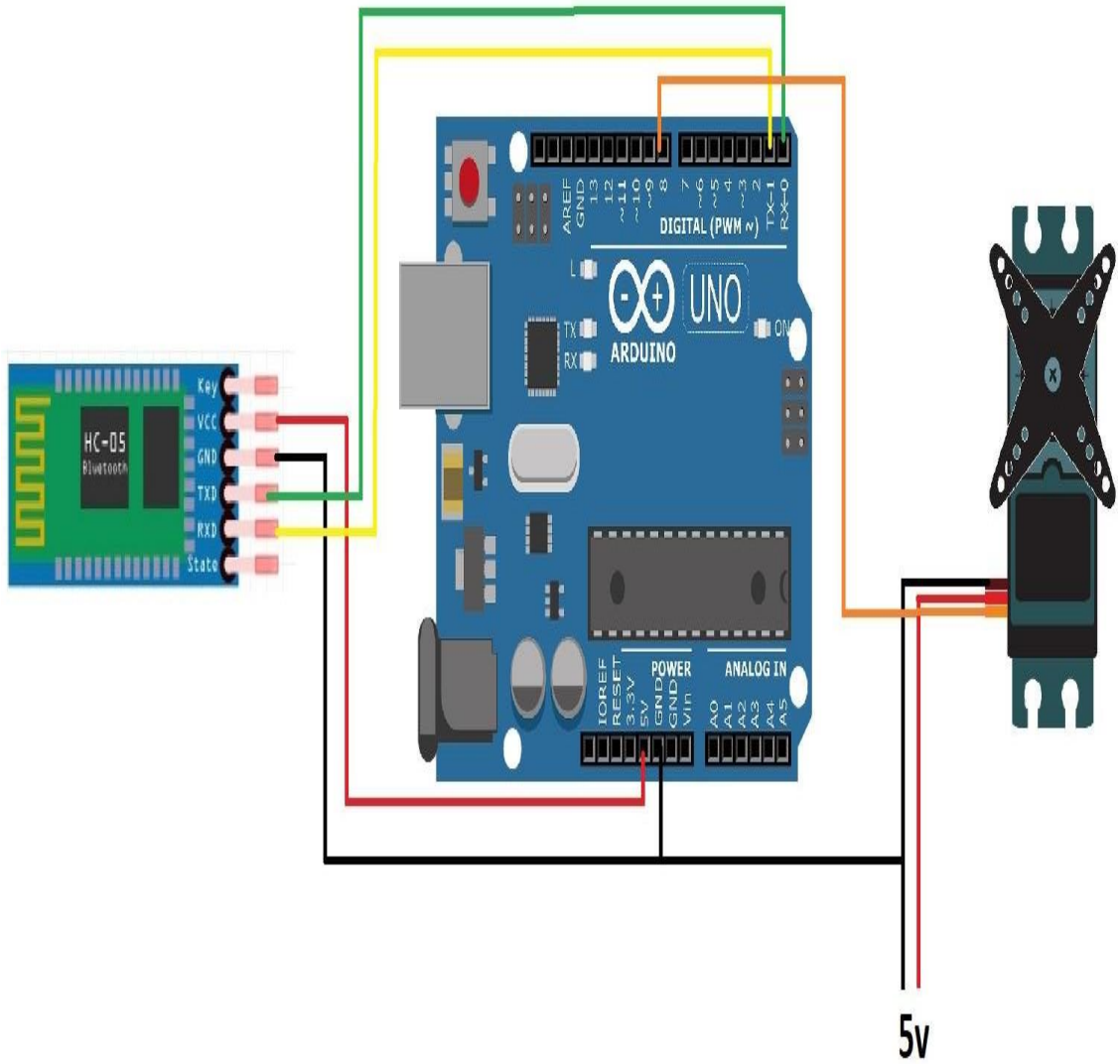


Fig 2.2 Hardware Architecture

This system has input from android Smartphone using Andruino software (v0.11), the overall system is controlled automatically and the output is a Servo motor that connected to the Arduino microcontroller circuit. The function of each block can be seen in Table-1.

No.	System Block	Function
1	Arduino Microcontroller	As data processing center
2	Android Smartphone (Andruino v0.11)	As data input
3	Bluetooth Module Hc-05	As data receiver
4	Battery and Adaptor	As the power supply
5	Servo Motor	As system output

Table 2.1 Funtion of different blocks

PROGRAMMING:

```
#include<Servo.h>
Servo my_servo;
char incoming_data ;
String data;
void setup() {
 Serial.begin(9600);
 my_servo.attach(8);
 my_servo.write(0);
}
void loop() {

 while(Serial.available())
 {
  delay(10);
  char incoming_data = Serial.read();
```

```
 data+=incoming_data;
 if(data=="ON")
 {
 my_servo.write(90);
 delay(5000);
  my_servo.write(180);
   delay(1000);
 }
 if(data=="OFF")
 {
 my_servo.write(0);
 delay(100);


  }
 }
data="";
}
```

NEED OF HOME AUTOMATION:

‘Internet of Things’ is an umbrella term used for all technologies that enable the connection of a device to the Internet.

Such systems depend on the collection of data. The data is then used for monitoring, controlling and transferring information to other devices via the internet. This allows specific actions to be automatically activated whenever certain situations arise. In a simple example, consider a smart kettle. The kettle can be programmed to automatically turn off once it reaches a specific temperature. It might also send a notification to the user on the same.

Now apply the same concept to the entire home and all the devices present. That is a smart home powered by IoT. Instead of manually going up to the device and taking action, those actions can be taken at the press of a button. These days, most smart IoT home automation devices allow you to control them via an app or even via voice commands.

HOW AUTOMATION IS CONNECTING THE IOT DEVICES:

- Connection and identification from the device to the IoT system through an IP address.
- Actuators that allow the devices to take action based on data from their own sensors and network feedback.
- IoT gateway to bridge data from the different devices to reach the cloud. It also translates the devices' protocols into one standard protocol and filters out unnecessary data from the devices.
- The cloud, where all data from the IoT devices is gathered and processed by software.
- User interface, from where users get the data from the devices so that they can make the required commands that the devices need to execute.

CHAPTER 3

CIRCUIT DESCRIPTION/COMPONENTS DESCRIPTION

The door lock system consisting both types of components:

I) Hardware components:

- Arduino Uno
- Servo motor
- Wires-10 cm Battery 5-6 V
- Bluetooth HC05
- Lock
- Jumper wires

II) Software components:

- Arduino Bluetooth Controller AndroidApp
- Arduino IDE

3.1HARDWARE COMPONENTS DESCRIPTION:

1. Arduino Uno :

Arduino Uno is a microcontroller board based on the ATmega328P (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator (CSTCE16M0V53-R0), a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.. You can tinker with your Uno without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.

"Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform; for an extensive list of current, past or outdated boards see the Arduino index of boards.

Fig. 3.1 Arduino Uno

Arduino UNO Features and Technical Specs

No.	Parameter Name	Parameter Value
1	Microcontroller	Atmega328
2	Crystal Oscillator	16MHz
3	Operating Voltage	5V
4	Input Voltage	5-12V
5	Digital I/O Pins	14 (D0 to D13)
6	Analog I/O Pins	6 (A0 to A5)
7	PWM Pins	6 (Pin # 3, 5, 6, 9, 10 and 11)
8	Power Pins	5V, 3.3V, Vin, GND
9	Communication	UART(1), SPI(1), I2C(1)
10	Flash Memory	32 KB (0.5KB is used by bootloader)
11	SRAM	2 KB
12	EEPROM	1 KB
13	ICSP Header	Yes
14	Power sources	DC Power Jack & USB Port

Table no. 3.1 Arduino uno

Arduino Uno Pinout

Arduino Uno is based on an AVR microcontroller called Atmega328. This controller comes with 2KB SRAM, 32KB of flash memory, 1KB of EEPROM. Arduino Board comes with 14 digital pins and 6 analog pins. ON-chip ADC is used to sample these pins. A 16 MHz frequency crystal oscillator is equipped on the board. The following figure shows the pinout of the Arduino Uno Board.

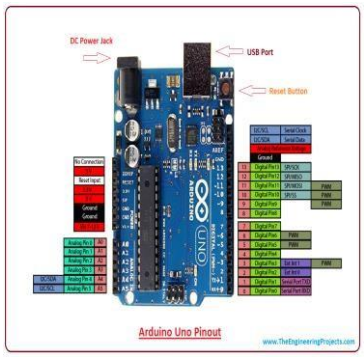


Fig. 3.2 Arduino Uno Pinout

Applications of Arduino UNO :

- Embedded System
- Security and Defense System
- Digital Electronics and Robotics
- Parking Lot Counter
- Weighing Machines
- Traffic Light Count Down Timer
- Medical Instrument
- Emergency Light for Railways
- Home Automation
- Industrial Automation

2 SERVOMOTOR :

A servo motor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity, and acceleration. It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors.

Fig. 3.3 Servo motor

SERVOMOTOR PINOUT :

The servo motor SG90 consists three pin GND, VCC and signal.

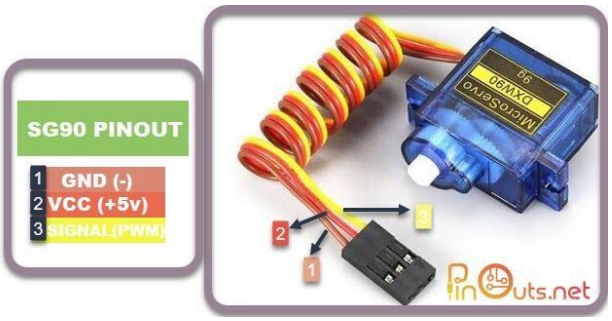


Fig. 3.4 Servo motor Pinout

SG90 Servo Motor Specifications

The SG90 micro servo motor we provide below features has TowerPro brand. The working voltage is 5v. With this motor, you can do applications that require low power and torque. The torque of sg90 is 2.5 kg/cm. This means: this servo motor can pull a 2.5 kg load horizontally. Sg90's gear system is plastic. So its gears can be easily damaged

3. Blutooth HC 05

The HC-05 is very easy to use Bluetooth to serial converter. HC-05 connects microcontrollers (like Arduino) to other Bluetooth enabled devices. This allows the devices to communicate wirelessly with each other.

HC-05 is a Bluetooth SPP(Serial Port Protocol) module designed for wireless communication. It can also be operated as a master or slave configuration.

Fig. 3.5 Bluetooth HC 05

How to Use the HC-05 Bluetooth module

The HC-05 has two operating modes, one is the Data mode in which it can send and receive data from other Bluetooth devices and the other is the AT Command mode where the default device settings can be changed. We can operate the device in either of these two modes by using the key pin as explained in the pin description.

It is very easy to pair the HC-05 module with microcontrollers because it operates using the Serial Port Protocol (SPP). Simply power the module with +5V and connect the Rx pin of the module to the Tx of MCU and Tx pin of module to Rx of MCU as shown in the figure below

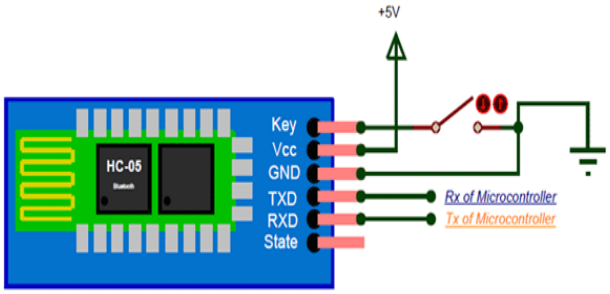


Fig. 3.6 Bluetooth Internal Module

During power up the key pin can be grounded to enter into Command mode, if left free it will by default enter into the data mode. As soon as the module is powered you should be able to discover the Bluetooth device as "HC-05" then connect with it using the default password 1234 and start communicating with it. The name password and other default parameters can be changed by entering into the

HC-05 Technical Specifications :

- Serial Bluetooth module for Arduino and other microcontrollers
- Operating Voltage: 4V to 6V (Typically +5V)
- Operating Current: 30mA
- Range: <100m
- Works with Serial communication (USART) and TTL compatible
- Follows IEEE 802.15.1 standardized protocol
- Uses Frequency-Hopping Spread spectrum (FHSS)
- Can operate in Master, Slave or Master/Slave mode
- Can be easily interfaced with Laptop or Mobile phones with Bluetooth
- Supported baud rate: 9600,19200,38400,57600,115200,230400,460800.

HC-05 Bluetooth Module Pinout

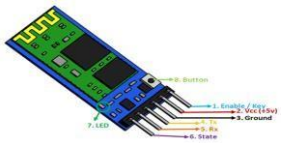


Fig. 3.7 Bluetooth Module

HC-05 Pinout Configuration

Pin Number	Pin Name	Description
1	Enable / Key	This pin is used to toggle between Data Mode (set low) and AT command mode (set high). By default it is in Data mode
2	Vcc	Powers the module. Connect to +5V Supply voltage
3	Ground	Ground pin of module, connect to system ground.
4	TX – Transmitter	Transmits Serial Data. Everything received via Bluetooth will be given out by this pin as serial data.
5	RX – Receiver	Receive Serial Data. Every serial data given to this pin will be broadcasted via Bluetooth
6	State	The state pin is connected to on board LED, it can be used as a feedback to check if Bluetooth is working properly.
7	LED	Indicates the status of Module: Blink once in 2 sec: Module has entered Command Mode Repeated Blinking: Waiting for connection in Data Mode Blink twice in 1 sec: Connection successful in Data Mode
8	Button	Used to control the Key/Enable pin to toggle between Data and command Mode

Table no. 3.2 Bluetooth pinout

Applications of Bluetooth module :

1. Wireless communication between two microcontrollers
2. Communicate with Laptop, Desktops and mobile phones
3. Data Logging application
4. Consumer applications
5. Wireless Robots
6. Home Automation

Fig. 3.8 Jumper wires

Fig. 3.9 Latch Lock

Fig. 3.10 Normal wires

3.2 Software Components :

1. Android App (Arduino Bluetooth Controller) :

Arduino Bluetooth Controller
Arduino Bluetooth Control is an application that allows you to control your arduino board (and similar boards) via Bluetooth, and so to create awesome and fully customized projects, with the new features available within the app.

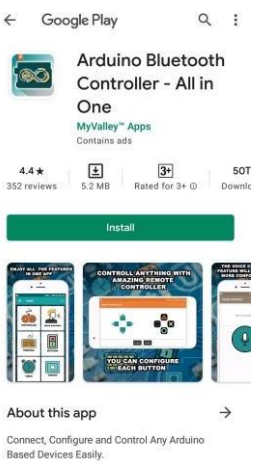
How Arduino Bluetooth Controller work :

The main way this is going to work is when you click a button on the app on your phone. Then, there is a signal sent to the arduino uno via bluetooth communication, and the arduino receives the signal.

A bluetooth module can be connected to via bluetooth, and can be communicated with via serial communication

Arduino Bluetooth Controller App Setup

1. Download the Application form here.



2.Pair your device with HC05/06 Bluetooth module1) Turn ON HC05/06 Bluetooth module2) Scan for available device3) Pair to HC05/06 by entering default password 1234 OR 0000.

3.Open the Application.

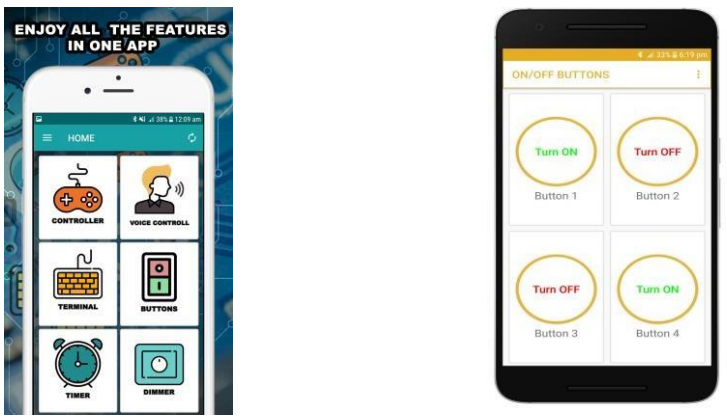


Fig. 3.11 Arduino Bluetooth Controller

2. Arduino IDE

The Arduino Integrated Development Environment is a cross-platform application that is written in functions from Cand C++. It is used to write and upload programs to Arduino compatible boards, but also, with the help of third-party cores, other vendor development boards

Arduino IDE(Integrated Development Environment) is the software for Arduino. It is a text editor like a notepad with different features. It is used for writing code, compiling the code to check if any errors are there and uploading the code to the Arduino.

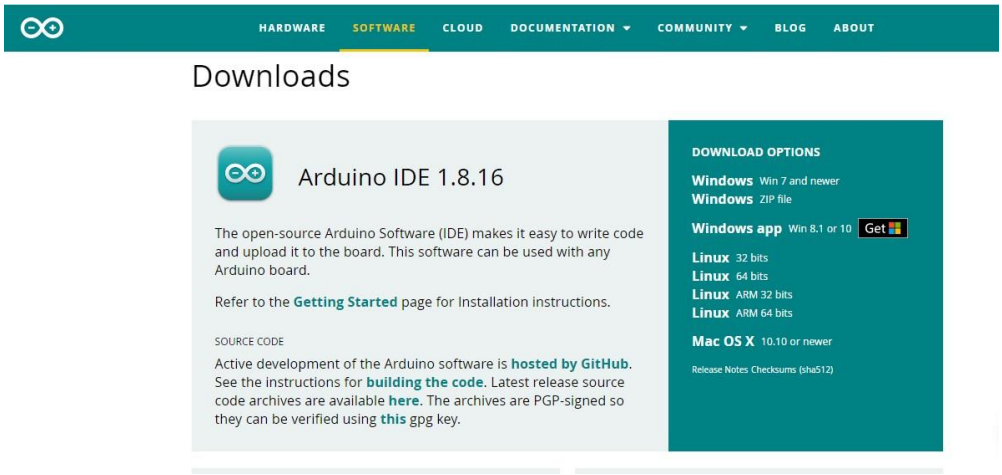


Fig. 3.112Arduino IDE

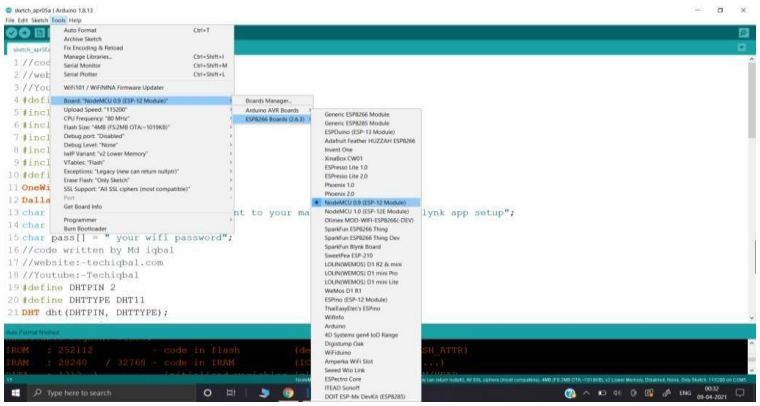
How it work :

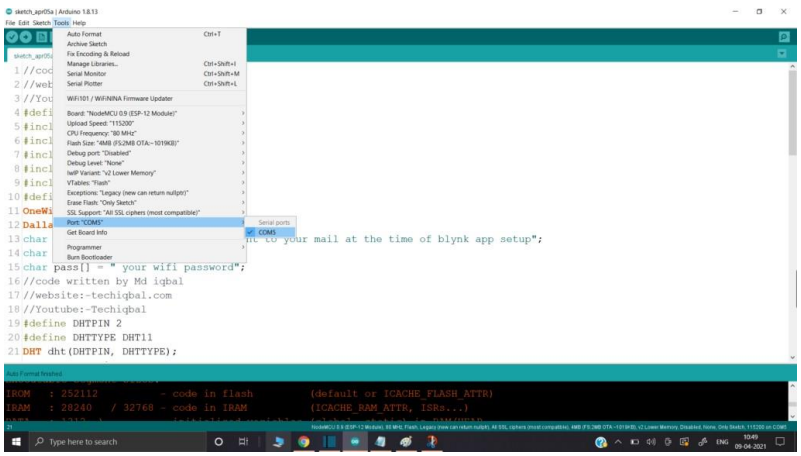
The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them

Arduino IDE Complete Setup

1. Download Arduino ide form here.

2. Connect with Arduino uno and install required libraries and upload code





Complete Arduino IDE setup

CHAPTER 4

METHODOLOGY & WORKING

SYSTEM METHODOLOGY & WORKING

1 METHODOLOGY

This chapter contains the methodology and the basic foundation used to carry out this project. The project is based on four main phases: Pilot Study, Design of Prototype, Implementation of Design and Testing. The first two steps will be completed in the given order while the last two steps will be implemented iteratively. This structure will hopefully hamper risks and inconveniences associated with the project, such as wrongly implemented code or misgivings regarding the prototype. It will also give a greater understanding of the problem definition and will help set the projects outlines and delimitations. The methodology is based upon the iterative and incremental development build model, which will allow the project to be more agile and adaptive for changes in mid-development. Enabling a test-driven and flexible development is particularly important in projects where multiple system parts are obliged to communicate with each other. An agile methodology was therefore chosen, instead of applying methodologies such as the waterfall model, which has a rigid, non-iterative approach.

1.1 Pilot Study: A research study was conducted before the phase of design and implementation. The research aimed to understand the nature, architecture and security challenges of implementing an ANDROID product. Gathering sufficient information regarding the two main themes of this thesis; The architecture design of common ANDROID applications and the security challenges faced by ANDROID entities.

The first task consisted of figuring out the common architecture of ANDROID systems and understanding the main three layers that are mentioned in the pilot study leading us to set-up a foundation of the physical environment and classifying the overall structure for our own ANDROID system represented by the smart door lock. The second main subject that took a place in the pilot study was understanding the security aspects of ANDROID systems. Since there are a vast variety of devices that are communicating with each other resulting in expanded breach and possibility for harmful attacks on the system, a main focus on the security aspects seemed reasonable and relevant. We tried to sum up the security challenges and generalize the attacks to set a list of requirements that are needed to be taken and considered when developing an ANDROID system.

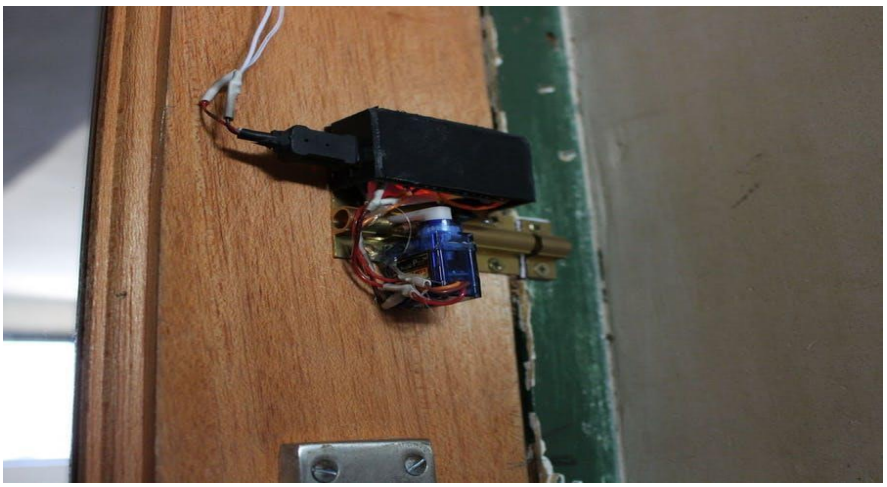
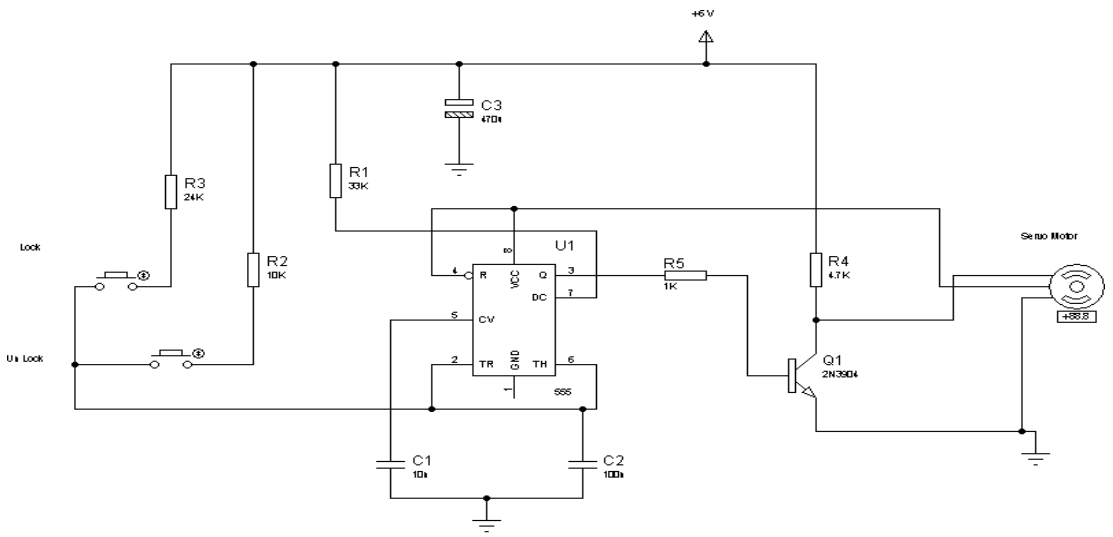


Figure1: An Outlook Of Door Lock System

1.2 Design Of Prototype : A complete specification for the prototype is derived and considered from the pilot study. Design choices take regard to the common architecture of ANDROID systems and the security challenges. The preferences comprised of a suitable microcontroller that would serve the functionality of the SDL, wireless devices

transmitting a continuous radio signal which can be detected by smart devices (e.g Smartphone) via a connective protocol (e.g Bluetooth), a cloud that can contribute in a secure and stable communication and an API that would be able to handle the functionality of the SDL.



Servo Motor Door Lock

Figure2: Design Layout Of Door Lock System

1.3 Implementation of the Design: The phase of development and implementation is conducted with an iterative strategy to construct the prototype that would match the specifications of the design. By breaking down the design into small chunks, we are able to develop and test in repeated sequences. In each iteration, new features can be developed and tested until we have a fully functional system that fulfills the purpose of the thesis. 25

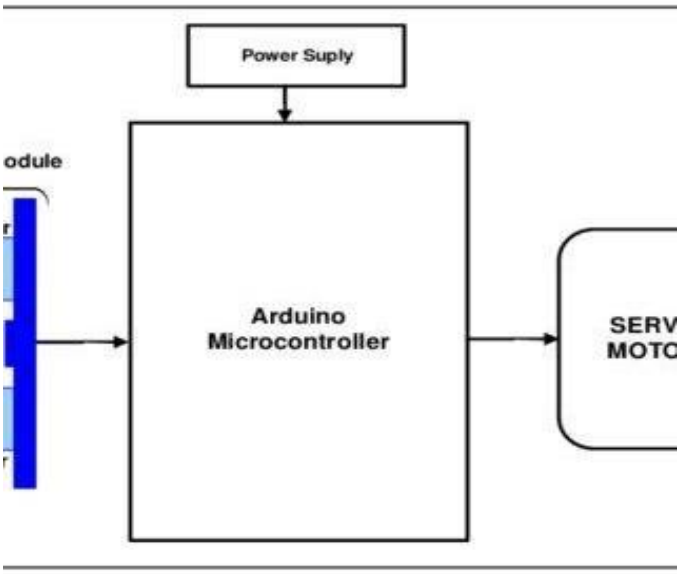


Figure3: Implementation of the Design

1.4 Test Plan : An elaborate test plan that encapsulates all the functionality of the prototype will be written. The test plan is used to verify that the prototype lives up to the expectation and the overall quality requested by the stakeholders. The goal is to continuously update and develop the test plan parallel to the implementation of the design. This will lead to an iterative working environment where implementation continuously will be tested against the testbench. The ideal goal is that the prototype will have an evaluated test for every state of the running implementation. We aim to restrict the tests to three main categories: Software Tests, Hardware tests and "Conclusive-End" tests where the final prototype, combined with both hardware and software, will be tested. The results of the tests will strictly focus on functionality but more importantly security. This will influence the way we write tests and the test plan itself. Results of the hardware and software tests will mostly be used to collect data for further development while the end tests will be neatly analyzed for future research and conclusions.

WORKING

- The basic idea behind the working of door lock lies in the ID sent by the Android phone by means of the developed app.
- To receive the data sent by the phone we use Bluetooth module HC-05 .
- The required android application can be made in two different ways.
- It can be baked using Android Studio or using Arduino bluetooth controller..
- In our project we have made use of Arduino bluetooth controller since it is easy to use and spares us from writing lengthy codes.
- The Arduino bluetooth controller website can be opened using any android phone.
- Further, all the code blocks are combined together.
- Now the app is completed, the .apk is extracted and then installed on a smartphone.
- After the installation of the application in a smartphone and the code uploaded into the smartphone.
- The lock is powered using a battery of 5-9V. Furthermore, the Bluetooth of the smartphone is turned on and is paired with the Bluetooth module connected to the Arduino board.
- On opening the application, the Bluetooth icon turn into lock icon.
- In the event when we switch 'LOCK' in the smartphone, at that point it turns the lock to 'on position' and simultaneously the lock symbol changes into unlocked icon.
- The control flow diagram of the proposed door automation system, which includes opening and closing actions,
- which will be as a result of an object within the specified range of detection (10cm). At the initial state the door
- was closed assuming no object was detected. Once an object is detected, the servo motor is activated and the

- door open as a result. The ultrasonic sensor keeps on checking if the detected object is within its range. Onthe
- other hand, if the object is out of range, the servo motor is activated again, this time for closing of the door else
- the door remains opened.
- The Arduino based door automation system schematic diagram. The schematic has three
- separate parts; an ultrasonic sensor, a controller, and a servo motor. The ultrasonic sensor detects presences of
- an object in the detections area and sends a control signal to the microcontroller. The servo motor is there to
- perform a control action (opening and closing the door) from the microcontroller.

Chapter-5

Result Analysis Conclusion &Future Work

1. Result analysis & conclusion
2. Future work.
3. Refrences

5.1 Result Analysis & Conclusion

The results of the test series shows the minimum system of the Arduino microcontroller Circuit system has a minimum value 9600 Bits per second, with 8data bits and 1 Stop Bits.

The whole series in this study operate the power of 5-6 volts. The power drawn from an adapter with a 7812 regulator IC. A function of this IC is to make the input voltage 220 volts of electricity into the main 5-6 volt DC, so it is safe and does not damage the circuit. Testing is done by ensuring the circuit has been installed correctly. With LED indicator that turn on in the microcontroller circuit and make sure there is no damaged component.Relay used to open and lock the output. The relay driver receives input data from Pin 6 on the microcontroller. Pin 6 on the microcontroller function as input keypad on smart phone. Voltage measurements performed on output of the microcontroller Pin 6 using Volt-Ohm meter. Testing was conducted to determine the changes or differences in voltage .Further testing is to examine the connectivity between Bluetooth on android Smartphone with Bluetooth module series HC-05 and the connection between keypad with Microcontroller. This is a ongoing project. This paper gives basic idea of how to control home security for smart home especially for door key locks. We use smart door lock system as a prototype for indoor and outdoor key lock system. It also provide a security and easy for Android phone/tab users. This project based on Android and Arduino platform both of which are Free Open Source Software. So the implementation rate is inexpensive and it is reasonable by a common person.

Accomplishment of wireless Bluetooth connection in microcontroller permits the system installation in more easy way. The system has been successfully designed and prototyped to control the door condition using an Android Bluetooth-enabled phone and Bluetooth modules via Bluetooth HC-05 .

5.2 Future work.

A rechargeable battery can be provided which can give power backup of 3-4hrs in case of power failure. It can also be implemented using cloud computing where user can control the lock irrespective of his location. Use of camera can also be done for surveillance. For further security, finger scanner, face recognizes oretc can be used. To avoid opening of door every time, voice conversation can also be done with the person on the other side of the door .This system can also be installed with a fire alarm. Usually at home we don't have fire alarms, so this system can work as both – lock and fire alarm. This system can be used in hotels, banks, motels, or any other place as an alternative lock for additional security. The IoT system that was developed in this thesis focus on the security approach more than the functionality of the system. However, the main functionality of the system has been developed where the user is able to access the door using the mobile app. Some of the functionality that this system need to be further developed is to make it deployable for a group of users. Even though the system has a high cohesion within its component, it lacks the ability to handle some alternative workflows. The system can control the main use-case but can sometimes be unresponsive because of missing error callbacks. It would be reasonable to increase the amount of feedback the system gives to both users and administrators, so that the product appears more trustworthy and is easier to troubleshoot. An implementation against relay attacks and unintentional locking should also be overseen. Prevention of relay attacks could be solved by introducing GPS coordinates as a vital element. One solution could be to force the mobile application to check if the smartphone coordinates closely match the coordinates of the deployed beacon. In that way the beacon will only request to open the door when it is physically present the system and, therefore, making relay attacks even more difficult.

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