Android based security system Using Arduino

Dereyk D'Souza, Arun Varia, Hiren Shah, Sanket Shah, Rohit Kant

Abstract— Security locks play a crucial role in the protection of materials valuable to a person or a group of people. These locks vary from being simple in design to complex. Locks that are simple in design and easy to use often are easy to breach into and locks that are complex in design are tough to breach but tedious to use. High end lock systems are expensive and difficult to install. This project aims to add simplicity to the present complex lock system by incorporating an android phone's Bluetooth connection, which nowadays are commonly available. Without the keypad available or lock visible makes this lock system even more secure than traditional locks.

Index Terms— Android, Arduino, Bluetooth, Bluetooth SPP, Smartphone, Security Locks, Wireless.

———————————— ◆ ————————————

1 INTRODUCTION

Maslow's hierarchy theory suggests that safety and security are the primary needs of a human being. Every person finds the need to have a secure security system for protecting their money, important documents, precious metals/stones and one's life itself. This project now comes into picture.

Security locks range from basic lock and key type to high end security locks with biometric inputs as its key for those who desire higher level of security. High end security locks offer higher security compared to low end locks. Installation of such complex locks is sometimes expensive and requires skilled personnel for installation. Low end locks are easy to install but often fall prey to tampering and get breached into easily.

This project uses an electromagnetic lock that is triggered to lock or unlock using electric signals from a controller board. This project uses a controller board called Arduino. This board is simple to use and program compared to other controller boards available in the open market. It is an open source physical computing platform based on a simple microcontroller. Arduino boards take inputs from various sensors or array of sensors and produce a respective digital signal. Arduino can easily establish a link between a computer and controller using respective software that is easily available in the market. Arduino uses an Atmega microcontroller as its heart to perform various operations. In our project we have established a link between the lock and the android phone using the phones Bluetooth. The main Arduino board contains a serial Bluetooth module connected to it. The android phone contains an application that is openly available to any one free of cost on the android play store. This applications establishes a connection with the serial Bluetooth modem attached to the Arduino board.

The android application for Bluetooth pairing has a UUID for user identification purpose. The Bluetooth connection will be established when the password entered is correct. Multiple phones can be used as a key to the lock if the password is known.

2 PROJECT DISCRIPTION

2.1 Block Diagram
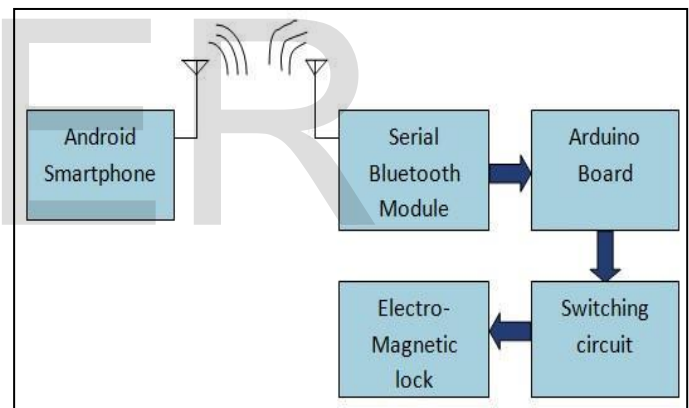
The block diagram mainly consists of:
- Android Smartphone
- Serial Bluetooth module/modem
- Arduino board
- Transistor switching circuit
- Electromagnetic lock

The Android smart phone can be of any type with any version of the software. The version of the software won't affect the working of the application that unlocks the security lock. The software used in the android phone is called Bluetooth SPP. SPP means serial port profile, so the data is sent serially.

This software establishes a wireless link between the android phone and serial Bluetooth module/modem. Paring takes place and the lock requests a password that one has to type in order to unlock the security lock.
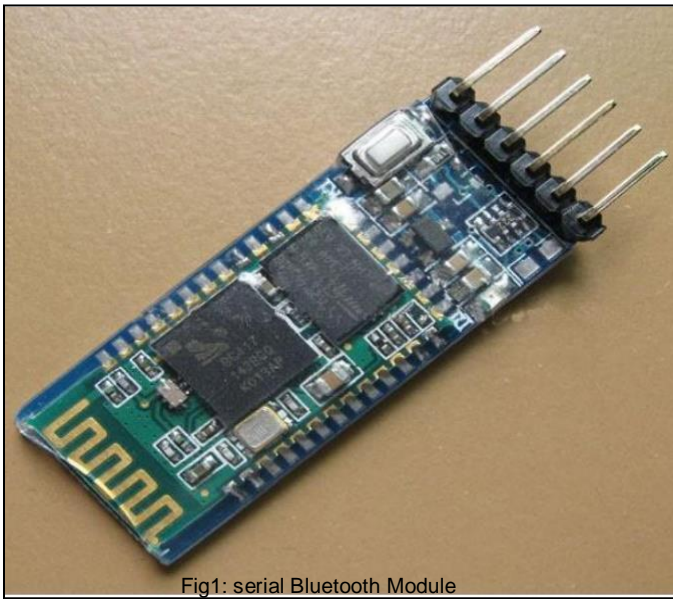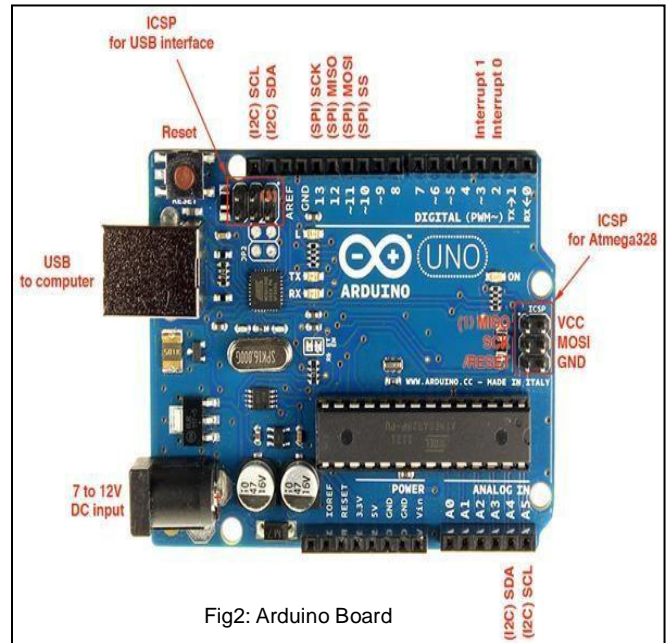
Fig1: serial Bluetooth Module

Fig2: Arduino Board

The serial Bluetooth module is a plug and play design type module. This type of module is compatible with any Arduino board and can be used for a wide variety of tasks from connecting to any mobile phone or tablet or laptops. Here we have used the Bluetooth module to receive the serial data that is transmitted from the Smartphone. The data is transmitted serially from the Smartphone to the Arduino board. The Arduino board serves as a link between the Bluetooth module and electromagnetic lock. It contains an Atmega controller IC as it main processor for carrying out its operations. It is an 8-bit RISC architecture microcontroller with non-volatile flash memory. It has a programming lock for software security. An USB slot for programming it directly through a computer. An 8 bit,16-bit timer/counter and USART for serial communication with certain peripherals. Operating voltages of -2.7 to +5 volts with maximum operating frequency of 8 MHz at 2.7v and 16MHz at 4.5v. The Arduino board contains two Atmega ICs, both can be programmed using ICSP (In circuit serial programmer).

Tx pin of the Bluetooth module is connected to Rx pin of the Arduino Board and the Rx pin of the Bluetooth module is connected to the Tx of the Arduino Board. The transistor switching circuit is used to control the security lock by providing appropriate signal. The transistor will be of higher rating since the current requirement of the lock is more compared to the Arduino board. The electromagnetic lock essentially consists of electromagnet that attracts a conductor with a very large force thus opening and shutting rapidly. The lock used in this project receives a direct current of 0.5 ampere when voltage supplied is 12 volts. The high rated transistor supplies enough current to the lock to open or lock it rapidly.

2.2 Working

The working speed of this project is based on the Arduino operating speed and the time taken by the Android phone to connect to the Arduino board via the serial Bluetooth module/modem.
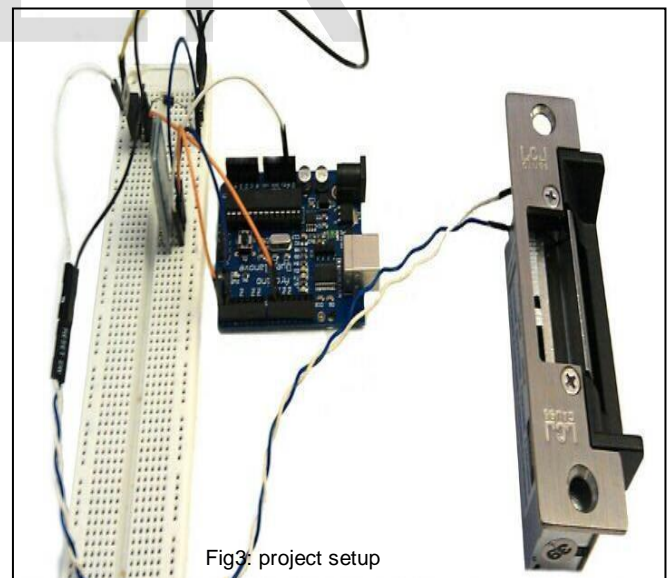

Fig3: project setup

As a person approaches the locked door or cabinet, he/she will use ones Android phone and switch on the Bluetooth. Then after scanning for all nearby Bluetooth devices the UUID of the lock will appear on the screen of the phone. After establishing a connection via the android application the lock system will ask for a password. As soon as the code is typed the Arduino board will receive this password through the serial

Bluetooth module. The controller on the Arduino board will check the password against the pre defined password stored in the program memory of the controller. If the password matches with the predefined password the controller will send a command to the electromagnetic lock via the transistor switching circuit. This signal will cause the electromagnetic lock to open for some seconds and will automatically lock after a few seconds.

There is a diode connected across the electromagnetic lock in order to prevent damage due to back e.m.f. generated when the electromagnetic lock is inactive.

Fig3: Electromagnetic lock

3 ADVANTAGES

[1] Easy to install and use since there are no interconnecting parts.

[2] Friction less operation since the lock used is Electromagnetic in nature.

[3] Since the lock is present behind the door it more secure and less susceptible to tampering.

[4] Economical.

[5] Low maintenance compared to traditional locks.

[6] Customizable since keys can be changed easily.

[7] Locks permits long distance buzz in

4 FUTURE SCOPE

This project can be modified from Bluetooth to Wi-Fi thus increasing the range for long distance buzz in. A compete history of entry and exist can logged thus making the system more secure. Alarm systems can also be integrated into the design and alert messages can be sent to the owner if any break in takes place or tampering with the lock.

5 REFERENCES

[1] Simon Monk, Arduino +Android Projects, 1st Edition, Tab

[2] Michael Margolis, Arduino Cookbook, 2nd Edition, O'Reilly Media

[3] ieeeXplore.com

[4] connectblue.com