

Android & Bluetooth Module Based Door Automation System

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Abstract—In this article, we propose a method of security technology based on Bluetooth module. The most popular home controllers are those that are connected to a Linux, Windows based PC and android mobile. In our research we presented a part of secure home technology which using Bluetooth in a mobile device, so it will more easy and efficient to use. It also based on Android and Arduino (ATmega 328) platform both of which are free open source software. In this paper, a system called door locks automation system using Bluetooth-based Android and IOS Smartphone is proposed and prototyped. First the hardware design and software development are described, then we present Bluetooth-based Smartphone application for lock/unlock the door. 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 center / data processing center, and solenoid as door lock output.

1. INTRODUCTION

Today, most mobile phones are a 'smart phone', which offers more advanced capabilities in connectivity issues. Smart phone usually support one or more short range wireless technologies such as Bluetooth, making it possible to transfer data via these wireless technology. Smart phone can provide computer mobility, ubiquitous data access, and pervasive intelligence for almost every aspect of business processes and people's daily lives [2]. Smart home technology is the technologies that are used in homes with various apparatus converse over a local network. For example, not only would a house owner be woken with warning of a fire alarm, the smart home would also release doors, call the fire department and light the pathway to safety. The use of Bluetooth technology in a smart phone today is not just for the transfer of data and files only. In recent years, smart home automation is one of the applications of Bluetooth technology. Bluetooth technology operate over unlicensed, its available at 2.4GHz frequency, it also can link digital devices within a range of 10m to 100m at the speed of up to 3Mbps but it depending on the Bluetooth device class. With these qualifications of Bluetooth, we offer a door automation system based on Bluetooth technology, especially in door automation system.

2. HARDWARE ARCHITECTURE AND IMPLEMENTATION

There are several steps in hardware design, i.e.

- The design of Arduino Uno (ATmega 328) circuit
- The design of Bluetooth circuit
- The design of Solenoid door locks circuit
- The design of LED circuit
- The design of power supply circuit
- The design of driver relay circuit

Arduino microcontroller serves as the brain of the whole series. The Arduino microcontroller using IC ATmega328 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.

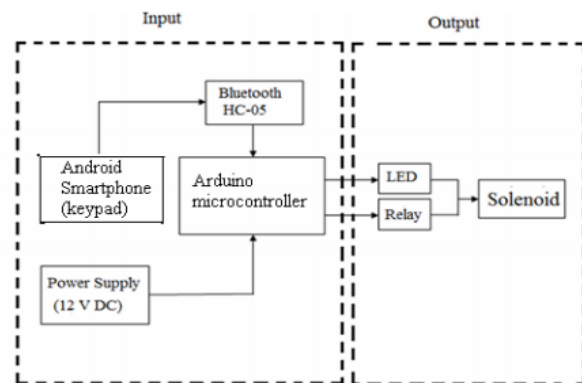


Fig. 1: Block diagram OS Door automation using android

This system has input from android Smartphone using Andruino software (v0.11), the overall system is controlled automatically and the output is a solenoid that connected to the Arduino microcontroller circuit.

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 (12V)	As the power supply
5	Driver Relay	As switch
6	LED	As indicator
7	Solenoid	As system output

Fig. 2: The function of each System Block.

Arduino Microcontroller and the Atmel 8-bit AVR RISC-based microcontroller combines 32 KB ISP flash memory with read while write capabilities, 1 KB EEPROM, 2 KB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface ,SPI serial port, 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts. The device achieves throughputs approaching 1 MIPS per MHz.

3. BLUETOOTH MODULE (HC-05):

Embedded Bluetooth serial communication module has two work modes: order-response work mode and automatic connection work mode. And there are three work roles at the automatic connection work mode. When the module is at the automatic connection work mode, it will follow the default way set lastly to transmit the data automatically. When the module is at the order-response work mode, user can send the AT command to the module to set the control parameters and sent control order. The work mode of module can be switched by controlling the module PIN (PIO11) input level.

Power supply circuit used to supply power throughout the series; the power needed for the whole series is equal to 12 Volts DC. There are several components in the power supply circuit, such as transformers that serve for lowering the voltage. Capacitors are used as filters. And the last is the type LM7812 regulator IC that functions as a regulator of the power output by 12 Volt

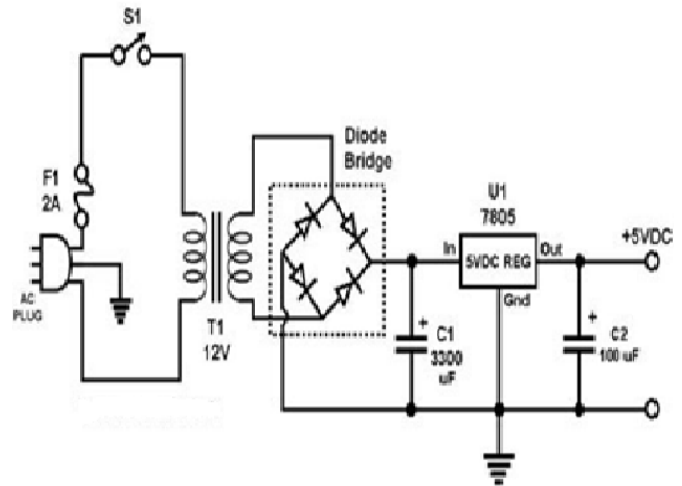


Fig. 3: Circuit Diagram

Relay has a function as an electronic switch. Relay will be active when given input from the microcontroller, and serves as a switch for the solenoid system. In this research, we use the electro mechanical solenoid 12 V with supply voltage to 12V from Adaptor. Solenoid connected to the Relay, Relay connected to the 5V pin of the Arduino Uno for supplying coil voltage and ground Relay to ground Arduino Uno pin.

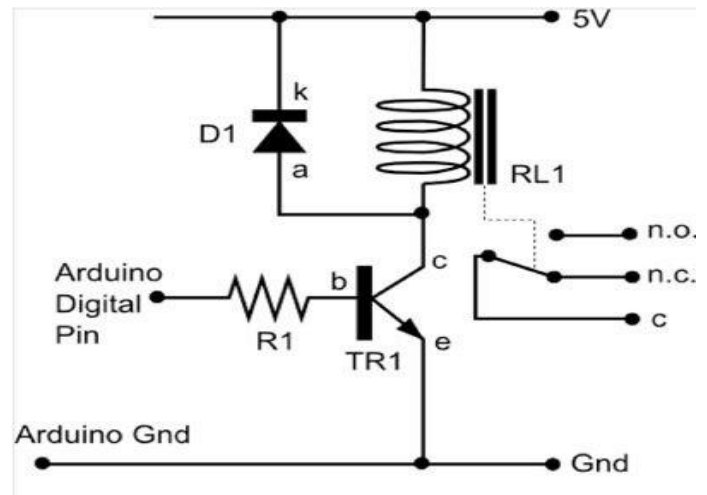


Fig. 4: Relay driver circuit with solenoid Software development

We have used C language as programming language for Arduino (1.0.5). To run Arduino microcontroller, the HEX file generated will be burned using burner. Fig. 4 above is showing relay driver circuit along with the software development, here we have used Relay as a switch to move the solenoid.

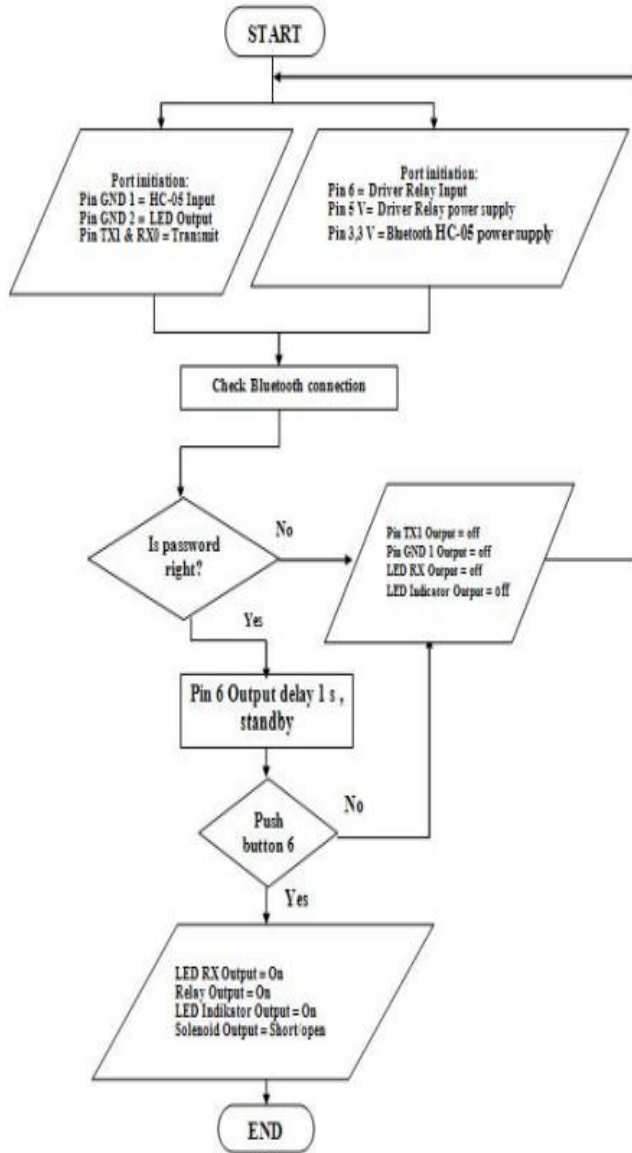


Fig. 5: Methodology Using Flowchart.

The data from complete relay unit will be received pin 6 in Arduino microcontroller. Output pin 6 in relay will be in high condition and 1 s delay after user gives an order. The authors will be developing the application for Android operating system using the Android SDK. The application will be compatible with Android version 2.3 Gingerbread and the development will utilize the. Android will plug-in for Eclipse as well. The documentation for Android the SDK Bluetooth API from the Android Developers website will be used extensively. Various Bluetooth devices such as Bluetooth headphones and keyboards will be used for Bluetooth connectivity with the device.

4. IMPLEMENTATION OF MODULE:

Development in Android requires installation of Android SDK. Along with the SDK, android platform tools and android tools are also necessary for developing applications in android. The latest version is Android API level.

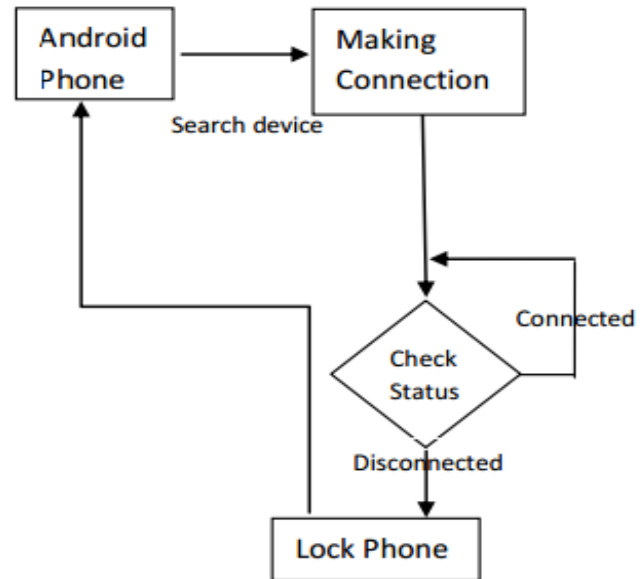


Fig. 6: Implementation of Module.

Android development environment is available for and supports both Windows and Mac operating systems. For the development of this application the authors selected the Windows version. For the Integrated Development Environment (IDE) Eclipse, a free open--source product, was chosen. Android has an Eclipse plug-in called ADT that integrates the Android SDK with Eclipse.

5. CONCLUSION

This paper gives idea of how to control home security for smart home, especially for door key locks. We use solenoid 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. We have discussed a simple prototype in this paper but in future it can be extended to many other regions.

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