

IoT based Electronic Door Opener

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Abstract: These days' people are sky rocketing in technological advancements. This has ushered a lifestyle that has become child's play. We pursue advanced technologies and software every single day. In the huge efforts of making our lives more sophisticated, we are contributing a fraction of a part through our project – SMART DOORS. Smart doors are simple projects that assist people in gaining access to doors and prevent the entry of unauthorized personnel. This uses an Arduino board with a lines of code dumped in it, a hexadecimal keypad and some jumper wires. The predominant attribute of this project is the Arduino board that facilitates the usage of this project which allows it to be set up anywhere and everywhere with utmost expedite efforts. This helps prevent security breaches and helps establish a secure environment in and around.

Keywords: Smart Doors, Microcontroller (Arduino), LCD Display, Wifi Module, Door Relay

1. Introduction

Security indicates protection of our life and assets. Ensuring the safety of people and their valuable things is very important for the prevention of illegal handling. Hence, focusing on door lock security or gate security is very important to avoid further problems in monitored areas. Even with the use of mechanical locks crimes do occur due to the fact that such locks can be easily broken. So, there is a need to come up with other kinds of locks which cannot be easily broken. So, many authors have presented different kinds of digital door locks, automatic password based door locks, software based door locks etc. which can be widely used in houses and offices. The prevention of unauthorized entry into buildings through the main doors is done through the use of ordinary, electronically operated locks, digital codes and biometrics technique like the finger print technology or some based on thumb printing only. These days, advanced automatic door security systems are available with the use of face detection systems, palmtop recognition systems face recognition systems and wireless sensors.

2. Literature survey

Door lock security systems can be broadly classified based on technology they use as 1) Motion detector based, 2) Biometric based, 3) GSM based, 4) smart card based, 5) RFID based, 5) Door phone based, 6) Bluetooth based, 7) Social networking sites based, 8) OTP based, 9) Password based, 10) VB based, 11) Combined system

3. Detailed design

This module has powerful on-board processors and storage devices that allow it to be integrated with the sensors and other application specific devices through its GPIOs with minimal development up-front and minimal loading during runtime. Its high degree of on-chip integration allows it to have minimal external circuitry, including the front-end module which is designed to occupy minimal PCB area. The ESP8266 supports APSD for Bluetooth co-existence interfaces and VoIP applications. It contains a self-calibrated RF that allows it to work under all operating conditions, and requires no external RF parts. The applications of ESP8266 are Wi-Fi location-aware, Smart power plugs, Home automation, devices, Industrial wireless control, Security ID tags.

4. Block diagram

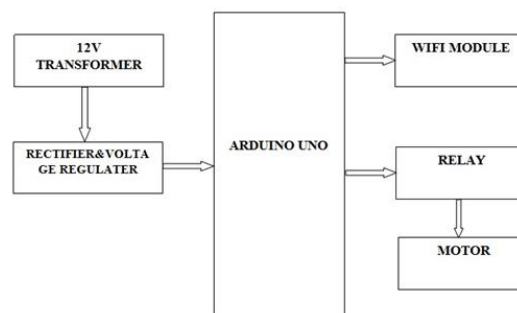


Fig. 1. Block diagram

The Uno board is the reference model for the ARDUINO platform and the first in a series of USB ARDUINO boards; for an extensive list of current, past or outdated boards see the ARDUINO index of boards. The board operates on an external supply of up to 20 volts. But if supplied with less than 7V, the 5V pin may supply less than five volts and the board has the potential to become unstable.

5. Working procedure of electronic door opener

- *Step 1:* When the system is switched on, LCD will be ON indicating that the power is supplied to the circuit.
- *Step 2:* Admin is given control over the electronic doors status through the web page connected over the wifi module.

- *Step3:* When the need arises, the admin gives the desired command which is received by the microcontroller (arduino) over the wifi module
- *Step4:* The microcontroller interprets the received command and forwards it on the relay which is connected to the motor that is used to drive the door.
- *Step5:* The motor drives the door according to the received commands resulting the opening and closing of the door.
- *Step6:* The final status of the door is displayed on the LCD and the same is forwarded to the admin over the wifi module.

A. ARDUINO UNO

ARDUINO UNO is a microcontroller board, based on the ATmega328P, with a 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a power jack, a USB connection, a 16 MHz quartz crystal, an ICSP header and a reset button. It contains everything necessary to support the present microcontroller. All you need to do is to connect it to a computer through a USB cable or else power it with either an AC-to-DC adapter or battery to get started. You can play around with your UNO without too much worry about doing something wrong, the worst thing that can possibly happen is that you end up replacing the chip for a few bucks and start over again.

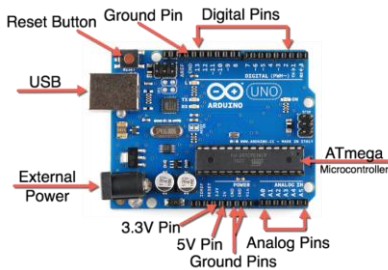


Fig. 2. Arduino

B. Power supply

The Arduino Uno can be powered with a USB connection or an external power supply. The power source would be selected automatically. External (non-USB) power can be received from an AC-to-DC adapter (wall-wart) or from a battery. The adapter can be connected by inserting a 2.1mm center-positive plug into the board's power jack. Leads from a battery can be plugged in the Gnd and V_{in} pin headers of the POWER connector.

The power pins are as follows:

- V_{IN} . This pin provides the input voltage to the Arduino board when it's using an external power source (as opposed to 5 volts from the USB connection or any other regulated source of power). One can supply voltage via this pin, or, if supplying voltage through the power jack, access it through the same.
- 5V. This pin regulates the voltage using the regulator and supplies a regulated 5V. The board can be supplied with power either from the USB connector (5V), the

DC power jack (7 - 12V), or the V_{IN} pin of the board (7-12V). Supplying voltage via the 3.3V or 5V pins bypasses the regulator, and can end up damaging your board. We don't recommend it.

- 3V3. A 3.3-volt supply is generated by the on-board regulator. Maximum current draw is 50 mA. GND. Ground pins

C. Wifi module

The WiFi Module is a self-contained SOC with integration of TCP/IP protocol stack that allows any microcontroller access to your WiFi network. It is capable of hosting an application and offloading all wifi networking functions from another application processor. This module is powerful enough to process the signals and has storage capability that allows it to be integrated with the sensors and other application specific devices through its General purpose input output pins with minimal development up-front and minimal loading during runtime. It has high degree of on chip integration which allows minimal external circuitry, including the front-end module, which is designed to occupy minimal PCB area. The ESP8266 supports APSD for VoIP applications and Bluetooth co-existing interfaces. It contains a self-calibrated Radio Frequencies allowing it to work under all operating conditions, and requires no external RF parts. The applications of ESP8266 are Home automation, Smart power plugs, Home automation, Wi-Fi location-aware devices, Security ID tags and Industrial wireless control.

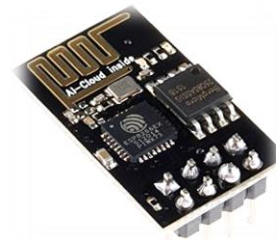


Fig. 3. Wifi module

D. Relay



Fig. 4. Relay

A relay is an electro mechanical switch; it consists of coil. When small current flows through the coil, magnetic field is induced, which causes the switch to move, resulting in closing and opening electrical connection. A Relay is used to control High voltage (Alternate current or Direct current) circuit using

small DC voltage circuit without any direct electrical connection between them. It means, Low DC voltage circuit and high voltage circuit are magnetically linked but electrically separated.

E. Motor

500 RPM 12V DC Motor is a high quality and low cost DC motor. It has pinions and steel gears to ensure longer life and better durability properties. The gears are fixed on hardened steel spindles which is polished to a mirror finish. The output shaft rotates in a plastic bush. The whole assembly is covered with plastic ring. Gearbox is sealed and lubricated with lithium grease which requires no maintenance. The motor is screwed to the gear box from inner side. Although motor gives 500 RPM at 12V, the motor runs smoothly from 4V to 12V and gives wide range of RPM, and required torque. 500RPM 12V DC geared motors are used in robotic applications. It is very easy to use and are available in various sizes. Nuts and threads on the shaft is used to connect the internal threaded shaft for easily connecting it to the door shaft.



Fig. 5. Motor

F. LCD display

The liquid-crystal display (LCD) uses the properties of both liquid and crystals which is needed to produce light to read the display. It is used to display the operating instructions and status of the output. It has better legibility, more information displaying capability and a wider temperature operating range.

6. Advantages, limitations and application

1) Advantages

- Assists people in gaining the control to access the smart doors.
- Smart doors prevent the entry of unauthorized personnel.

2) Limitations

This system is not applicable places with poor network connectivity.

3) Application

- Security, remote monitoring, transportation and logistics.
- This system also can be interfaced with the vehicle alerting system.
- Can be used by larger organizations that require sophisticated security.

7. Conclusion

Smart Door prevents security breaches and helps establish a secure environment in and around. The need for an advanced door lock security systems using new technologies increases everyday as security becomes a very serious issue for everyone. Due to the recent trends in various sophisticated methods of security for home, companies, buildings, vehicles etc., there is no need to worry any longer, as automatic security systems are here to deal with it.

References

- [1] Oke Alice O., Adigun Adebisi A., Falohun Adeleye S., and Alamu F. O., "Development of a Programmable Electronic Digital Code Lock System", International Journal of Computer and Information Technology, Volume 2, Issue 01, January 2013.
- [2] Mohammad Amanullah "Microcontroller Based Reprogrammable Digital Door Lock Security System by Using Keypad & GSM/CDMA Technology", IOSR Journal of Electrical and Electronics Engineering, Volume 4, Issue 6, Mar. - Apr. 2013.
- [3] Ashish Jadhav, Mahesh Kumbhar, and Mahesh Walunjkar, "Feasibility Study of Implementation of Cell Phone Controlled, Password Protected Door Locking System", International Journal of Innovative Research in Computer and Communication Engineering, Vol. 1, Issue 6, August 2013.