

GSM Based Smart Locker

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Abstract- Security is the main concern for everyone. Everyone wants to live securely in his/her house. Everybody wants themselves to keep safe or secure from various incidents like theft in their house. This GSM Based Smart Locker is a locking technology which will allow a user to unlock without using traditional key. Traditional lock and key system has several flaws. To reduce vulnerability and to make the system robust this lock has been developed. It allows a user to program a “string”(key code) that will unlock the lock. As this code is known only by owner and some persons selected by the owner there is a very lesser probability to unlock the code by any unauthorized person. This is a module based on microcontroller and a GSM 300 kit. It can be remotely controlled by the owner. The user who wants to unlock the lock will first send the string(key code) to a particular GSM SIM number through a sms from user’s mobile. If the the key code of sms will get matched with the key code which has already been programmed in the device then only lock will unlock. In the same way if the user who wants to lock the lock will first send the string(key code) to a particular GSM SIM number through a sms from user’s mobile. If the the key code of sms will get matched with the key code which has already been programmed in the device then only lock will get locked. Again if owner is far from his home and he wants to unlock the door for someone then he can remotely unlock the door without informing him the secret key code. Each time user either locks or unlocks the door, the owner or administrator will be notified.

Key Words: Microcontroller, Arduino UNO, GSM SIM 300.

1. INTRODUCTION

There is one input for the GSM Based Smart Locker. The input is SMS which has to be sent to GSM 300 module to lock and unlock the locker. There are 2 LEDs also, green LED and red. If the door is closed the red LED turns on and if it gets unlocked the green LED turn on. Output of this project is locking and unlocking [servo motor[1] + status LEDs] and EXECUTED acknowledgement to user after execution. Owner of the system will also receive notification about user’s mobile number and command SMS sent by the user.

2. IMPLEMENTATION

This project is based on microcontroller and GSM SIM 300. Here we have used Arduino UNO to make this system reliable and robust. GSM 300 kit has been used for authentication purpose and remotely controlling the system. Here is the details of implementation.

The GSM Based Smart Locker is implemented on a miniature locker replica, with a locker-frame and a door that can be opened and closed. There is also a bar that comes down in front of the door, not allowing it to be opened, which simulates our lock. We will finally install

the LEDs on the top of the doorframe to be visible and accessible by the user. The breadboard, GSM SIM 300 and Arduino are mounted just inside the doorframe.

2.1 Software

The code for the system is all written in the Arduino[2] programming environment. The software is used for many of the background processes such as:

- storing pattern(key code) for lock and unlock
- comparing SMS with key code
- detecting the state of the system
- unlocking the door
- locking the door
- determining if the door is open or closed
- determining if the door should be locked or unlocked
- lighting up LED’s

The Arduino integrated development environment (IDR) is a cross-platform application written in Java, and derives from the IDR for the language and the Wiring projects. It is designed to introduce programming to artists and other newcomers unfamiliar with software development. It includes a code editor with features such as syntax highlighting, brace matching, and automatic indentation, and is also capable of compiling and uploading programs to the board with a single click. A program or code written for Arduino is called a sketch. Arduino programs are written in C or C++. The Arduino IDE comes with a software library called “Wiring” from the original Wiring project, which makes many common input/output operations much easier. Users only need define two functions to make a runnable cyclic executive program:

□ Setup(): a function run once at the start of a program that can initialize setting.

□ Loop(): a function called repeatedly until the board powers off.

2.2 Hardware

Arduino -> Arduino is a single-board microcontroller, intended to make building interactive objects or environments more accessible. It is a tool for making computers that can sense and control more of the physical world than our desktop computer. It’s an open-source physical computing platform based on a simple microcontroller board, and a development environment for writing software for the board.

Relay Driver -> Relays have been around for a long time and though often now replaced with solid state switches, they have unique properties that make them more robust than solid-state devices and are not going away. The unique properties are high current capacity, ability to withstand ESD and drive circuit isolation. There are numerous ways to drive relays. In preparation for some of the more advanced relay drivers I will be posting in the future, I have

listed a few basic relay drivers for our reference. Included are the following: High side toggle switch driver, low side toggle switch driver, bipolar NPN transistor driver, Darlington transistor driver, N-Channel MOSFET driver, and ULN2003 driver.

Power Supply-> It will take 12v Battery as a power supply to activate the Arduino uno.

Motorized Lock -> Motorized lock installed inside metal doors providing multi-bolt locking. It is Suitable for installation in new or existing metal doors with a multi-point locking mechanism. It is recommended for installation in Internal and external doors in public buildings, institutes and offices, such as - main entrance doors, safety doors with access control, fire doors, emergency and automatic doors.

GSM SIM 300 -> It is a plug and play GSM Modem with a simple to interface serial interface. Use it to send SMS, make and receive calls, and do other GSM operations by controlling it through simple AT commands from micro controllers and computers. It uses the highly popular SIM300 module for all its operations. It comes with a standard RS232 interface which can be used to easily interface the modem to micro controllers and computers.

3. HARDWARE EQUIPMENT

3.1 Arduino UNO

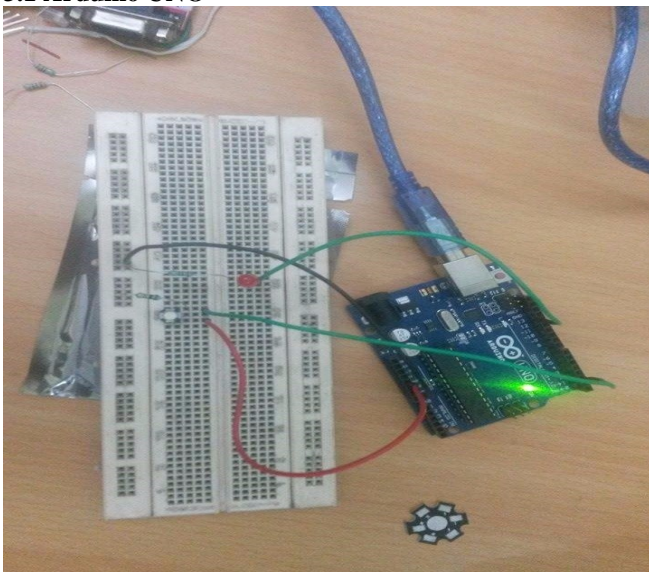


Fig -1: ARDUINO UNO connected with Breadboard

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, 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.

The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter.

3.2 BC547B

The NPN[3] Bipolar Transistor is designed for use in linear and switching applications. The device is housed in the TO-92 package, which is designed for medium power applications.

3.3 Resistor

A resistor is a passive two-terminal electrical component that implements electrical resistance as a circuit element. Resistors act to reduce current flow, and, at the same time, act to lower voltage levels within circuits. It measures by OHM.

3.4 IN4007

It is a rectifier diode with these features – low forward voltage, high current capability, low leakage current, high surge capability.

3.5 LED

A light-emitting diode (LED) is a two-lead semiconductor light source. It is a pn-junction diode, which emits light when activated. When a suitable voltage is applied to the leads, electrons are able to recombine with electron holes within the device, releasing energy in the form of photons. This effect is called electroluminescence, and the color of the light (corresponding to the energy of the photon) is determined by the energy band gap of the semiconductor.

3.6 Relay

Relay is an electromagnetic device which is used to isolate two circuits electrically and connect them magnetically. They are very useful devices and allow one circuit to switch another one while they are completely separate. They are often used to interface an electronic circuit (working at a low voltage) to an electrical circuit which works at very high voltage. For example, a relay can make a 5V DC battery circuit to switch a 230V AC mains circuit.

3.7 Electro-magnetic Lock



Fig -2: Electromagnetic lock

An electromagnetic lock[5], magnetic lock, or maglock is a locking device that consists of an electromagnet and an armature plate. There are two main types of electric locking devices. Locking devices can be either "fail safe" or "fail secure". A fail-secure locking device remains locked when power is lost. Fail-safe locking devices are unlocked when de-energized. Direct pull electromagnetic locks are inherently fail-safe. Typically the electromagnet portion of the lock is attached to the door frame and a mating armature plate is attached to the door. The two components are in contact when the door is closed. When the

electromagnet is energized, a current passing through the electromagnet creates a magnetic flux that causes the armature plate to attract to the electromagnet, creating a locking action. Because the mating area of the electromagnet and armature is relatively large, the force created by the magnetic flux is strong enough to keep the door locked even under stress.

3.8 Lock Driver Circuit

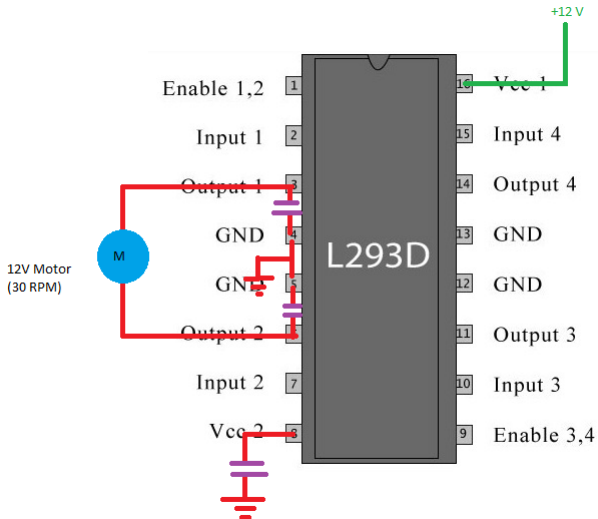


Fig -3: Driver circuit

A driver circuit is needed to drive the electromagnetic lock.

3.8 GSM SIM 300



Fig -4: GSM SIM 300

A GSM Modem is a device that modulates and demodulates the GSM signals and in this particular case 2G signals. The modem we are using is SIMCOM SIM300. It is a Tri-band GSM/GPRS Modem as it can detect and operate at three frequencies (EGSM 900 MHz, DCS 1800 MHz and PCS1900 Mhz). Default operating frequencies are EGSM 900MHz and DCS 1800MHz.

Sim300[6] GSM module used here, consists of a TTL interface and an RS232 interface. The TTL interface allows us to directly interface with a microcontroller while the RS232 interface includes a MAX232 IC to enable communication with the PC. It also consists of a buzzer, antenna and SIM slot. Sim300 in this application is used as a DCE (Data Circuit-terminating Equipment) and PC as a DTE (Data Terminal Equipment).

4. FLOWCHART AND DFD

4.1 Flowchart

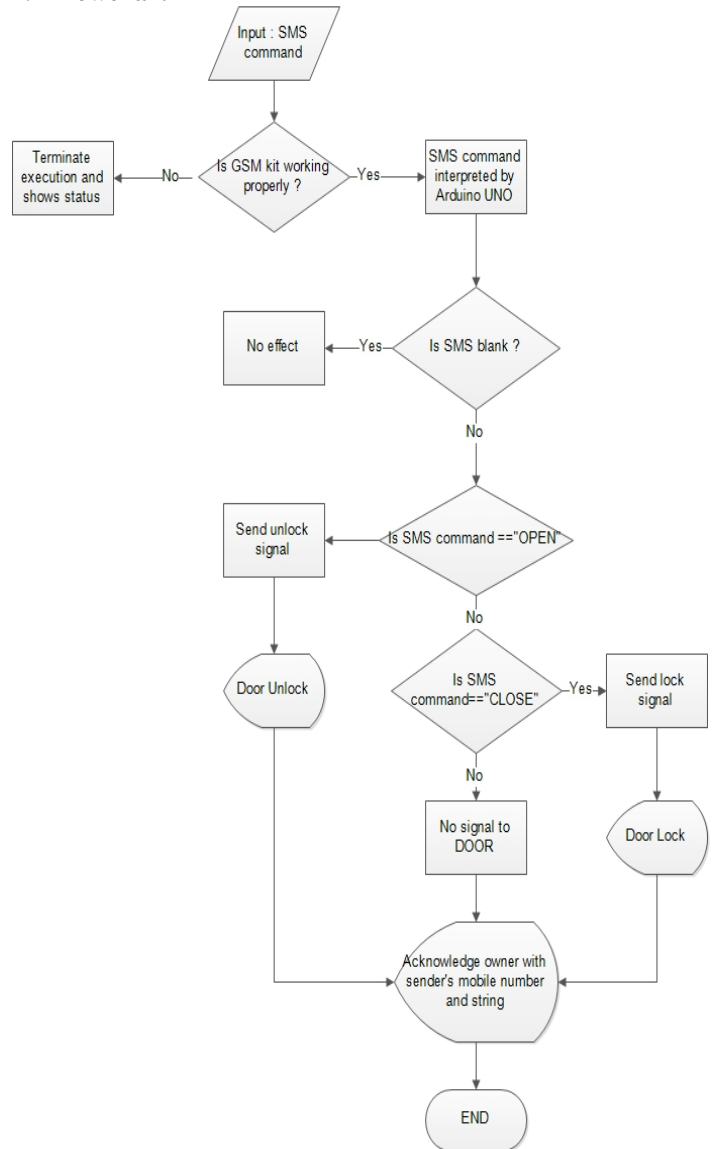


Fig -5: Flowchart

4.2 Algorithm

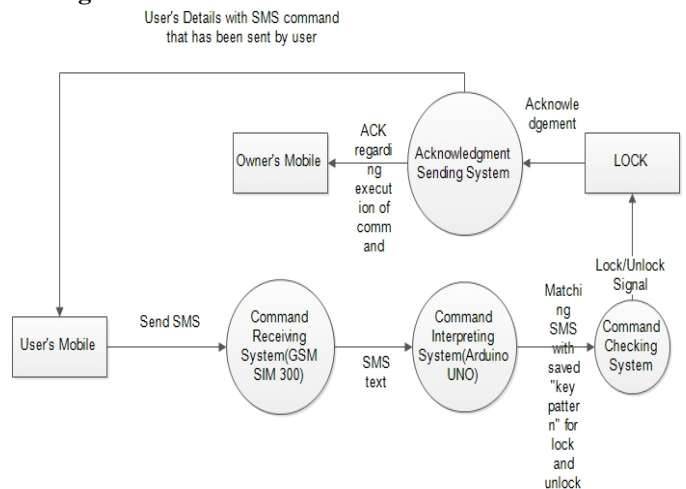


Fig -6: DFD

5. BLOCK DIAGRAM AND CIRCUIT DIAGRAM

5.1 Block Diagram

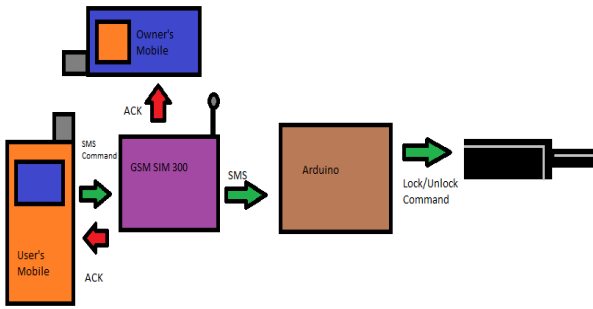


Fig -7: Block Diagram

5.2 Circuit Diagram

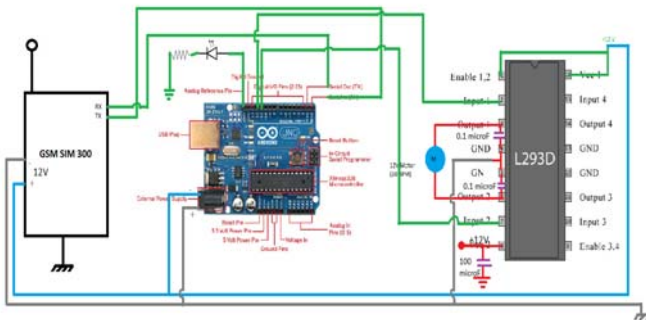


Fig -8: Circuit Diagram

6. SNAPSHOTS

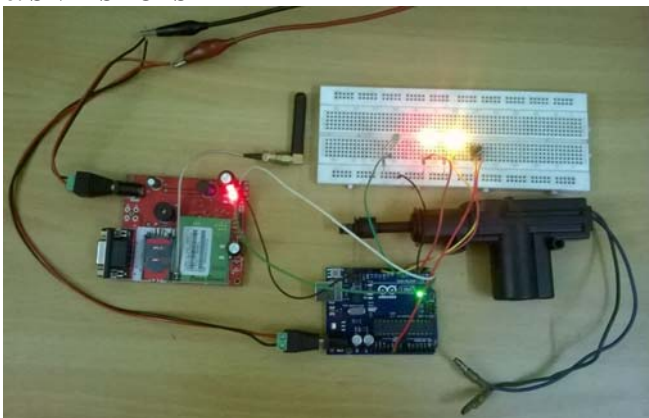


Fig -9: Snapshot-1

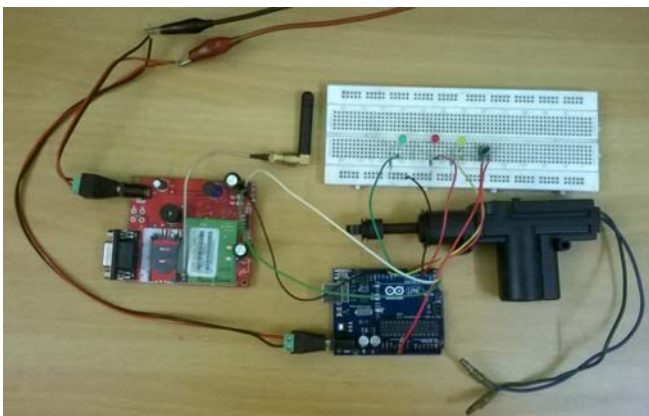


Fig -10: Snapshot-2

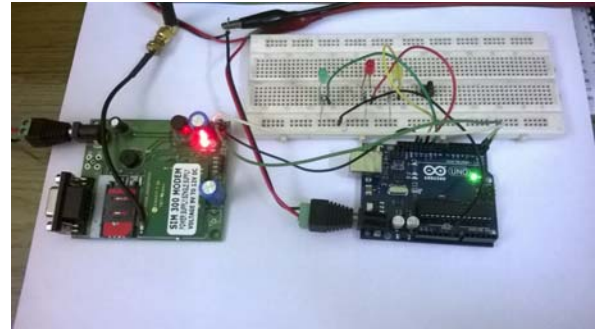


Fig -11: Snapshot-3

CONCLUSIONS

Our project has several advantages,

- no need to keep key for a particular lock;
- cost efficient than other high-end lock;
- low operating cost;
- locking technique is unique;
- low cost;
- satisfiable quality and less maintenance and robust device;
- remotely controlled
- GSM based authentication;
- notification will be sent to owner's mobile and user's mobile.

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BIOGRAPHIES



Souvik Paul had completed his B.Tech. in Computer Sc. and Engineering from M.C.K.V. Institute of Engineering in 2007, M.Tech. in Electronics and Communication Engineering from M.C.K.V. Institute of Engineering in 2010. He has worked in Infogen Global as Software Developer and also in Technical Assistant in SPG Solutions. He has acted as Assistant Professor in CSE dept. of Calcutta Institute of Technology. He is now teaching in The Heritage Academy as Assistant Professor of BCA(H) dept



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