SMART SECURITY MANAGEMENT SYSTEM

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ABSTRACT

*A **smart lock** is an electromechanical lock which is designed to perform locking and unlocking operations on a door when it receives such instructions from an authorized device using a wireless protocol and a cryptographic key to execute the authorization process. It also monitors access and sends alerts for the different events it monitors and some other critical events related to the status of the device. Smart locks can be considered part of a **smart home**.*

Most smart locks are installed on mechanical locks and they physically upgrade the ordinary lock.

*Smart locks, like the traditional locks, need two main parts to work: the lock and the key. In the case of these electronic locks, the key is not a physical key but a **smartphone** or a special key configured explicitly for this purpose which wirelessly performs the authentication needed to automatically unlock the door.*

Smart locks allow users to grant access to the key to the lock by means of a virtual key.

Basic infrastructure requirements with wireless locking are very low. There are no additional server function requiremements beyond public key infrastructure standards.

Major advantage with wireless locking comes with automating log-off. Hence common lacking of caution by mobile users may be entirely compensated. Automatic wireless authentication factors do not require any handling. The only requirement to the user just to wear a token without any keying is unsurpassed in comfort and functional value. Wireless locking provides additional security for networks against fraudulent access and usage.

*Wireless locking offers best robustness against **de-authentication attacks**. Continuous connection based encrypted key exchange between active token and receiver dongle provides a sufficient security level prepared for certification under ISO/IEC 15408 common criteria specification. Initially connection based encrypted key exchange serves for a lower security level which appears sufficient for most requirements*

INTRODUCTION:

This project is basically a remotely accessible, keyless and secure locking system**.**

Security system is highly preferable not only for home but also anywhere security issues are needed. This security is included for Home/ Bank/Office and for the purpose of safety, everybody wants to take proper measures to prevent intrusion.

It is a system that firstly, senses an unauthorized accessing of the lock. Secondly, it notify the concerned user instantly and irrespective of proximity from the device in such a case. A keyless locking system with virtual key generation technology, that will not only makes it smart but also secure.

A combination of both the technologies renders a smart, secure and reliable locking system that solves tones of problems in a single package.
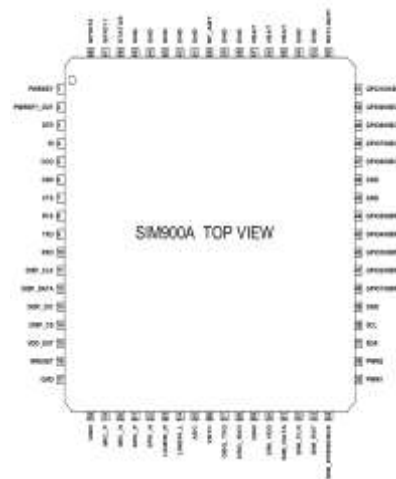
GSM Module provides keyless and remotely accessible key while the Reed Switch in conjunction with Arduino accounts for ensuring the security aspect.

COMPONENTS REQUIRED:

1) SIM 900A GSM MODULE

This is an ultra-compact and reliable wireless module. The SIM900A is a complete Dual-band GSM/GPRS solution in a SMT module which can be embedded in the customer applications. Featuring an industry-standard interface, the SIM900A delivers GSM/GPRS 900/1800MHz performance for voice, SMS, Data, and Fax in a small form factor and with low power consumption.

With a tiny configuration of 24mmx24mmx3mm, SIM900A can fit in almost all the space requirements in user applications, especially for slim and compact demand of design.

GSM/GPRS Modem-RS232 is built with Dual Band **GSM**/GPRS engine- **SIM900A**, works on frequencies 900/ 1800 MHz. The Modem is coming with RS232 interface, which allows you connect PC as well as microcontroller with RS232 Chip(MAX232). ... It is suitable for SMS, Voice as well as DATA transfer application in M2M interface.
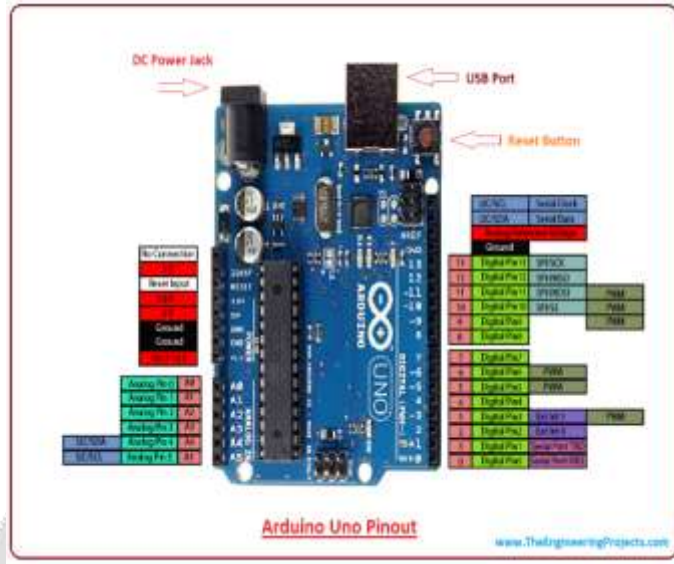
2) ARDUINO UNO

Arduino Uno is a microcontroller board developed by Arduino.cc which is an open-source electronics platform mainly based on AVR microcontroller Atmega328.

It allows the designers to control and sense the external electronic devices in the real world.

The Arduino Uno has a number of facilities for communicating with a computer, another Arduino board, or other microcontrollers. The ATmega328 provides UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX). An ATmega16U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer.
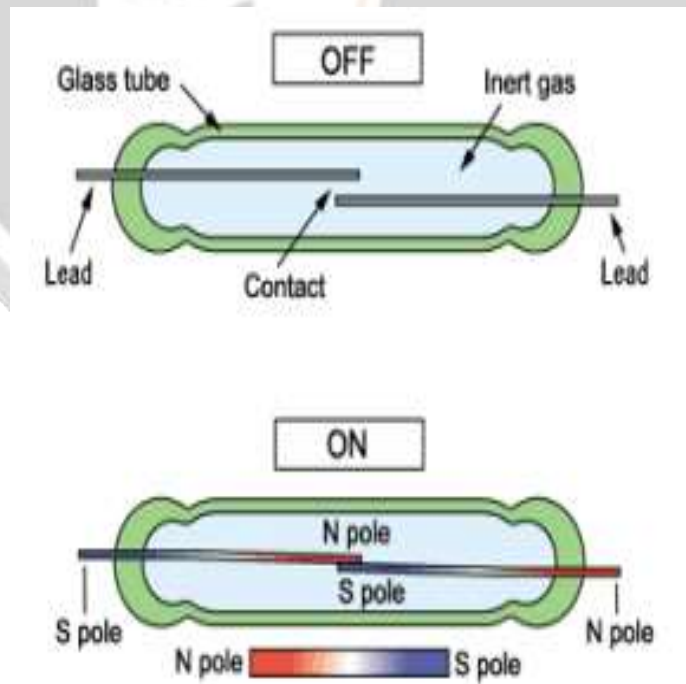
The 16U2 firmware uses the standard USB COM drivers, and no external driver is needed. However, on Windows, a .inf file is required. The Arduino Software (IDE) includes a serial monitor which allows simple textual data to be sent to and from the board. The RX and TX LEDs on the board will flash when data is being transmitted via the USB-to-serial chip and USB connection to the computer (but not for serial communication on pins 0 and 1). A Software Serial library allows serial communication on any of the Uno's digital pins.

Arduino Uno Pinout

3) REED SWITCH

The **reed switch** is an electrical switch operated by an applied magnetic field. It was invented at Bell Telephone Laboratories in 1936 by W. B. Ellwood. It consists of a pair of contacts on ferromagnetic metal reeds in a hermetically sealed glass envelope. The contacts may be normally open, closing when a magnetic field is present, or normally closed and opening when a magnetic field is applied.

The switch may be actuated by a coil, making a reed relay,[1] or by bringing a magnet near the switch. Once the magnet is pulled away from the switch, the reed switch will go back to its original position.

ALBA URMET ELECTRONIC LOCK

Use the Self-contained screws to install lock body, cylinder and door holder into the door edge or door frame. Proposed 5mm min. Installation distance from lock body to lock holder. The loading spring is adjustable with the door's weight and door closer's power. Dead bolts could change direction according to the Open Type. Use a DC12V +/- 10% voltage. Push or turn the button, lock could automatic unlock after 1 second.

Features:

1. It supports Electrical control or hand operation.

2. Has functions of high guard and high security, e.g. protect non-key's unlock after message report.

3. Fits for building intercom or access control systems.

4. Could be mounted in residential building, commercial housing, hotel, warehouse, school.

5. Can be used on Wooden / Metal doors.

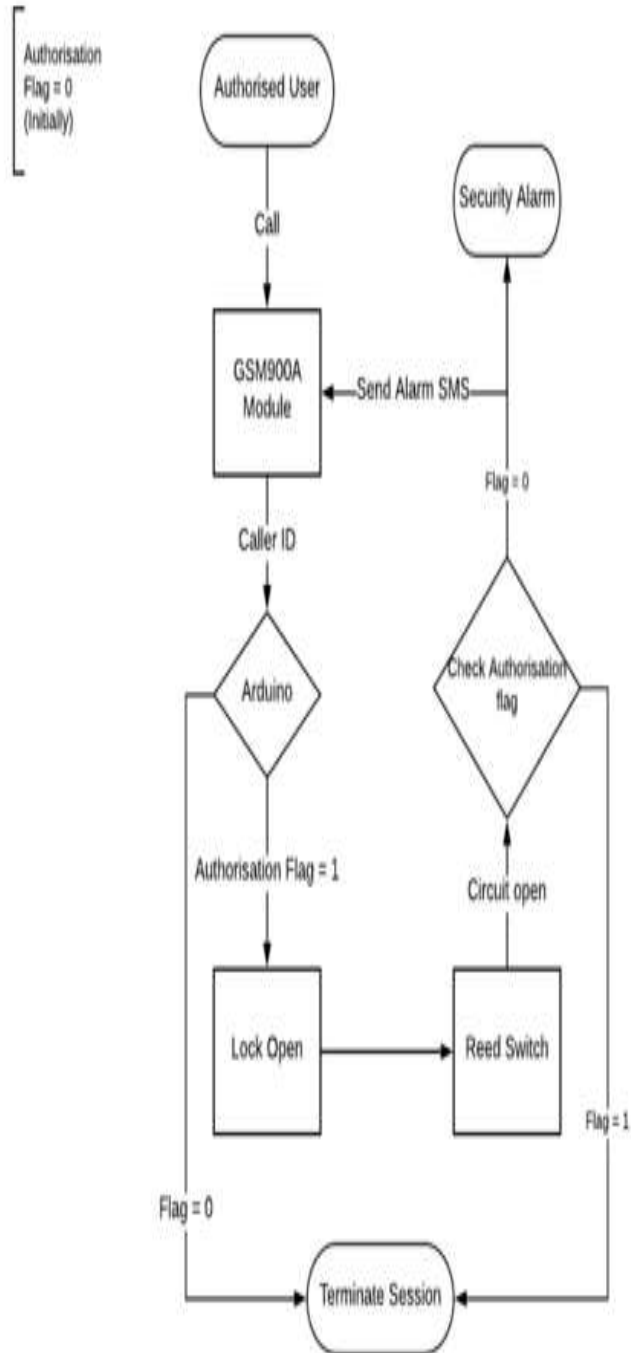**TECHNICAL SPECIFICATION**

1) GSM SIM900A

- Single supply voltage: 3.4V – 4.5V
- Power saving mode: Typical power consumption in SLEEP mode is 1.5mA
- Frequency bands :SIM900A Dual-band: EGSM900, DCS1800. The SIM900A can search the two frequency bands automatically. The frequency bands also can be set by AT command.
- GSM class: Small MS
- GPRS connectivity: GPRS multi-slot class 10 (default) , GPRS multi-slot class 8 (option)
- Transmitting power: Class 4 (2W) at EGSM 900, Class 1 (1W) at DCS 1800

- Operating Temperature: -30ºC to +80ºC
- Storage Temperature: -5ºC to +90ºC
- DATA GPRS: download transfer max is 85.6KBps, Upload transfer max 42.8KBps
- Supports CSD, USSD, SMS, FAX
- Supports MIC and Audio Input
- Speaker Input
- Features keypad interface
- Features display interface
- Features Real Time Clock
- Supports UART interface
- Supports single SIM card
- Firmware upgrade by debug port
- Communication by using AT commands

2) ARDUINO UNO

- Microcontroller: ATmega328P

- Operating Voltage: 5V

- Input Voltage (recommended): 7-12V

- Inout Voltage (limit): 6-20V

- Digital I/O Pins: 14 (of which 6 provide PWM output)

- PWM Digital I/O Pins: 6

- Analog Input Pins: 6

- DC Current per I/O Pin: 20 mA

- DC current for 3.3V Pin: 50 mA

- Flash Memory: 32 KB (ATmega328P) of which 0.5 KB used by bootloader

- SRAM: 2 KB (ATmega328P)

- EEPROM: 1 KB (ATmega328P)

- Clock Speed: 16 MHz

- LED_BUILTIN: 13

- Length: 68.6 mm

- Width: 58.4 mm

- Weight: 25 g

FLOWCHART/BLOCK DIAGRAM:

WORKING:

Working starts with the user intending to open the lock calling on the designated sim number in GSM module. Upon receiving a call, GSM module sends the immediate caller id i.e the user's Mobile Number as a parameter for verification to the arduino. The process of verification can be initiated hence.

Step 1 : Authentic User Verification
Arduino on receiving the caller id as parameter from GSM SIM900A module, runs it through a series of code to match it with the authorised called id/ids. In case of a positive match i.e. Lock Opening request is by an authentic user then a positive signal is sent into the Alba Urmet Lock to open up. This signal is a power supply of 12V and 5A. Also, an authentication flag variable which is initially set to 0 is reset to 1 i.e flag = 1.
In case of a negative match i.e Lock Opening request by an unauthorised user either of the operations can be performed based upon the user specifications/demands :
1. An unauthorised request sms or notification can be sent to the user.
2. Do nothing, lock doesn't open.

Step 2 : Anti-theft notification system
A reed switch system is attached along the door side of the locking system such that once the door opens, magnetic circuit of reed switch is open. Hence, it sends a signal of broken circuit to the arduino microcontroller for verification. This signal is sent regardless of the manner in which lock is opened i.e either genuinely or by unfair means.
Now, as the lock opens the door will be open, the circuit of reed switch will be therefore open.
The reed switch will send the signal to arduino that the circuit is broken. The arduino will check this information with the authorization flag. If the flag=1, there would be no action and hence, indicating a successful authorised lock access. If the flag during verification process is found to be not equal to 1, thereby indicating an unauthorised access, following actions will be immediately taken :
1. UNAUTHORISED ACCCESS sms or call to the User.
2. Trigger the security alarm to notify local action authorities such as security guards, neighbours etc.

APPLICATIONS

1) Domestic Door Locks

2) Industrial Security Systems

3) Restricted Area Management System

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