Armoured Infrastructure using Multiple Protocols

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Abstract: **We all are aware of the fact that there has been a sharp increase in criminal offences like theft, robberies, assaults, murders etc in the recent past that is affecting our society on a large scale. So the requirement for a well equipped infrastructural security system is definitely on the rise. So we propose some ideas to build an integrated and fully customized security system at a reasonable cost using the embedded technology. In this system we are mainly using wireless protocols named GSM (Global system for mobile communication), DTMF (Dual tone multiple frequency), RF (Radio Frequency) and a camera for live streaming. If a wrong card is entered, then an SMS will be sent to the authorized person and an indication would be given to the security man by a buzzer the SMS would be sent using GSM protocol. There would be a live streaming using a camera. DTMF is used to access the lock of the inside doors of the infrastructure using cell phone of the authorized person. RF protocol is used due to which there will be an access given to the neighbours.**

Keywords: **RFID Reader, GSM, RF, DTMF, Security System.**

I. INTRODUCTION

Infrastructural security has become a concern of worldwide. The necessity of a low cost electronic infrastructural based security system designed in co-ordination with other security measures is always there in our society to reduce the risk of home intrusion. Security systems are necessary during any emergencies that occur at Banks, Houses, Offices etc. As the technology is emerging every second, abundant infrastructure   based systems have been developed and implemented to keep their welfare safe and also to protect from illegal invasion. So we want to utilize the embedded technology to build an integrated and fully customized security system at a reasonable cost.

In this system a user unlocks the door using R.F Id system. Here we are using the R.F ID system which allows the user to access the system after which the respective person has to enter the correct password. Using this, the security of the system can be increased and any unauthorized will not be allowed to access a highly secured area. This automatic password based lock system will provide the user more security yet cost-efficient way of locking-unlocking system. Moreover to provide better security, if the user enters an incorrect password the door gets locked permanently. As soon as an incorrect password is entered an SMS is sent to the authorized person. Also a notification is also given to the security guard through a buzzer which is connected in the security office, to notify that an unauthorized   person is accessing the system.

Global System for Mobile communications (GSM) is the world's most popular standard for mobile telephone systems. GSM gives low-cost implementation of the Short Message Service (SMS) supported on mobile standards as well. So GSM module is used for the SMS to be sent to the authorized person. In this project we are also using a camera with the help of which the authorized person will be able to have a live view of the respective area. This helps the user to become alert and take the required action. Further, using the DTMF protocol the user can lock all the other doors of that particular infrastructure. If any problem arises in locking the doors by the authorized person, an alternative is also provided wherein the neighbours are also given an access using Radio Frequency (R.F) protocol. Due to this if the authorized person is unable to access then the neighbours will be able to access giving a complete security.

II.   PROPOSED METHOD

In this proposed work, the RF ID Reader reads the ID number from the passive tag and sends it to the microcontroller. If the ID number is valid then it allows to enter the password and the door of the infrastructure will be unlocked. If the user enters an incorrect password the door gets locked permanently. As soon as an incorrect password is entered an SMS is sent to the authorized person using the GSM module. Also a notification is also given to the security guard through a buzzer which is connected in the security office, to notify that an unauthorized   person is accessing the system.

In this project we are also using a camera with the help of which the authorized person will be able to have a live view of the respective area. This helps the user to become alert and take the required action. Further, using the DTMF protocol the user can lock all the other doors of that particular infrastructure. If any problem arises in locking the doors by the authorized person, an alternative is also provided wherein the neighbours are also given an access using Radio Frequency (R.F) protocol.

III.   RFID FUNDAMENTALS

RFID is an effective automatic identification technology for variety of objects. The most important functionality of RFID is the ability to track the location of the tagged item. Based on power source, RFID tags can be classified into three major categories: active tags, passive tags, and semi-passive (semi -active) tags. An active tag contains both a radio transceiver and a battery that is used to power the transceiver. Active tags are more powerful than passive tags/semi-passive tags. RFID tags can also be classified into two categories: tags with read/write memory, and tags with read-only memory. The tags with read/write memory are more expensive than the tags with read-only memory. RFID tags operate in three frequency ranges: low frequency (LF, 30–500kHz), high frequency (HF, 10–15MHz), and ultra high frequency (UHF, 850–950MHz, 2.4–2.5GHz, 5.8GHz).20 LF tags are less affected by the presence of fluids or metals when compared to the higher frequency tags. RFID reader is
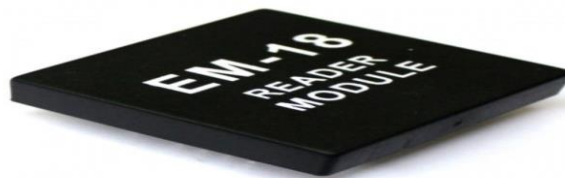Shown in fig.1.

Fig.1: RFID Reader.

IV.   GSM

This GSM Modem can accept any GSM network operator SIM card and act just like a mobile phone with its own unique phone number. Advantage of using this modem will be that you can use its RS232 port to communicate and develop embedded applications. Applications like SMS Control, data transfer, remote control and logging can be developed easily. In the current work, SIM900 GSM Module is used, it is shown in fig.2.

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). The baud rate is configurable from 9600-115200 through AT command. The GSM/GPRS Modem is having internal TCP/IP stack to enable you to connect with internet via GPRS. It is suitable for SMS, Voice as well as DATA transfer application in M2M interface.

Fig.2: SIM900 GSM Module.

The onboard Regulated Power supply allows you to connect wide range unregulated power supply. Using this modem, you can make audio calls, SMS, Read SMS, attend the incoming calls through simple AT commands.

Features

- Dual band GSM/GPRS 900/1800MHz.

- Configurable baud rate.

- SIM card holder.

- Built in network status LED.

- Inbuilt powerful TCP/IP protocol stack for internet data transfer over GPRS.

V. RF CIRCUIT

The RF circuit of this project utilises the RF module (Tx/Rx) for making a wireless remote, which could be used to access inner door of the infrastructure from a distant place. RF module, as the name suggests, uses radio frequency to send signals. These signals are transmitted at a particular frequency and a baud rate. A receiver can receive these signals only if it is configured for that frequency.

The system allows one way communication between two nodes, namely, transmission and reception. The RF module has been used in conjunction with a set of four channel encoder/decoder ICs. Here HT12E & HT12D have been used as encoder and decoder respectively. Encoder IC (HT12E) receives parallel data in the form of address bits and control bits. The control signals from remote switches along with 8 address bits constitute a set of 12 parallel signals. The encoder HT12E encodes these parallel signals into serial bits. Transmission is enabled by providing ground to pin14 which is active low. The control signals are given at pins 10-13 of HT12E. The serial data is fed to the RF transmitter through pin17 of HT12E.
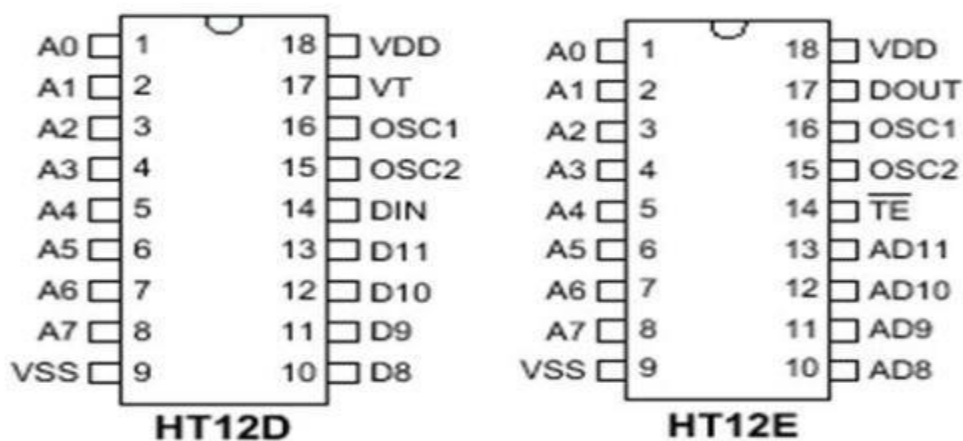

Fig.3: Pin Diagram of HT12D & HT12E.

Transmitter, upon receiving serial data from encoder IC (HT12E), transmits it wirelessly to the RF receiver. The receiver, upon receiving these signals, sends them to the decoder IC (HT12D) through pin2. The serial data is received at the data pin (DIN, pin14) of HT12D. The decoder then retrieves the original parallel format from the received serial data.

VI. DTMF

In this project, the inner door of the infrastructure is controlled by a mobile phone that makes a call to the mobile phone attached to the Arduino Uno. In the course of a call, if any button is pressed, a tone corresponding to the button pressed is heard at the other end of the call. This tone is called "Dual Tone Multiple-Frequency" (DTMF) tone. The lowest frequency used is 697Hz and the highest frequency used is 1633Hz, as shown in figure 4.

FREQU- -ENCY	1209 HZ	1336 HZ	1477 HZ	1633 HZ
697 Hz	1	2	3	A
770 Hz	4	5	6	B
852 Hz	7	8	9	C
941 Hz	*	O	#	D

Fig.4: DTMF Tone Selection Table.

The DTMF keypad is arranged such that each row will have its own unique tone frequency and also each column will have its own unique tone frequency.
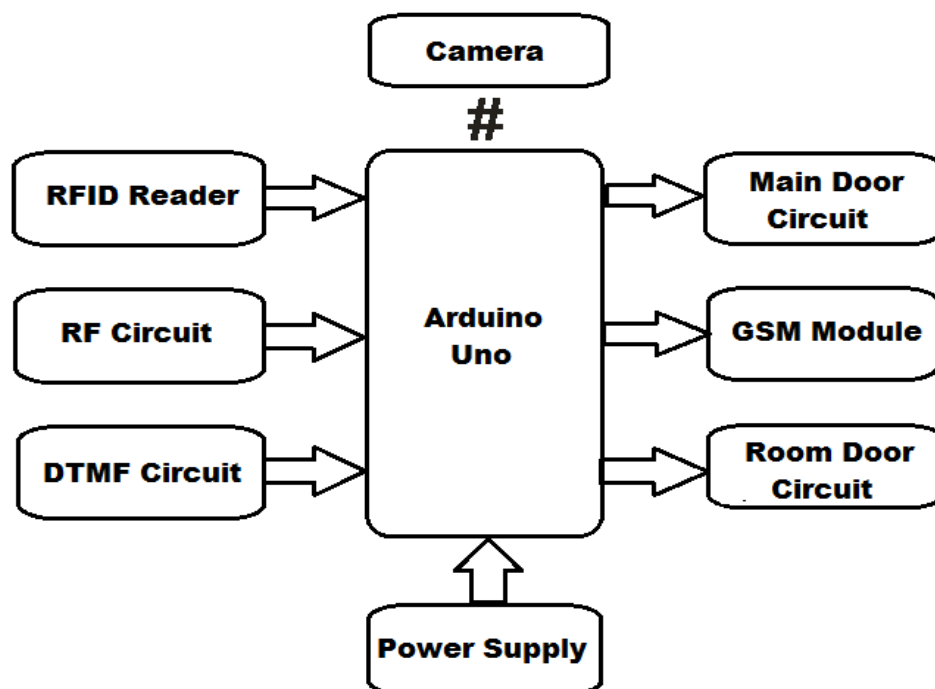
VII.   BLOCK DIAGRAM

Fig.5: Block Diagram of Armoured Infrastructure.

The block diagram of Armoured Infrastructure using multiple protocols is as shown in figure 5. In this proposed work, the RF ID Reader reads the ID number from the passive tag and sends it to the microcontroller. If the ID number is valid then it allows to enter the password and the door of the infrastructure will be unlocked. If the user enters an incorrect password the door gets locked permanently. As soon as an incorrect password is entered an SMS is sent to the authorized person using the GSM module. we are also using a camera with the help of which the authorized person will be able to have a live view of the respective area. This helps the user to become alert and take the required action. Further, using the DTMF protocol the user can lock all the other doors of that particular infrastructure. If any problem arises in locking the doors by the authorized person, an alternative is also provided wherein the neighbours are also given an access using Radio Frequency (R.F) protocol. The circuit is powered by 5v regulated dc.

VIII. CONCLUSION

The Security system proposed in this paper gives multiple way security to the infrastructure by using RFID, GSM, DTMF and RF module. It is a low cost, low in power consumption, compact in size and a reliable system. This system is used to keep the welfare safe and to protect from illegal attacks.

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