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RFID Security Access Control System using 8051 Microprocessor

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Abstract: The main objective of this project is to provide security in an organization by allowing only the authorized personnel to access the secure area. The security of any organization is a priority for the authorities. The concern is for the physical property and also for the intellectual property. For this reason, only, the authorized person with a valid RFID tag is allowed into the secured premises. This tag contains an integrated circuit that is used for storing and processing information, modulating and demodulating the radio frequency signal that is being transmitted. Thus, once the person shows the RFID tag to the card reader it scans the data present in the tag and compares it with the data present in the microcontroller. When the data matches with that in the microcontroller, the load will be turned ON which is operated by a relay being driven from the output of the microcontroller. If a valid tag is swiped then the system displays a message "AUTHORIZED" else it states "UNAUTHORIZED" and doesn't allow access. A lamp is used as an indication besides the LCD display. This project can be further enhanced by interfacing it with GSM technology. Any attempt for unauthorized access can be intimated to the security personnel through an SMS. It can also be interfaced with a finger print module to reduce the drawback of RFID system i.e. exchanging RFID tags.

Keywords: Security And Access Control, RFID, Face Recognition.

I. INTRODUCTION

Automatic identification and access control system has become necessary to overcome the security threats faced by many organizations in India these days. By installing the system at the entrance will only allow the authorized persons to enter the organization. The system can also be installed at various points inside the organization to track the person's movement and to restrict their access to sensitive areas in the organization. In such a way, suspicious persons can be caught which will surely improve the security level in the organization. Radio frequency identification (RFID) is a wireless technology that can be used to develop the access control system. The literature has revealed the use of this technology to automate various processes ranging from industrial sector to home control. The use of RFID technology to automate sight spot ticket management system. The system hardware consists of RFID electronic tickets, RFID readers, computer terminals, optical networks, computer servers and site controllers. Electronic ticket contains the S-DES encrypted form of data including scenic region number, scenic spot number, ticket type, ticket date, site number, serial number and check bit. The RFID reader at the site reads the data inside the e-ticket and transmits it to the computer terminal and servers though the network. The data is decrypted at the terminal and its authenticity is verified. The site controller then allows the right tourist to enter the spot.

This system identification and authentication process is carried out at three sub-levels namely the sale sub- system, the decision sub-system and the management sub-system. All these processes communicate with each other through database information. They have developed an automatic vehicle parking control system based on RFID technology in the city of Novi Sad, Republic of Serbia. The hardware of the system consists of RFID tag and reader operating at a frequency of 13.56MHz for authentication, inductive loop for metal detection, a capacity sensor for counting vehicles, Siemens MC 39i GPRS modem for communication between entrance and exit gates and FEC FC440 programmable logic controller (PLC) which is the heart of the system. When the car stops on the inductive loop at the entrance, RFID tag is read by the reader. The data on the tag includes the unique identification number (UID), RFID Security Access Control System validity period and check bit for checking the parking status. This data is manipulated by PLC and access is granted for parking the vehicle if tagged information contains correct UID, validity period and parking status. The security system is basically an embedded one. Embedded stands for hardware controlled by software. Here, the software using a microcontroller controls all the hardware components.

The microcontroller plays an important role in the system. The main objective of the system is to uniquely identify and to make security for a person. This requires a unique product, which has the capability of distinguishing different

person. This is possible by the new emerging technology RFID (Radio Frequency Identification). The main parts of an RFID system are RFID tag (with unique ID number) and RFID reader (for reading the RFID tag). In this system, RFID tag and RFID reader used are operating at 125KHz. The microcontroller internal memory is used for storing the details. The PC can be used for restoring all the details of security made. This report provides a clear picture of hardware and software used in the system. It also provides an overall view with detailed discussion of the operation of the system.

II. FUNCTIONAL DESCRIPTION

The project uses a RFID reader that sends carrier signal at 125 KHz and while a RFID card is swiped over the same it receives those carrier signals under mutual inductive coupling of the coil of the reader and the card. The card used gets powered by inductive means with the coil inside receiving the induced power which is then duly rectified and filtered for a DC voltage to drive the inbuilt chip in the card.

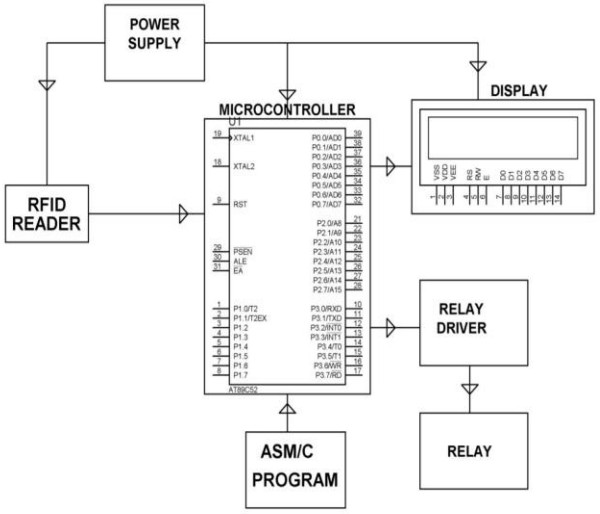

Fig1. Block Diagram RFID Security Access Control System.

Thus, while the card is swiped over sends a valid data to the reader through the same inductive coupling. This TTL data from the reader is directly sent to the MC for comparing the inbuilt data in the program to output a logic high from the MC at pin 36 to drive a relay by ULN2003 which finally actuates the load for example a lamp in this case. The LCD display indicates all the position accruing in the process.

A. Individual Functional Description

1. Transformer: Transformers convert AC electricity from one voltage to another with a little loss of power. Step-up transformers increase voltage, step-down transformers reduce voltage. Most power supplies use a step-down transformer to reduce the dangerously high voltage to a safer low voltage. The input coil is called the primary and the output coil is called the secondary. There is no electrical connection between the two coils; instead they are linked by an alternating magnetic field created in the soft-iron core of the transformer. The two lines in the middle of the circuit symbol represent the core. Transformers waste very little power so the power out is (almost) equal to the power in. Note that as voltage is stepped down and current is stepped up.

Fig2. Transformer RFID Security Access Control System.

The ratio of the number of turns on each coil, called the turn's ratio, determines the ratio of the voltages. A step-down transformer has a large number of turns on its primary (input) coil which is connected to the high voltage mains supply, and a small number of turns on its secondary (output) coil to give a low output voltage.

TURNS RATIO = (Vp / Vs) = (Np / Ns)

Where,
Vp = primary (input) voltage.
Vs = secondary (output) voltage
Np = number of turns on primary coil
Ns = number of turns on secondary coil
Ip = primary (input) current
Is = secondary (output) current.

2. Ideal power equation: If the secondary coil is attached to a load that allows current to flow, electrical power is transmitted from the primary circuit to the secondary circuit. Ideally, the transformer is perfectly efficient; all the incoming energy is transformed from the primary circuit to the magnetic field and into the secondary circuit. If this condition is met, the incoming electric power must equal the outgoing power:

$$P_{\text{incoming}} = I_p V_p = P_{\text{outgoing}} = I_s V_s,$$

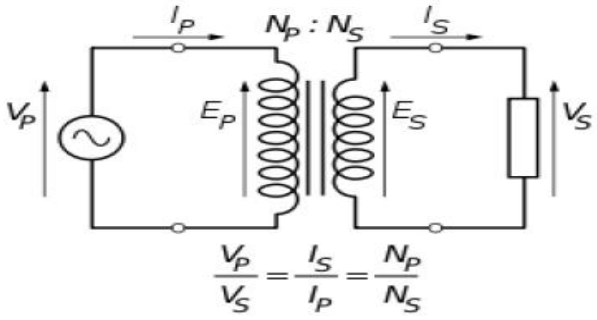

Fig3. Ideal Transformer RFID Security Access Control System.

Giving the ideal transformer equation

$$\frac{V_s}{V_p} = \frac{N_s}{N_p} = \frac{I_p}{I_s}$$

Transformers normally have high efficiency, so this formula is a reasonable approximation. If the voltage is increased, then the current is decreased by the same factor. The impedance in one circuit is transformed by the square of the turns ratio. For example, if an impedance Zs is attached across the terminals of the secondary coil, it appears to the primary circuit to have an impedance of $(Np/Ns)^2Zs$. This relationship is reciprocal, so that the impedance Zp of the primary circuit appears to the secondary to be $(Ns/Np)^2Zp$.

3. Microcontroller AT89S52

The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density non-volatile memory technology and is compatible with the industry standard 80C51 instruction set and pin out. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional non-volatile memory programmer. By combining a versatile 8-bit CPU with in-system programmable Flash on a monolithic chip, the Atmel AT89S52 is a powerful microcontroller which provides a highly-flexible and cost-effective solution to many embedded control applications. The AT89S52 provides the following standard features: 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, Watchdog timer, two data pointers, three 16-bit timer/counters, a six-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry. In addition, the AT89S52 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port, and interrupt system to continue functioning. The Power-down mode saves the RAM contents but freezes the oscillator, disabling all other chip functions until the next interrupt or hardware reset.

4. LCD Background

Frequently, an 8051 program must interact with the outside world using input and output devices that communicate directly with a human being. One of the most common devices attached to an 8051 is an LCD display.

Fig4. LCD .

Some of the most common LCDs connected to the 8051 are 16x2 and 20x2 displays. This means 16 characters per line by 2lines and 20 characters per line by 2 lines, respectively. Fortunately, a very popular standard exists which allows us to communicate with the vast majority of LCDs regardless of their manufacturer. The standard is referred to as HD44780U, which refers to the controller chip which receives data from an external source (in this case, the 8051) and communicates directly with the LCD.

5. RFID Reader

Radio Frequency Identification, or RFID, is a rapidly-emerging identification and logging technology. Whether or not you have come across RFID systems in your work, you have probably encountered RFID in your daily life, perhaps without even being aware of it. At their simplest, RFID systems use tiny chips, called "tags," to contain and transmit some piece of identifying information to an RFID reader, a device that in turn can interface with computers. To begin understanding RFID, think of a conventional Point-of-Sale barcode reader scanning grocery barcodes. In its simplest form, an RFID system is much the same: it also can identify a package. However, unlike barcodes, RFID tags don't need a direct line of sight: within limits, we can now scan an unpacked skid of boxes. Next, think of RFID tags as mini databases, or as barcodes that can accumulate information as they travel. At this point, RFID diverges qualitatively from barcoding, giving it great new potential. Radio-frequency identification (RFID) is a technology that uses communication through the use of radio waves to exchange data between a reader and an electronic tag attached to an object, for the purpose of identification and tracking. It is possible in the near future, RFID technology will continue to proliferate in our daily lives the way that bar code technology did over the forty years leading up to the turn of the 21st century bringing unobtrusive but remarkable changes when it was new. RFID makes it possible to give each product in a grocery store its own unique identifying number, to provide assets, people, work in process, medical devices etc. all with individual unique identifiers - like the license plate on a car but for every item in the world.

This is a vast improvement over paper and pencil tracking or bar code tracking that has been used since the 1970s. With bar codes, it is only possible to identify the brand and type of package in a grocery store, for instance. Furthermore, passive RFID tags (those without a battery) can be read if RFID Security Access Control System passed within close enough proximity to an RFID reader. It is not necessary to "show" the tag to the reader device, as with a bar code. In other words, it does not require line of sight to "see" an RFID tag, the tag can be read inside a case, carton, box or other container, and unlike barcodes RFID tags can be read hundreds at a time. Bar codes can only read one at a time. Some RFID tags can be read from several meters away and beyond the line of sight of the reader. The application of bulk reading enables an almost-parallel reading of tags. Radio-frequency identification involves the hardware known as interrogators (also known as readers), and tags (also known as labels), as well as RFID software or RFID middleware. Most RFID tags contain at least two

parts: one is an integrated circuit for storing and processing information, modulating and demodulating a radio-frequency (RF) signal, and other specialized functions; the other is an antenna for receiving and transmitting the signal.

B. Implementation

1. Hardware connection

Power supply:

- +5V to 8051 microcontroller
- +12V to 13 modules and other IC

Interconnection of Components:

- Power supply to 8051microcontroller through voltage regulator
- ULN2003 IC interfaced relay to 8051ATMEL
- RFID Module connected to microcontroller through RS232.
- LCD connected to 89C52 through ULN2003

2. Interconnection of Components

Power Supply: The circuit uses standard power supply comprising of a step-down transformer from 230Vto 12V and 4 diodes forming a bridge rectifier that delivers pulsating dc which is then filtered by an electrolytic capacitor of about 470µF to 1000µF. The filtered dc being unregulated, IC LM7805 is used to get 5V DC constant at its pin no 3 irrespective of input DC varying from 7V to 15V. The input dc shall be varying in the event of input ac at 230volts section varies from 160V to 270V in the ratio of the transformer primary voltage V1 to secondary voltage V2 governed by the formula V1/V2=N1/N2. As N1/N2 i.e. no. of turns in the primary to the no. of turns in the secondary remains unchanged V2 is directly proportional to V1.Thus if the transformer delivers 12V at 220V input it will give 8.72V at 160V.Similarly at 270V it will give 14.72V.Thus the dc voltage at the input of the regulator changes from about 8V to 15V because of A.C voltage variation from 160V to 270V the regulator output will remain constant at 5V. RFID Security Access Control System.

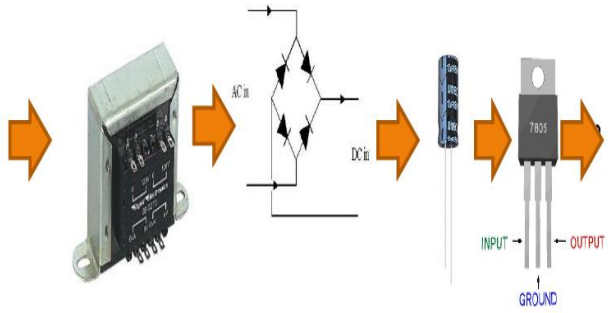

Fig5. Power Supply

The regulated 5V DC is further filtered by a small electrolytic capacitor of 10µF for any noise so generated by the circuit. One LED is connected of this 5V point in series with a current limiting resistor of 330Ω to the ground i.e., negative voltage to indicate 5V power supply availability. The unregulated 12V point is used for other applications as and when required.

3. Standard Connections To 8051 Series Micro Controller

ATMEL series of 8051 family of micro controllers need certain standard connections. The actual number of the Microcontroller could be "89C51", "89C52", "89S51", "89S52", and as regards to 20 pin configuration a number of "89C2051". The 4 set of I/O ports are used based on the project requirement. Every microcontroller requires a timing reference for its internal program execution therefore an oscillator needs to be functional with a desired frequency to obtain the timing reference as t =1/f. A crystal ranging from 2 to 20 MHz is required to be used at its pin number 18 and 19 for the internal oscillator. It may be noted here the crystal is not to be understood as crystal oscillator It is just a crystal, while connected to the appropriate pin of the microcontroller it results in oscillator function inside the microcontroller. Typically, 11.0592 MHz crystal is used in general for most of the circuits using 8051 series microcontrollers. Two small value ceramic capacitors of 33pF each is used as a standard connection for the crystal as shown in the circuit diagram

C. Operation

Connections:

Fig6. Connection Diagram.

The output of the power supply which is 5v is connected to the 40th pin of MC and GND is connected to 20th. Port 2.0 to 2.7 of MC are connected to D0 to D7 of MC of LCD display. Port 3.0 of MC is connected to the RFID reader and Port0.3 of MC is given to pin 1 of Relay driver ULN2003A. Pin 9 and 16 of ULN2003A are connected to a relay.

Working: The project uses a RFID reader that sends carrier signal at 125 KHz and while a RFID card is swiped over the same it receives those carrier signals under mutual inductive coupling of the coil of the reader and the card. The card used gets powered by inductive means with the coil inside receiving the induced power which is then duly rectified and filtered for a DC voltage to drive the inbuilt chip in the card. Thus, while the card is swiped over sends a valid data to the reader through the same inductive

coupling. This TTL data from the reader is directly sent to the MC for comparing the inbuilt data in the program to output a logic high from the MC at pin 36 to drive a relay by ULN2003 which finally actuates the load for example a lamp in this case. The LCD display indicates all the position accruing in the process. RFID Security Access Control System.

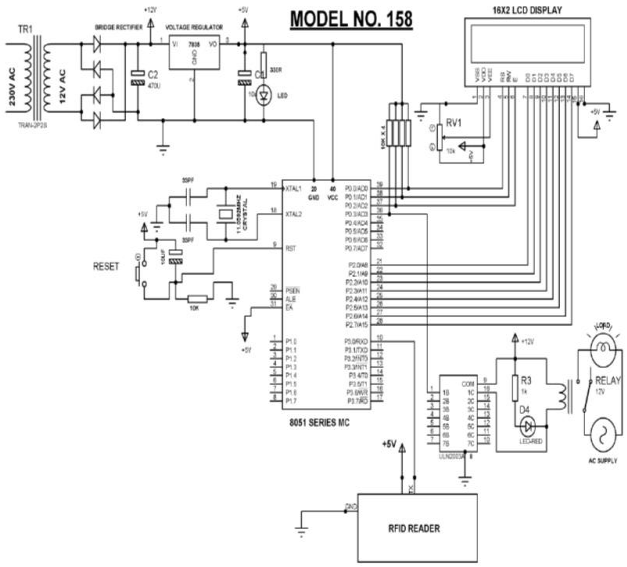

Fig7. Circuit diagram of RFID security access control system.

III. RESULT & ANALYSIS

A. Results

The important aspect of RFID based security access control system uses a RFID reader that sends carrier signal at 125 KHz and while a RFID card is swiped over the same it receives those carrier signals under mutual inductive coupling of the coil of the reader and the card. The card used gets powered by inductive means with the coil inside receiving the induced power which is then duly rectified and filtered for a DC voltage to drive the inbuilt chip in the card. Thus, while the card is swiped over sends a valid data to the reader through the same inductive coupling. This TTL data from the reader is directly sent to the MC for comparing the inbuilt data in the program to output a logic high from the MC at pin 36 to drive a relay by ULN2003 which finally actuates the load for example a lamp in this case. The LCD display indicates all the position accruing in the process, as shown in the below practical output.

B. Analysis

This project proposes an integrated approach to overcome the security threats faced by many organizations in India these days. By installing the system at the entrance will only allow the authorized persons to enter the organization. This project is to demonstrate that wireless technology that can be used to develop the access control system. The literature has revealed the use of this technology to automate various processes ranging from industrial sector to home control. RFID Security Access Control System.

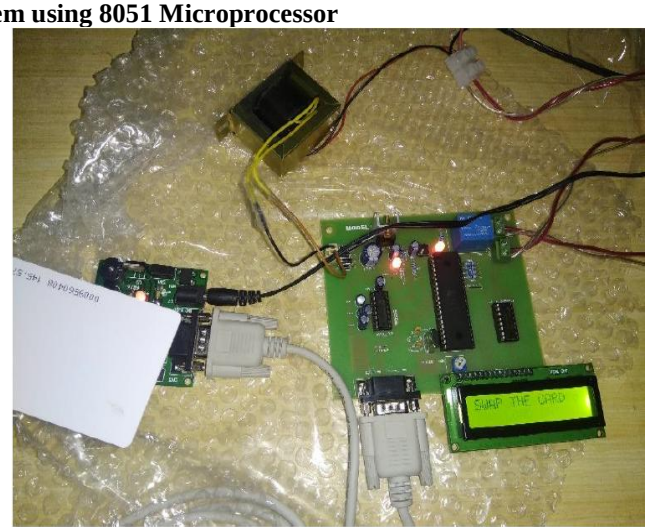

Fig8. view of prototype.

Fig9. view of authorized card LOAD ON

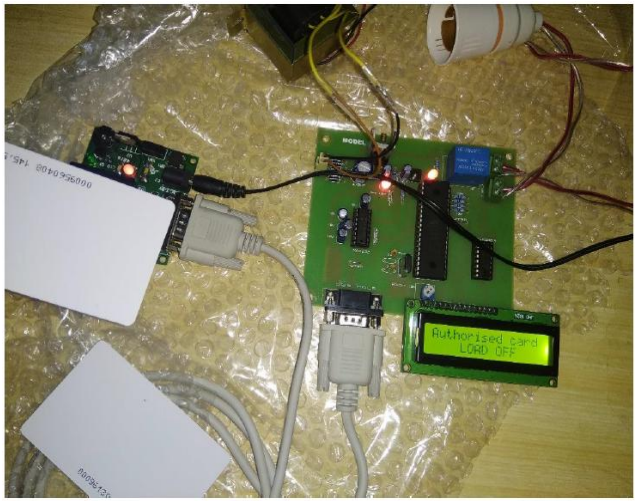

Fig10. View of authorized card LOAD OFF

IV. CONCLUSION & FUTURE SCOPE

Conclusion: While the use of RFID technology is increasing across a range of different industries, the associated security and privacy issues need to be carefully addressed. Because RFID tags come in different flavors,

there is no overall, generic RFID security solution. Some low-cost passive and basic tags cannot execute standard cryptographic operations like encryption, strong pseudorandom number generation, and hashing. Some tags cost more than basic RFID tags and can perform symmetric-key cryptographic operations. Organizations wishing to use RFID technology need to therefore evaluate the cost and security implications as well as understand the limitations of different RFID technologies and solutions.

Future scope: The RFID card can be used to store information such as administrative, medical, biological, and pharmaceutical records. The RFID card simplifies the administrative process and enables doctors to have access to a more complete and comprehensive healthcare information. The RFID card has the function of identifying the student and also acts as an electronic purse and can be used purchase products from stores or tickets to public transportation. Transportation Rechargeable contact-less cards allow ticket-less and cash-less travels. Parking and telecommunications can also be paid using the smart card. This will simplify the passenger boarding process. Welfare Card can be used to identify the holder using a series of personal keys and fingerprint. The RFID card holder then uses the card to access government databases and receive the welfare payment. The security will help eliminate fraud.

V. BIBLIOGRAPHY

[1]"The 8051 Microcontroller and Embedded systems" by Muhammad Ali Mazidi and Janice Gillespie Mazidi, Pearson Education.

[2] ATMEL 89S52 Data Sheets.

[3] D. L. Wu, Wing W. Y. NG, D. S. Yeung, and H. L.Ding, "A brief survey on current RFID applications," in Proc. International Conference on Machine Learning and Cybernetics, Baoding, July 12-15, 2009, pp. 2330-2334.

[4]G.Ostojic,S.Stankovski,andM.Lazarevic,"Implementation of RFID technology in parking lot access control system," in Proc. Annual RFID Eurasia Conference, 2007.

[5] N. Ahmad, S. Butler, and U. Ramachandran, "Guardian Angel: An RFID based indoor guidance and monitoring system," 2010, pp. 546-551. RFID Security Access Control System.

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