

Automatic Library Door Opening System Using RFID

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Abstract:

The Radio Frequency Identification (RFID) system which is a new generation of Auto Identification and Data collection technology to provide a secured accessibility to authorized persons into the library. Radio Frequency Identification (RFID) systems will become prevalent in our daily lives due to their low cost and easy to use characteristics. RFID based Library door opening system would help to allow fast operation for the library and will prove immediate and long term benefits to library in traceability and security.

Keywords —Automatic door opening, RFID Tag,RFID Reader.

I. INTRODUCTION

Access control is the process of authenticating a user's claimed identity and giving or denying the access. The aim of the proposed system is to construct a secure access control system to control the entry of human beings through a door or a passage using RFID technology. In general, Radio Frequency Identification (RFID) technologies allow the transmission of a unique serial number wirelessly, using radio waves. The two main parts of the system that are required to do this are the RFID 'tag' and the RFID 'Reader'. Whenever the RFID tag is sensed by the RFID reader, it sends a signal to the door controller and then, the door controller provides an interrupt signal to a motor. The motor performs the open or close operation according to the received signal. The proposed system is an automatic identification and authentication system which can be deployed at the doors of the building to authenticate authorized people. And this proposed system aims to develop a very low cost authentication system based on the low cost components than those which are already available in the market. This newly deployed RFID system helps us to resolve the issues faced by the

existing system and increases the reliability and improves the ease of maintenance of the authentication system.

II. EXISTING SYSTEMS

The most common method of security which all of us are familiar with is the traditional lock and key arrangement. There are several options to replace the traditional method as a security system of a door. Firstly, the magnetic access card may be thought of as an electronic "key". Each access card is uniquely encoded. But the cost of operation is high. Secondly, Access control keypads are devices which may be used in addition to or in place of card readers. The keypad requires that a person desiring to gain access enter a correct numeric code. Where access control keypads are used in place of card readers, only a correct code is required to gain entry. This system is also known as barcode system. Another method used is door opening by sensing the human body movements using the PIR sensor. Generally a human body emits infrared energy which is detected by the PIR sensor from the particular distance. The main disadvantage of the system it did not provide a secured accessibility to the place where it used.

III. PROPOSED SYSTEM

The RFID (Radio Frequency Identification), one of the promising technologies, that has been widely used in the access control and security systems. RFID is an automatic identification technology. RFID is a technology that helps to identify the animate or inanimate through radio waves. Whenever the RFID tag is sensed by the RFID reader, it sends a signal to the door controller and then, the door controller provides an interrupt signal to a motor. The motor performs the open or close operation according to the received signal. This proposed is more efficient and provides the faster operation than the existing systems.

IV. COMPONENTS

The major components used in the proposed security system using RFID technology are:

- a) RFID
- b) RFID reader,
- c) RFID tag,
- d) Door Controller,
- e) DC gear motor,

The brief description and some special features are described in the following:

A. RFID

RFID is basically a tiny electronic device that consists of a small chip and an antenna. The chip typically is capable of carrying few bytes of data or less. There are three basic components that all RFID contains. One of them is interrogator or commonly known as a reader, a transponder or tag and antenna to communicate between voltage in the wire and air medium.

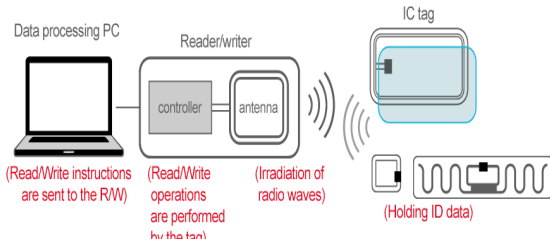


Fig. 1 Basic RFID

B. RFID READER

An RFID reader is a device that is used to de-brief an RFID tag. RFID readers communicate with tags through an RF channel to obtain identifying information. The RF module acts as both a transmitter and receiver of radio frequency signals. The reader has an antenna that emits radio waves; the tag responds by sending back its signals. The reader is a handheld or fixed unit that can interrogate nearby RFID tags and obtain their ID numbers using radio frequency (RF) communication (i.e. the process does not require contact). When a passive tag is within range of a reader, the tag's antenna absorbs the energy being emitted from the reader, directs the energy to 'fire up' the integrated circuit on the tag, which then uses the energy to beam back the ID number and any other associated information.

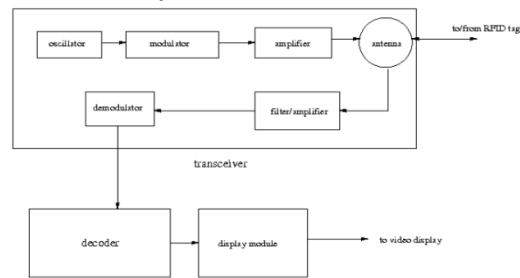


Fig. 2 Block Diagram of RFID Reader

C. RFID TAG

A radio-frequency identification system uses tags, or labels attached to the objects to be identified. The RFID tag consists of a small RF transmitter and receiver. An RFID reader transmits an encoded radio signal to communicate with the tag. The tag receives the message and responds with its identification information. There are two main components present in the RFID tag. Firstly, a small silicon chip or integrated circuit which contains a unique identification number (ID). Secondly, an antenna that can send and receive radio waves. These two components can be tiny: the antenna consists of a flat, metallic conductive coil rather than a protruding FM-style aerial, and the chip is potentially less than half a millimetre. There are two main types of tags: passive and active.

Passive tags are currently the most widely deployed as they are the cheapest to produce. Passive tags is used in this project which is available in our country. The table I shows the different types of RFID Tags available and its characteristics.

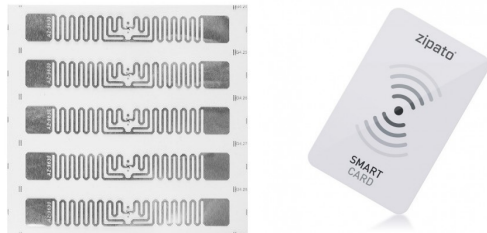


Fig. 3 RFID Tags

TABLE II
 TYPES OF RFID TAGS

Tags and features	Types of RFID Tags		
	Passive Tag	Active Tag	Semi Passive Tag
Internal Power Source	No	Yes	Yes
Response	Weaker	Stronger	Stronger
Size	Small	Big	Medium
Range	10 centimeters to few meters	Hundreds of meters	Hundreds of meters
Sensors	No	Yes	Yes
Cost	Less expensive	More expensive	Less expensive

D. DOOR CONTROLLER AND MOTOR

a. Controller:

The microcontroller is the main controlling element which controls the operation of this security access control system. Microcontroller is a device which includes a microprocessor, memory and IO lines on a single chip. The microcontroller reads the unique identification number inside the tag. The assembly language programs written in the microcontroller receives input signal, manipulates it, and provides necessary control signals to actuator.

b. Motor

In this project, DC gear motor is used as actuator in the proposed security system. A door along with locking system is driven by DC Gear motor. Fig 4 shows the dc gear motor which is having rated voltage of 12v and rated power of 45w. DC Gear motor acts as actuator, which is able to open and close the door in real-time. The RFID reader detects tag in real-time and open door automatically and closes it again after a specific time interval. DC Gear motors from Precision Micro drives not only offer the variable speed and torque control required in each of these applications.



Fig. 4 DC Gear Motor

V. WORKING OF THE SYSTEM

The Diagrammatic representation of the working principle of the proposed system is shown in Fig.5. The RFID reader produces radio waves to get identifying information from the tag. The RFID Reader will be able to claim the information stored in the RFID tag whenever the tag comes into the particular region of contact. And then the RFID tag responds by sending back its signals to the reader which is now acting as receiver. Then, the RFID Reader converts radio waves returned from the RFID tag into a form that can be passed on to microcontrollers, which can make use of it. The microcontroller then verifies the tag information with the information that was programmed in it. Finally, once the tag information is verified, the system generates a control signal through parallel

port which controls the opening and closing of door by means of actuator (DC Gear motor).

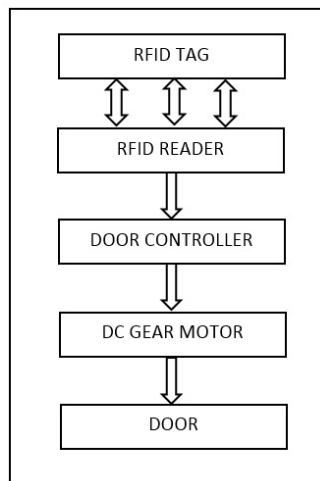


Fig. 3 Block Diagram of Proposed system

VI. CONCLUSION

The design and construction of the proposed security system is successfully implemented using RFID technology. One of the main objective of the proposed system is to ensure the safety of the library by authenticating the authorized persons into the library and it is achieved at an impressive range of 5cm using passive RFID tags while keeping the cost of the complete system at considerably very low.

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