RFID Biocapsule

Swati Balla, Chaitrali Degvekar, Gaurav Deshmukh, Nirmal Raghavan, Prof. S. N. Vaidya
Department of Electronics
Datta Meghe College of Engineering
Mumbai, Maharashtra, India

***Abstract*—Radio-frequency identification (RFID) is a technology that uses radio waves to transfer data from an electronic tag, called RFID tag or label, attached to an object, through a reader for the purpose of identifying and tracking the object. RFID technology is a matured technology that has been widely deployed by various organizations as a part of their automation systems. In this project, an RFID based system has been built in order to produce an attendance management system. This system consists of two main parts which include: the hardware and the software. The hardware consists of a motor unit and RFID reader. The RFID reader, which is a low-frequency reader (125 kHz), is connected to the host computer via a serial to USB converter cable. The Time-Attendance System GUI is developed using Visual Basic.Net. The Attendance Management System provides the functionalities of the overall system such as displaying live ID tags transactions, recording attendance and other minor functions.**

Keywords—RFID reader;ATMEGA16;Biocapsule

I. INTRODUCTION

Radio-frequency identification (RFID) is the wireless use of electromagnetic fields to transfer data, for the purposes of automatically identifying and tracking tags attached to objects. The tags contain electronically stored information. Some tags are powered by electromagnetic induction from magnetic fields produced near the reader. Some types collect energy from the interrogating radio waves and act as a passive transponder. Other types have a local power source such as a battery and may operate at hundreds of meters from the reader. Unlike a barcode, the tag does not necessarily need to be within line of sight of the reader, and may be embedded in the tracked object. Radio frequency identification (RFID) is one method for Automatic Identification and Data Capture (AIDC). RFID tags are used in many industries. An RFID tag attached to an automobile during production can be used to track its progress through the assembly line. Pharmaceuticals can be tracked through warehouses. Livestock and pets may have tags injected, allowing positive identification of the animal.[3]

Most educational institutions' administrators are concerned about student irregular attendance. Truancies can affect student overall academic performance. The conventional method of taking attendance by calling names or signing on paper is very time consuming and insecure, hence inefficient. Radio Frequency Identification (RFID) based attendance system is one of the solutions to address this problem. This system can be used to take attendance for student in school, college, and university. It also can be used to take attendance for workers in working places. Its ability to uniquely identify each person based on their RFID tag type of ID card makes the process of taking the attendance easier, faster and secure as compared to conventional methods of attendance systems. Students or workers only need to place their ID card on the reader and their attendance will be taken immediately. This system consists of microcontroller. RFID reader detects the tag. These tags have provided to students with particular ID. As soon as the student or worker with valid RFID card comes near to the RFID detector, detector will sense the card and collect the necessary information present in the card. The information is transmitted wirelessly using GPRS. The received information is then updated in the respective student's profile on the WEB. Microcontroller is used for controlling the events. With real time clock capability of the system, attendance taken will be more accurate since the time for the attendance taken will be recorded. The system can be connected to the computer through RS232 or Universal Serial Bus (USB) port and store the attendance taken inside database. An alternative way of viewing the recorded attendance is by using HyperTerminal software. A prototype of the system has been successfully fabricated.

The use of Radio-frequency identification (RFID) technology in automated electronic environment and for tracking objects has been widely researched upon by researchers and deployed by various organizations as part of their automation systems. Examples of a real RFID contact less data link deployments that utilize RFID technology for object tracking and automated data collection solution include Automated Toll Collection Systems, Products Tracking, Identifying criminals, etc.

II. LITERATURE REVIEW

In the process of system development, literature reviews conducted to understand the theory, methods and technologies associated with systems that have been developed. Background research on the organization and comparative studies of existing systems is also done to understand the system requirements before the system was developed.

A. Barcode Attendance System

The barcode system is a common type of time and attendance system through which the efficiency of measuring and tracking employees' time could be increased to a great degree. With the automation through barcode technology, the errors previously made in the manual payroll or attendances are eliminated.

B. Biometric Attendance System

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III. PROPOSED SYSTEM

Proposed system mainly consists of RFID tag and RFID reader and the overall process is controlled by microcontroller. RFID reader is used to detect the tag .These tags have been provided to students with particular ID. As soon as student with valid RFID card comes near to the RFID reader, detector will sense the card and collect necessary information present in the card. The necessary information is then updated in the database. Microcontroller is used for controlling the events.

On college level application we use 8051 .But 8051 is ROM memory working. Other Types like 8951 are available in the market which have flash memory. 8951 in particular has 4k flash memory. There are two types of 8951(89C51 & 89S51).89C51 uses CMOS technology whereas 89S51 uses IN SYSTEM PROGRAMABLE (ISP) technology.

We use ATmega16 which has 16-bit flash memory & 8-bit processor which is much faster and has superior operating speed and processing capacity than 89S51 which is a 4-bit processor.

It is 40 pin controller. VCC(5V) is given to pin no.40. Ground is given to pin no. 20. Pin No. 18 and 19 are given to the crystal oscillator. Crystal oscillator is given a frequency of 11.059 Mhz. The aforementioned oscillation is selected because it is easy to get Baud rate of 9600. Pin no. 9 is power on reset. Whenever this pin is activated, memory is set back to Zero location and the program resets.

This controller has 4 ports(0,1,2,3). All the ports are bidirectional ports. Port 3 has serial communication pins Rx & Tx. RFID Reader module is attached to Rx pin. RFID reader module is given 5V input supply. RFID reader module produces a 125 KHz carrier signal. 'Visiting tags', 'Biocapsule', etc. are all 'Passive Tags' i.e. they do not have power supply of their own. When 125Khz carrier signal is transmitted , they interact with these Passive Tags and the tags develop power on their own by wireless power transmission. Passive tags have no power source of their own and instead derive power from the incident electromagnetic field. Commonly the heart of each tag is a microchip. When the Tag enters the generated RF field it is able to draw enough power from the field to access its internal memory and transmit its stored information.

When the transponder Tag draws power in this way the resultant interaction of the RF fields causes the voltage at the transceiver antenna to drop in value. This effect is utilized by the Tag to communicate its information to the reader. The Tag is able to control the amount of power drawn from the field and by doing so it can modulate the voltage sensed at the Transceiver according to the bit pattern it wishes to transmit.

Each of these chips are stored with 12- digit identification number. The 12-digit number is 'Superimposed' on carrier as a 'Modulating signal' and retransmitted. Rx pin gets the required data where the carrier is removed and only the Modulating signal is present.

The data corresponding to the identification no. need to be displayed. This is done with the help of a LCD of 16 character by 2 row display i.e. (16X2). LCD is given VCC(5v) & also grounded. The LCD has contrast pins which are variable pins(allows to adjust the brightness according to command logic given).The LCD has three control pins Data/Command , Read/W rite & Enable pin. It has data pins D0-D7 but data pulse is given to D4-D7 only. This is called 4-bit mode. The first three pins are for command pins. 4-bit data is sent in two pulses and LCD displays 8-bit data.

Port 2 acts as output transistor(will act as relay driver). The Relay is single pole double throw (SPDT).There are four relays. Each relay has normally open & normally closed contact. Normally closed contact is connected to the GND & normally open is connected to supply of 12V. The pole is connected to '12V DC MOTOR' of 30 RPM.

A. Working of Relay

This method is used to display the concept of priority in our project. There are four relays. When the first relay is selected and input of 1/0 is given i.e.(first throw of the relay is selected) then the motor runs in the forward direction and the door opens and waits for 5 seconds and then the second throw is selected and the motor reverses its direction and the door is closed. The second relay can be connected to an electronic device like fan & light as examples in our project. The third relay can be connected to an electronic device like AC. The fourth relay can be connected to an electronic device like PC.

When the RFID reader module reads the identification number, it can detect if the person entering is boss or peon or student or some other person based on the RFID identification number depending on which it can perform pre-programmed action.

For example :-

- Say a peon has entered then by priority allocation only first and second relay will be activated. That means door will be operated & light & fan will be turned on.
- Say a student has entered then first, second and fourth relay will be turned on. That means door will be opened, light & fan will be turned on & PC will be started.

- When a teacher enters, all four relays will be turned on.

This hypothetical example is for a lab. This project can be modified for a variety of places like a company, office, security rooms, banks, etc.

B. Working of Video Attendance System

In the case of normal RFID attendance system, the system can be fooled if a single person carries multiple RFID tags and then swipes them for attendance. But this can be avoided by using RFID video attendance. In this method when RFID system is activated and the door opens a hidden camera captures the image of the person. In this system for demonstration purpose, a laptop is used. The data is given to the controller using TTL USB Converter. When the door opens, the computer is given a trigger by Tx pin of ATmega16. Thus, the laptop captures the image through the webcam & log file is created with date & time and we can keep track of the attendance.

C. Automation

As automation feature we have connected light and temperature sensors to port1.This feature can be understood by the following example. If a person enters during the day time, there is no need of light & if the temperature is already cool there is no need for fan or A.C. For light sensor, LDR is used with current limiting resistor & connected to terminal 0 of port1. We set a predetermined set point of illumination limit below which light is turned on. The preset point at which the light is to be turned on is adjusted to 0.7V.The controller pin assumes logic0 below 0.7 V and logic1 above 0.7V.When high amount of light falls ,resistance of LDR decreases and the logic 1 is assumed by the controller. When less amount of light (darkness) falls on the LDR resistance increases and logic 0 is assumed by the controller.

In the same way for temperature sensing, thermistor is used. Hermiston is 10 Kilo-ohms negative temperature coefficient (NTC) i.e. it changes its resistance depending on the temperature. We arrange a potential divider circuit by connecting it with another resistor and it's junction is connected to port1.1(terminal 1 of port 1). For this as well we set the predetermined temperature at which A.C. & fan gets on and the voltage equivalent is adjusted as 0.7V. If the temperature increases the resistance decreases and the voltage increases and the logic is taken as 1. Similarly when temperature decreases logic0 is taken. This is displayed and the gate or relay system is operated on the basis of its priority.

For Example:

- If a person enters during daytime and there is sufficient illumination then only the fan gets turned on and the light remains off.
- Similarly if the temperature is cool then ac & fan will not get turned on.
- This helps in saving electricity and improves efficiency of energy utilization.

D. Software Used

Visual Basic (VB) is an event driven programming language and associated development environment from Microsoft for its COM programming model.

IV. CIRCUIT DIAGRAM

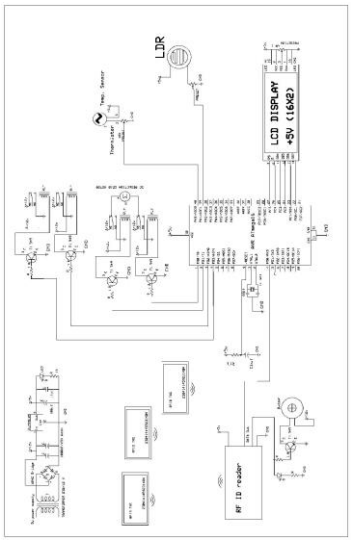

Fig. 1. RFID Biocapsule

V. FUTURE SCOPE AND APPLICATIONS

In the long run, with reducing unit tag and reader costs, several businesses will be able to leverage the benefits of RFID technology. RFID can be used in a variety of applications such as:

- Access management
- Tracking of goods
- Tracking of persons and animals
- Toll collection and contactless payment
- Machine readable travel documents
- Tracking sports memorabilia to verify authenticity
- Airport baggage tracking logistics
- Timing sporting events

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VII. CONCLUSION

The study has identified and explained the key benefits of RFID technology. RFID will open doors to a pool of applications from a plethora of industries. Although the focal challenge to thwart the adoption is its investment cost, RFID technology provides an ocean of lucrative business opportunities that could convince several firms adopt it. The first part of the paper explains the evolution of RFID technology and the role of its individual components within the system.

The second part of the paper discusses the feasibility of employing RFID technology and how it is benefactor of improved efficiency at lowered costs. The last benefactor of improved efficiency at lowered costs. The last part of the paper highlights one of the numerous practical implementations of RFID technology. RFID technology definitely promises an increased effectiveness and improved efficiency for business processes.

VIII. REFERENCES

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