Secure Authentication using RFID

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Abstract
Authentication is an essential issue for any organization. Previously, automated authentication was present using punch cards system, but it had security issues. Now days, organizations prefer to have biometrics based authentication. But using biometrics applications is very costly and time consuming. We can derive a time and cost effective solution for this problem using RFID (Radio Frequency Identification). Using feature provided by RFID to detect multiple individuals with very short amount of time and provide security with image pattern matching algorithm. To implement this system, we will interface camera with RFID enabled system which will use Low Frequency (LF) RFID tags. On every detection the camera will capture photograph. Then authentication is processed by using image pattern matching algorithm. Such system will be cost and time effective.

Keywords
Radio Frequency Identification (RFID), Low Frequency (LF), Two Level Security, Automatic Authentication

I. Introduction

Radio Frequency Identification (RFID) is old technology but more widely used in location tracing and tracking applications, due to wider reading ranges, and larger memory capacities, making it a key contributor to the growth of the radio technology industry. Many large corporations are interested in research and development within the field of RFID due to potential growth in various RFID applications. The people management system is an application where masses data needs to be collected and managed in a short duration. But due to authentication issues with this technology makes it less effective. RFID is an automated data collection technology in which radio communication for data transfer across two entities: a reader and a tag. The tag has two sections: one for radio communication and other for data storage. The tags are broadly classified into 3 categories namely active, passive and semi passive. The active tags have an internal power source e.g. a battery, which limits the life time. A passive tag doesn't have a power source and obtain the energy from the magnetic field of the reader. These types of tags are smaller, cheaper and can be used for long time. The scope of the paper is limited to passive tags. The functionality of RFID Passive tags is very simple. When a tag comes in the vicinity of the reader, it detects the radio signals generated by the reader and start to transmit the data stored in the memory. The radio signal generated by the reader offers the power needed to function and the synchronization data for communication between two entities. RFID has emerged as a key technology for automatic data collection. Using this, one can speed up authentication process. Every individual having RFID enabled identity can be detected in very short amount of time. But problem of secured authentication comes into the picture here. One way is proceeding with camera and matching the pattern for individual's photograph.

II. Literature Survey

There are many different types of RFID systems out in the market. They are categorized according to their frequency ranges. Some of the most commonly used RFID kits are as follows:

- Low-frequency (30 KHz to 500 KHz)
- Mid-Frequency (900KHz to 1500MHz)
- High Frequency (2.4GHz to 2.5GHz)

These frequency ranges mostly tell the RF ranges of the tags from low frequency tag ranging from 3m to 5m, mid-frequency ranging from 5m to 17m and high frequency ranging from 1m to 30m.
A basic RFID system consists of three components:

- An antenna or coil
- A transceiver (with decoder)
- A transponder (RF tag)

A. Antenna

The antenna emits radio signals to activate the tag and read and write data to it. Antennas are the conduits between the tag and the transceiver, which controls the system's data acquisition and communication. Antennas are available in a variety of shapes and sizes. Often the antenna is packaged with the transceiver and decoder to become a reader (a.k.a. interrogator), which can be configured either as a handheld or a fixed-mount device. The reader emits radio waves in ranges of anywhere from one inch to 100 feet or more, depending upon its power output and the radio frequency used. When an RFID tag passes through the electromagnetic zone, it detects the reader's activation signal. The reader decodes the data encoded in the tag's integrated circuit (silicon chip) and the data is passed to the host computer for processing. The antenna and circuit is shown in fig 1.

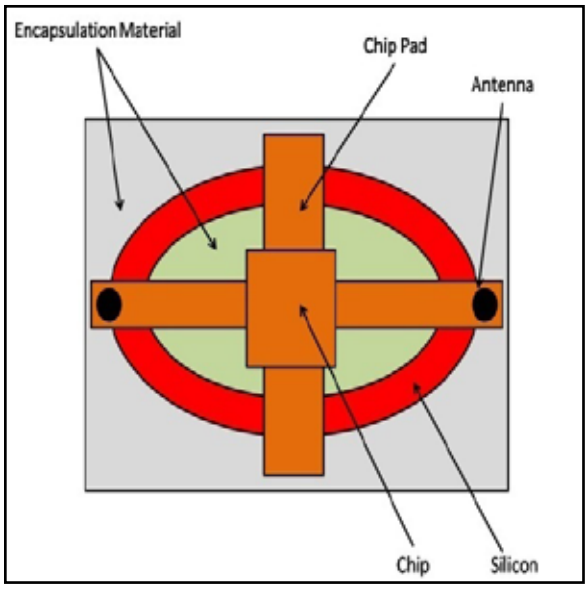

Fig. 1: Antenna and Circuit

B. Tags

An RFID tag is comprised of a microchip containing identifying information and an antenna that transmits this data wirelessly to a reader.
There are three options in terms of how data can be encoded on tags:

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1. Read-only tags contain data such as a serialized tracking number, which is pre-written onto them by the tag manufacturer or distributor. These are generally the least expensive tags. These tags are generally used for tracking of objects in known premises.
2. "Write once" tags enable a user to write data to the tag one time in production or distribution processes. Again, this may include a serial number, but perhaps other data can be added to it by the user at first time.
3. Full "read-write" tags allow new data to be written to the tag as needed and even written over the original data.

The RFID tag is shown in the fig. 2.

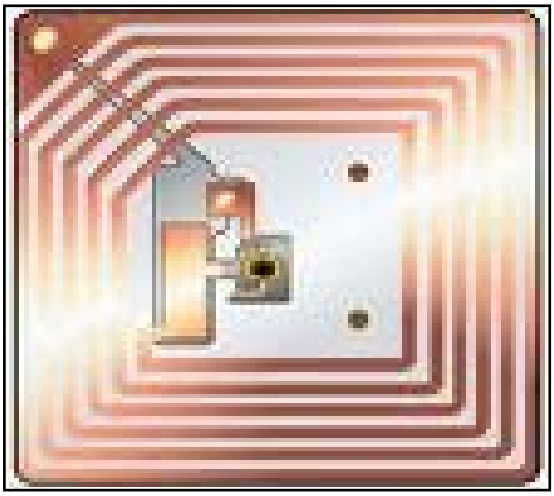

Fig. 2: RFID Tag

C. RF Transceiver

The RF transceiver is the source of the RF energy used to activate and power the passive RFID tags. The RF transceiver may be enclosed in the same cabinet as the reader or it may be a separate piece of equipment. When provided as a separate piece of equipment, the transceiver is commonly referred to as an RF module. The RF transceiver controls and modulates the radio frequencies that the antenna transmits and receives. The transceiver filters and amplifies the backscatter signal from a passive RFID tag. The RFID reader is shown in the fig. 3.

Fig. 3: RFID Reader

Basically the reader communicates with the computer using serial port RS-232. It is interfaced with RFID circuitry through a microcontroller. Microcontroller's ports are used for internal communication and interfacing. The RFID reader circuit is shown in fig. 4.

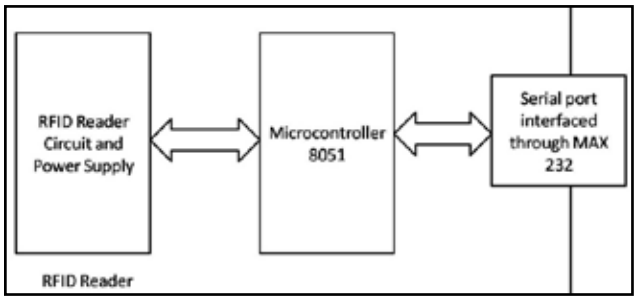

Fig. 4: RFID Reader Circuit

III. Proposed System

A. Overview

As we have mentioned above, RFID technology is able to identify individual entity in the short period of time, we are proposing the system that will prove to be handy in situations where security is important. This system will provide faster and secured authentication to the organization premises and restricted area with more precision than earlier RFID based system.

B. Implementation

In the proposed system consider a passage long about 20 ft. Passage has two doors which will define two phases of authentication.

At the first door individual has to come through an obstacle which will slow an individual and allow a person to enter at a time so the reader placed before the first door will have sufficient time to identify an individual. If the particular individual trying to get authenticated, is not identified can exit from side door. Otherwise first door is opened for an individual.

To restrict an intruder we are using infrared. Infrared is placed at the inner side of the door. The infrared emitter is placed at the upper side and receiver/sensor is placed at the bottom side as an individual passes through the first gate the infrared signal reaching to the receiver will be interrupted which will result in closing the door, so only an individual having a valid RFID card is able to enter into first door. The infrared embedded automatic door is shown in fig. 5.

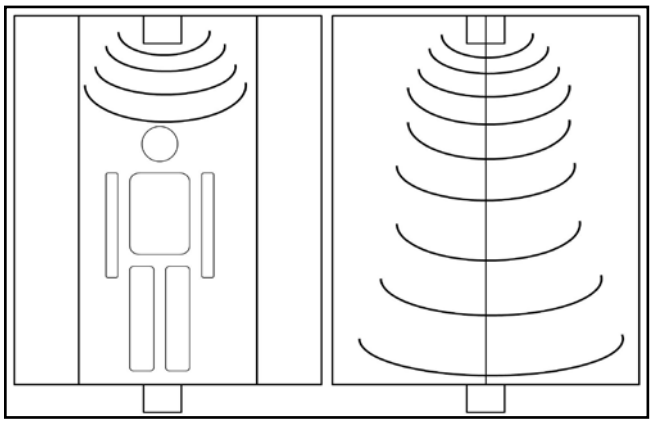

Fig. 5: Infrared Embedded Automatic Door

After successfully entering through first door photograph of individual will be captured. In the second phase of authentication captured photograph will be matched with previously stored photograph of that particular individual. If it satisfies pattern matching criteria decided by an organization, the individual is successfully authenticated. If due to any problem it fails to satisfy the criteria alarm in the security room will be raised along with result of the pattern matching for both photographs (newly

captured photograph and previously stored photograph of that particular individual). The fig. 6, photograph pattern matching is shown below.

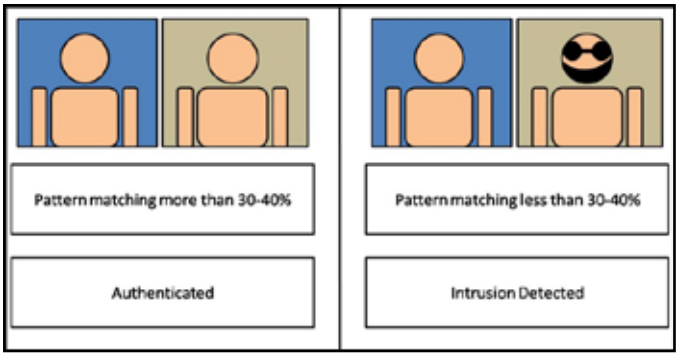

Fig. 6: Photograph Pattern Matching

If alarm is raised because of unsatisfactory result for pattern matching, security authorities will handle the situation. After manual checking, security authorities can authenticate the particular individual. Otherwise the authentication is totally denied. The total situation is described using following fig. 7.

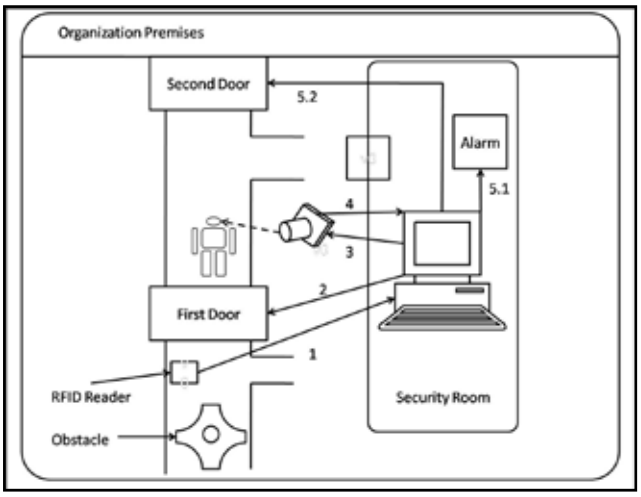

Fig. 7: Overview Diagram of Entrance

IV. Conclusion

Thus we have studied existing system and found that there are some disadvantages in it. We will be replacing existing system with improved quality system. This will work faster and easier than existing system.

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