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Modern Secured Approach for Authentication System by Using RF-Id and Face Recognition

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Abstract—*The research paper on "Micro-controller Based Automotive Security System using RFID with Face Recognition" is an advanced autonomous process for security measures that can be applicable to any institution that wishes to monitor and allow access to restricted personnel. The motivation for the project was to eliminate human personnel from the process to make it cost effective especially since it can function non-stop for 24 hours a day. The project incorporates the use of RFID technology to act as a first line of identification for an individual. This is further enhanced by adding a MATLAB algorithm for facial recognition. Since the project was successful in achieving its goal, the results can vouch for this technology to be ad*apted *in all interested institutions in our country*.

Keywords— *Face recognition, micro-controller, MATLAB, RFID Module, RFID reader and RFID tag*.

I. INTRODUCTION

Security is the degree of resistance to, or protection from impairment. It applies to any vulnerable and valuable asset, such as a person, dwelling, community, nation or organization. Security system refers to an electronic system that provides necessitated resistivity against impairment. We developed a security system based on RFID with Face Recognition system.

II. RADIO FREQUENCY IDENTIFICATION TECHNOLOGY

Radio frequency identification (RFID) Technology is one of the fundamental factors in the development of a universal information system for different object. It captures information directly about an object through radio wave emission without human interruption. The basic principle of RFID is the creation of magnetic field between two circuits [1]. This is a wireless technology traced the movements of objects through radio enable scanning devices in security and privacy systems.

A. Background

RFID Technology was first invented in 1948. However, it was not mainstreamed for commercial applications until 1980s. During World War II, it was first used for identification by Sir Robert Watson–Watt in his radar system to differentiate between German air-crafts and their own air-crafts with attached radio transponders [1]. During 1960s, by applying radio frequency technology a device called EAS was invented which was used for theft prevention. It could detect the presence or absence of the tag. It was a popular since that time for different applications. In 1990s, based on the RFID technology EPC was originated. The EPC Network was invented by EPC global. This consisted of serial numbers to create links between tags and readers. The product code was identified the individual product and can be read using radio frequency. In June 2003, world's largest commercial enterprise, Wal-Mart used RFID technology to achieve evolvements in the inventory supply process and theft control [1]. During July 2004, the US Department of Defense developed a security and privacy system with the introduction of electronic passports. Bio-metric information was stored in passports which worked for automated identity verification and greater security by the adoption of RFID technology. During 2005-2010, this system is standardized in its performance and involved to perform in personal and commercial applications. In Bangladesh, Mr. Delwar Hossain founder of Deltech, Ltd first started a company in 2002 for implementing systems based on RFID technology. This company helps several organizations to implement RFID. Recently Apollo Hospital, Dhaka undertook RFID project to track employee's whereabouts as well as their attendance. The Bangladesh army also employs the RFID system in their office for access control.

B. General Components of RFID

A basic RFID system consists of three components. The integration of these components enables RFID devices to perform various tasks. These three components are –

1) Antenna

Antenna is the vital component of an RFID module for communication with the system. It consists of a coil with windings and able to transmit and receive signal [1].

2) RFID reader

An RFID reader is a transceiver (including antenna) device with both read and write characteristics. It can produce and receive radio signal. The antenna of the reader collects data from the tag and sends to transceiver through radio frequency signal [2]. It employs low level anti-collision algorithm therefore one reader can allow multiple tags at a time [2]. The reader has two types module and they are-

RF module: An RFID reader contains an RF module which acts as both transmitter and receiver radio frequency .The transmitter consists of oscillator which produce carrier frequency, a modulator impinge data commands upon this carrier signal and an amplified it to wake up the tag [1]. The receiver has demodulator to extract the returned data and an amplifier to strengthen the signal for processing [3]. This signal then passes to the control module for progress.

A control module is a significant element for an RFID reader to control the reflected signal from the receiver to convey the data in the host computer. The control unit is formed of microprocessor which employs an operating system and memory to filter and accumulate the data signal [1].

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3) RFID tag

It is a portable device having an RFID system capable of data transmission is called a tag or an RFID transponder. It is a combination of a microchip and an antenna. The microchip has an internal memory which stores informational data. The antenna transmits the data to the reader when the tag is activated and provides identification of the tagged product [2]. Depending on the range of frequency and required power tags are three types and the are-

Passive RFID tag: The passive RFID tag does not contain any power supply. The power is supplied by the reader. Reader emits the electromagnetic waves to induce a current along the tag's antenna. Therefore the tag draws power from the reader and energizes the circuit in the tag. These tags are mostly used in low – frequency system and cheaper in cost.

Active RFID tag: The active RFID tag has an internal power source which is used to produce a signal in response to a reader. This uses in high frequency system and more expensive.

III. Face Recognition

An image of the face is the identification of a person which contains physical information about the person that can be used for security reasons and access control. Therefore, images play the single most significant role in human perception. Comparison of different images through technology is creating a bond between human and machines. A person's face which needs to be recognized is compared with a facial database and this process is known as Face Recognition (FR). Face recognition is a bio-metric phenomenon that recognizes faces which are already stored in databases. It detects various facial expressions, viewing positions and color segmentations to recognize people without realizing them that they are analyzed. The methodology in our project heavily depends on feature extraction algorithm under the PCA method. This algorithm has generated with MATLAB using image processing toolbox where the equalization occur.

A. Classification of Face Recognition System

The images of faces of people can be identified through some categories of face recognition for security purposes. Face recognition system has two category verification of an image and face identification.

Face Verification is 1:1 match that compares a face image against a template face image [5]. The face image of one person is identified according to some facial features and verifies it with the stored face image in the network.

Face identification is the main part for face recognition. *Face identification is 1*: N match that compares a probe face image against all image templates in a face database [5]. Two approaches are used to detect the human faces which are color segmentation and genetic searching. In color segmentation approach makes use of skin color to isolate a face [6]. Here an RGB image converted into YIQ space to detect the presene of skin color value in image. Whether, in genetic searching space is reduced by applying it to search for the expected face regions of the image in gray scale mode.

B. Feature Extraction Methods

This method is used to detect the local facial feature such as eyes, nose, mouth etc and inserts it as input data [6], [5]. For utilizing this method, edge detection is used to reliably find the features. Through this method the location of facial features points are obtained to find the initial. The two approaches that computes this method are geometry based approach and template – based approach.

Geometry based approach creates the relationship between those facial points. It can reduce the input facial image to a vector of geometric features and identify eyes, mouth, nose etc. of facial features using vertical edge map. Geometric – based approaches use geometric information such as features relative positions and sizes of the face components as a features measure [6].

Template- based approach is a standard face pattern matched with the located face components of the original face image to recognize the face [6]. The method is known as deformable template approach. The deformable templates are specified by a set of parameters which uses a prior knowledge about the expected shape of the feature to guide the contour deformation process.

IV. Microcontroller

The ATmega16 is a low power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. By executing powerful instructions in a single cycle, the ATmega16 achieves throughput approaching 1 MIPS per MHz allowing the system designer to optimize power consumption versus processing speed. The AVR core combines a rich instruction set with 32 general purpose working registers. All the 32 registers are directly connected to the Arithmetic Logic Unit (ALU), allowing two independent registers to be accessed in one single instruction executed in one clock cycle. The resulting architecture is more code efficient while achieving throughputs up to ten times faster than conventional CISC microcontrollers.

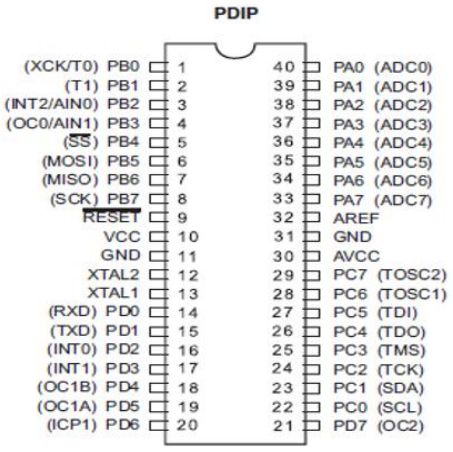

Fig. 1. Pin configuration of PIC16F876A.

V. Hardware Implementation

The following block diagram (Figure 2) is a sequential approach of our work

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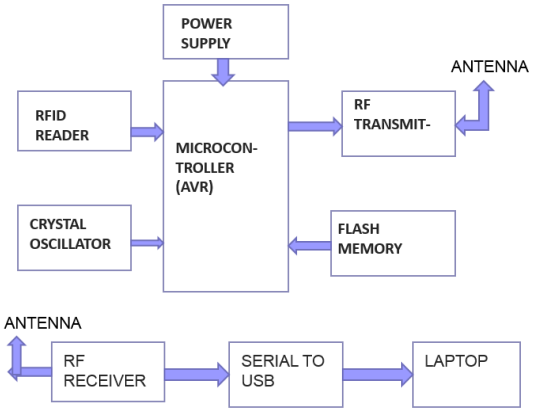

Fig. 2. Block diagram.

A. *Hardware Sequence*

When the power is turned on, the RFID reader module reads the ID number from the scanned card. Microcontroller then takes the data from RFID reader module and the ID number is displayed on LCD. Then Microcontroller compares the ID number and displays the respective "ACCEPTED" or "REJECTED" message on LCD. Then, the relevant Data is sent over to PC. This only happens if a match occurs in the hardware level. Readily afterwards, RFID reader module gets ready for the next scan.

After receiving data from UART terminal, user image corresponding to the received data is extracted from the database. A database is a folder of respective user images. Then, a snapshot of the incoming users face is taken by the camera and comparison between the extracted image and snapshot is carried out. If the images match, then the user is allowed to access the secured area.

VI. Experimental Results

A. *Circuit Diagram*

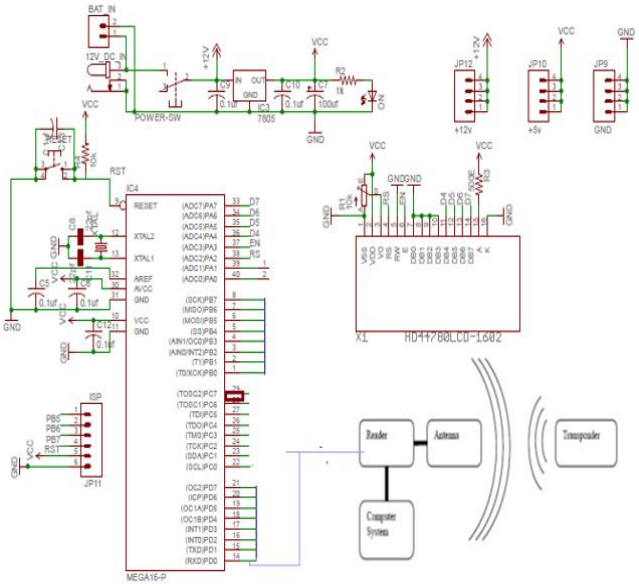

Fig. 3. Circuit diagram.

B. *Proteus Simulation*

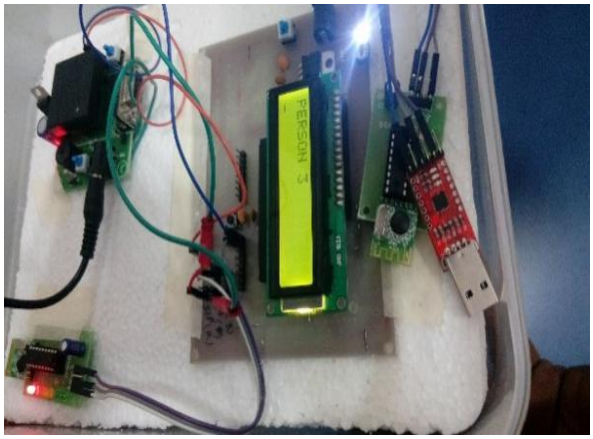

Fig. 4. Accepted case.

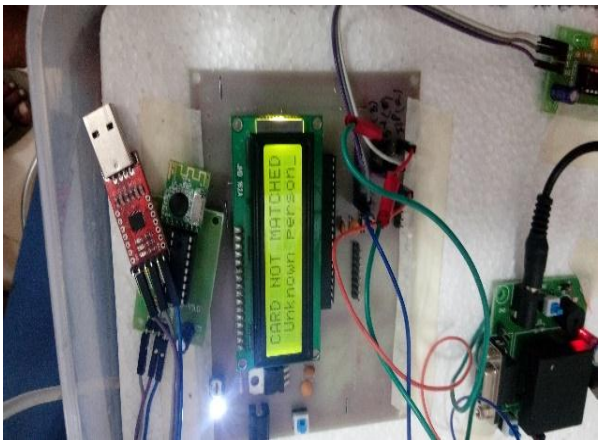

Fig. 5. Rejected case.

C. *Breadboard Implementation*

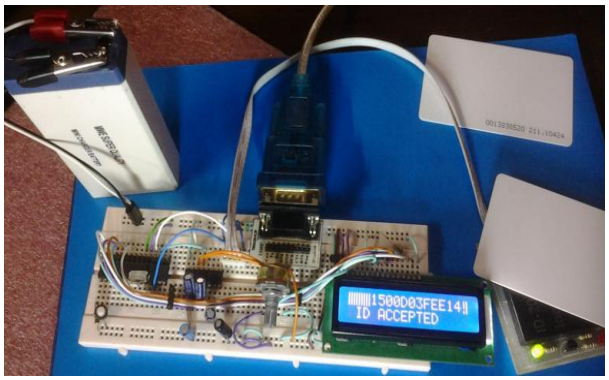

Fig. 6. Breadboard Implementation.

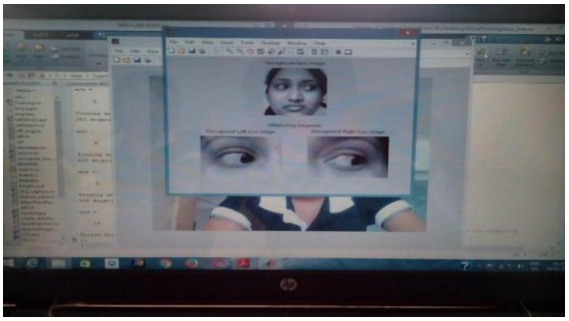

Fig. 7. Matched condition.

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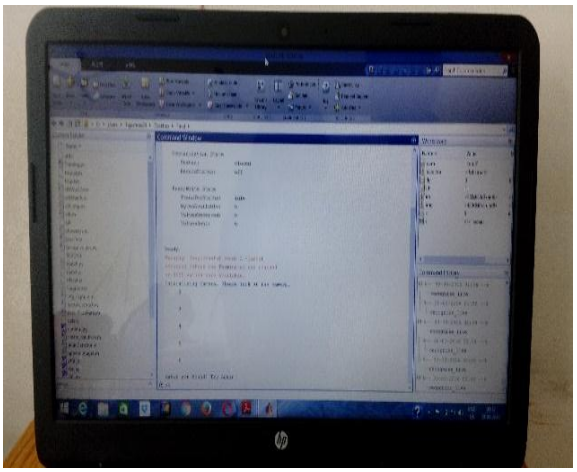

Fig. 8. Unmatched condition.

VII. Future Work

Since RFID is a simple and smart security gadget, hopefully it will be picked up by many security seeking bodies. Some possible applications of our work may be secured office entrance, personal vault security, RFID based car lock, secured network access, age verification system, personal car registration card. Use of active RF tags and high frequency reader module will increase the scanning range of the system. Integration of GSM module with the present system along with necessary microcontroller coding will provide a remote control over the secured area. Automatic switching of certain electrical appliances like, Air Conditioner, Fans, lights and etc. at different temperature levels, can be done at by integrating temperature sensors like LM35 and motion sensors.

VIII. Conclusion

In our limited research perimeter, no exact resemblance of our work was found. Though, separate works on Radio Frequency Identification and Facial Recognition are available on respective fields of virtual intelligence, no such combination of RFID and Image Processing has come up in our findings. The goal of our project reflected a new thinking. Now, in working condition, this project holds up a fresh new approach of security system.

References

[1] N. Karmakar, *Introduction to RFID System*, 3rd Edition, 2010.
[2] K. Ahsan, H. Shah, and P. Kingston, "RFID applications: An introductory and exploratory study," *International Journal of Computer Science Issue (IJCSI)*, vol. 7, issue 1, no. 3, pp. 1-7, 2010.
[3] R. Want, *RFID Explained: A premier on Radio Frequency Identification Technology*, 1st Edition, Morgan & Claypool Publishers, 2006.
[4] N. Jindal, "Improved PCA based face recognition system," *International Journal of Advanced Research in Computer Engineering & Technology (IJARCET)*, vol. 2, no. 6, pp. 2108-2113, 2013.
[5] H. M. Hasan, Dr. W. A. Al Jouhar, and Dr. M. A. Alwan, "Face recognition using improved FFT based radon by PSO and PCA technique," *International Journal of Image Processing (IJIP)*, vol. 6, issue 1, pp. 26-37, 2012.
[6] S. P. Khandait, P. D. Khandait, and Dr. R. C. Thool, "An efficient approach to facial feature detection for expression recognition," *International Journal of Recent Trends in Engineering (IJRTE)*, vol. 2, no. 1, pp. 179-182, 2009.

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