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Design of Smart Security System using Image Processing and Embedded System

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Abstract: The conventional design of real time security system typically monitors only the property and lacks physical control aspects. Also the term security is not well defined because there is the time delay between the alarm system going on and actual arrival of the security personnel. This paper discuss the development of the security and monitoring system that works where the traditional security system that are mainly concerned about curbing burglar and gathering evidence against trespassing fail. The paper present the design and implementation of the smart security system based on image processing and embedded system. An additional feature that enhance the security aspect of the system is its capability of monitoring entry points such as doors and windows so that in the event any breach, an alerting short message services and image through email is sent to the authorized members instantly.

Keywords: Global System for Mobile Communication(GSM);Short message services(SMS); image transfer through email; Home/Organization security.

I. INTRODUCTION

In recent years, security issues have grown so dramatically that the need to remotely control and secure residential and commercial properties assumed significant importance . Although there have been many attempts to develop and implement a fully functional and reliable security system, none of those was really able to penetrate the market. Statistical data reveal that a home without a security system is three times more likely to be broken into compared to those which are equipped with a state-of-the art security system . These facts make it obvious that a good real security system will reduce the chances of intrusion and thus, can protect both life and property. Hence, it is necessary to develop and implement a very dependable security system that can protect the user and properties.

According to statistical data of 2010, there were four million household break-ins in the United States, of which 500,000 resulted in bodily injuries and 20,000 resulted in homicides .Home security is thus becoming increasingly important to homeowners. Many companies are now looking to entering the market by providing technology that provides remote home security over a broadband application using Internet. AT&T reports that the U.S. broadband penetration is about 60 percent, while home security penetration is only about 25 percent; these figures suggest a remarkable market opportunity.

A. Formulation of Problem

Problems that can be formulated in this thesis is how the message is able to inform the undesired conditions were observed for residential security systems and organization also. Below are the problem definitions :

1. In alarm security system time delay may occur and it provides the disturbance to the neighbouring persons..It doesn't identify the difference between the human and the objects. In password security system, the password is easily hacked by the others and it is difficult to change the password.

2. In android and web based applications was developed for security is also easily hacked by the hackers.

B. System Development Method

Method system development which writer used is SDLC method (System Development Life Cycle) linear model sequential or often called a Rapid Application Development (RAD). Stages are as follows :

1) Analysis and Quick Design, in this step we do :
a) Analysis of problem solving, that consist of analysis problem, analysis software requirement and analysis hardware requirement
b) Quick Design, for this design do the Designing Classes and designing interfaces

2) Construction, in this step we will create the specification that consist of : limitation implementation, implementation class and implementation of interface

3) In this step testing is taken based on the applications.

4) Implementation, the last step is implementation into the organization, house residence, medical fields etc.

II. OVERVIEW OF SYSTEM AND TOOLS

In this we briefly present the details of the proposed system which provides the hardware platform for developing embedded system based on PIC controller and software platform for developing the image processing tool in MATLAB. This system having following attributes.

1.The one time password(OTP) is generated through sweeping the RFID reader and is send to the user by GSM module.
2.Authentication takes place.
3.Automatic message notification of any breaches in security.

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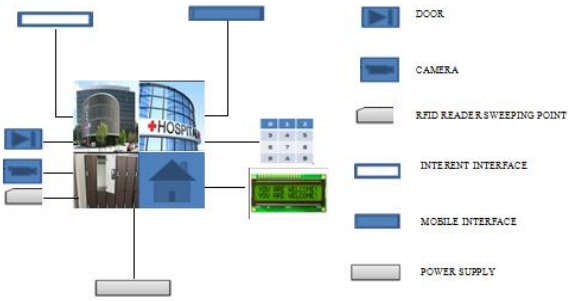
4.Simultaneously the image is send.
5.Highly extensible and customized.

The proposed system can be applicable for following fields: industrial applications, medical applications, residential applications and so on. It cab be tailored to fit the users needs at low cost. The system was developed as a custom -designed controller in programmable Interface Controller .C programming language was used for interaction between the main controller and external components ,viz keypad, liquid crystal display, Radio frequency identification reader, universal synchronous receiver transmitter and PC with MATLAB. This paper development flow is comprised of three categories:

1.Hardware design steps;
2.Software design steps;
3.System design steps(involving both hardware and software).

The present work combines PIC hardware design and software design such as MATLAB and Embedded C.To prove the concept of hardware and software co-design. A prototype of the proposed smart security system as been designed, implemented and tested in real time environment.



OVERALL DESIGN

III. DESIGN STEP

The following section we describes the design aspects.

A.Hardware design

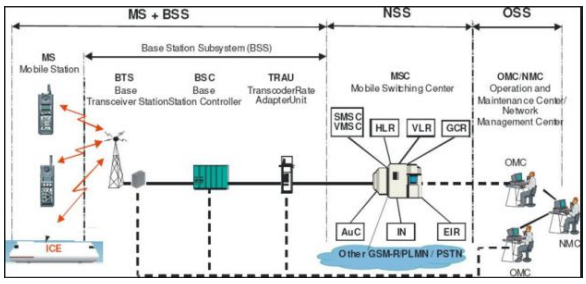
1.PIC Controller

PIC is a family of modified Harvard architecture microcontrollers made by Microchip Technology, derived from the PIC1650 originally developed by General Instrument's Microelectronics Division. The name PIC initially referred to *Peripheral Interface Controller*. It is generally thought that PIC stands for Peripheral Interface Controller, although General Instruments' original acronym for the initial PIC1640 and PIC1650 devices was "Programmable Interface Controller". PIC devices are popular with both industrial developers and hobbyists due to their low cost, wide availability, large user base, extensive collection of application notes, availability of low cost or free development tools, serial programming, and re-programmable Flash-memory capability.The acronym was quickly replaced with "Programmable Intelligent Computer".

PIC have a set of registers that function as general-purpose RAM. Special-purpose control registers for on-chip hardware resources are also mapped into the data space. The address ability of memory varies depending on device series, and all PIC devices have some banking mechanism to extend addressing to additional memory. Later series of devices feature move instructions, which can cover the whole addressable space, independent of the selected bank. In earlier devices, any register move had to be achieved through the accumulator.

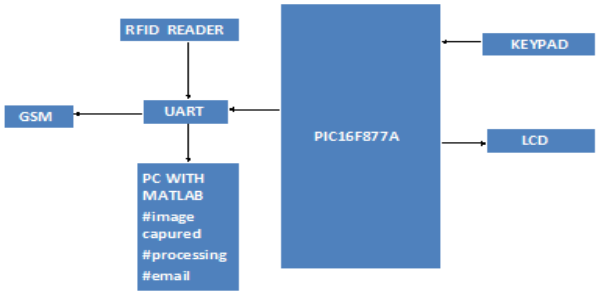
2.GSM

GSM (Global System for Mobile Communications, originally *Group Special Mobile*), is a standard developed by the European Telecommunications Standards Institute (ETSI) to describe the protocols for second-generation (2G) digital cellular networks used by mobile phones, first deployed in Finland in July 1991.2G networks developed as a replacement for first generation (1G) analog cellular networks, and the GSM standard originally described a digital, circuit-switched network optimized for full duplex voice telephony. This expanded over time to include data communications, first by circuit-switched transport, then by packet data transport via GPRS (General Packet Radio Services) and EDGE (Enhanced Data rates for GSM Evolution or EGPRS)



3.Radio Frequency Identification Reader

A radio frequency identification reader (RFID reader) is a device used to gather information from an RFID tag, which is used to track individual objects. Radio waves are used to transfer data from the tag to a reader.



RFID is a technology similar in theory to bar codes. However, the RFID tag does not have to be scanned directly, nor does it require line-of-sight to a reader. The RFID tag it must be within the range of an RFID reader, which ranges from 3 to 300 feet, in order to be read. RFID technology allows several items to be quickly scanned and enables fast identification of a particular product, even when it is surrounded by several other items. RFID tags have not replaced bar codes because of their cost and the need to individually identify every item. Applications including:

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Passport ,Smart cards, Airplane luggage, Toll booth passes Home appliances, Merchandise tags, Animal and pet tags.

4.UART

A Universal asynchronous receiver/transmitter, abbreviated UART , is a computer hardware device that translates data between parallel and serial forms. UART are commonly used in conjunction with communication standards such as TIA (formerly EIA) RS-232, RS-422 or RS-485. The *universal* designation indicates that the data format and transmission speeds are configurable. The electric signaling levels and methods (such as differential signaling etc.) are handled by a driver circuit external to the UART.

B.Software design

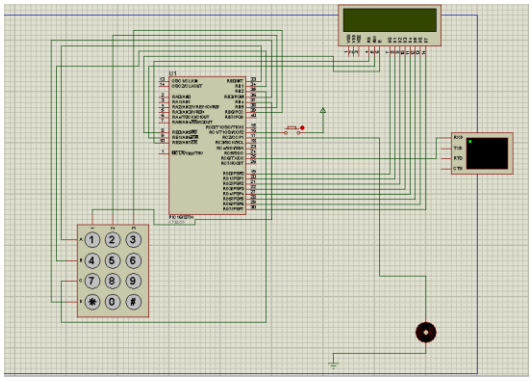
The system has two main soft components is given below

1.Embedded C

2.Image processing tool(MATLAB)

1.Embedded C

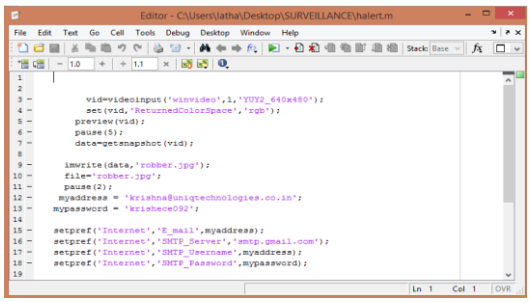
C is the most widely used programming language for embedded processors/controller. Its small and simpler to learn, understand, program and debug



Compared to Assembly language c code written is more reliable scalable ,more portable between different platforms. This paper is dealing with PIC16F877A Ic in Micro controller family .For coding MPLAB software is used, this is free integrated development environment for the development of embedded applications on PIC micro controller and is developed by microchip technology.

2.MATLAB

MATLAB(Matrix laboratory) is using in various fields especially 63 tools. One of the tools is image processing. MATLAB is a high-performance language for technical computing. It integrates computation, visualization, and programming in an easy-to-use environment where problems and solutions are expressed in familiar mathematical notation.

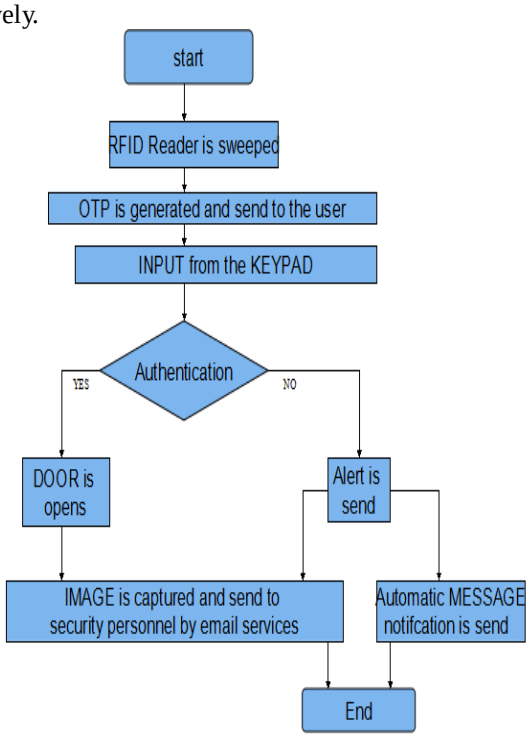


C.SYSTEM DESIGN

The overall system design for proposed system is: When a RFID Reader is sweeped , the OTP is generated and send to the user. Then authentication is takes place by comparing the password is entered by the user with OTP. T he authentication is succeed the image of the user is captured and send to the authorized member through mail by MATLAB. When the authentication is failed the alert message is send to the authorized members through GSM and at the same time the image is captured and send to the authorized members.

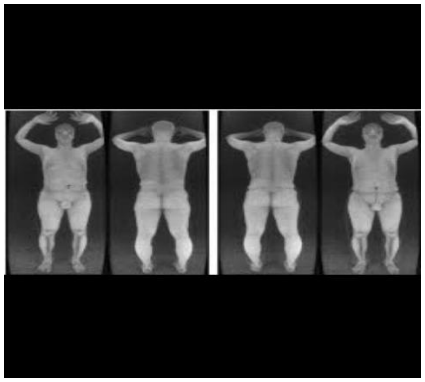
It gives the following advantage when compare to the older system:

To provide an effective security for the public domain . Immediate action can be done. Easily identify the unauthorized better than other technology Provide authentication, integrity, confidentially Proven effectively.



IV.FUTURE DEVELOPMENT

The future development of the security system is the scanning of the whole body to provide the highest security. Therefore no more forgery can be done in this type of security.



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In the future development the whole body of the authorized person is scanned and the corresponding information are stored in the server. Every little bit of information are stored therefore no more forgery can be happened in this level of security system.

V.CONCLUSION

Based on the description and discussion, it can be concluded that :

a) Based on testing , this application can be run in accordance with the objectives, analysis, and design that has been designed, so the application can support the early warming system for the industries, residential area, medical application.

b) It can provide the user's needs with affordable cost

c) It can gives high level of authentication, integrity, confidentially Proven effectively.

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