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Smart Receptionist System using Smart Lock and Wireless Communication

Aseema Parveen J[1], Vishali. C[2], Mr. S. B. Mohan[3]
[1.,2]Student, [3]Associate Professor, ECE Dept.
Dhaanish Ahmed College of Engg., Chennai, Tamil Nadu.

Abstract: ***Security has become one of the major issues with the advent and rise in technology. This project is a security system that lets you see a visitor while the main door is locked. This embedded system is built by using PIC 16F877A as hardware technology. If you are in the middle of a meeting in a conference room and there is a visitor at the door, this system will send a notification to your mobile or PC, with the photo captured using web camera as email and MMS using GSM. Also if there is an important person visiting the organization, there will be an indication provided by flashing of LED. If the authorized person approves the photo of the visitor, using the "PROVIDE ACCESS" tab, the solenoid lock opens and the visitor makes an entry into the organization. If not, the visitor presses the "DENY ACCESS" tab and the solenoid lock remains closed. This system is used to maintain the security of the organization and can even be implemented for a large section of homes like apartments.***
Keywords: PIC 16F877A, Email, MMS, Web camera, Solenoid lock, GSM.

I. INTRODUCTION

With the emergence of developed technology security system has become one of the upcoming field. Security system for an organization introduces many technologies for making the system installation easy and secure. Most of the systems make use of mobile communication like GSM[3] and Wi-Fi[1] for security systems. The central processing unit for the proposed system is developed using the PIC 16F877A micro-controller which is a low cost and efficient controller used in many applications.

Here the embedded system technology is combined with the wireless technology .Here we are using a web camera which is used to provide access by capturing the image when a person presses the doorbell switch. Then this image is sent as email to the receptionist who further decided whether to give access or not. When the access is provided the door is opened and if the visitor turns out to be new to the organization, the photo of the person and a message is sent to the highest authority of the organization for further approval through email and GSM. Thus we maintain security of the organization. This system can also be used in multiple ways as we can protect our houses, banks,vehicles and lockers etc.,

Fig.1.1:Overview

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A. Block Diagram

The system mainly operates on two major conditions, one-when the visitor is regular and the other when the visitor is completely new to the environment. The input section consists of the doorbell switch and the web camera. Both are interfaced to the web camera.

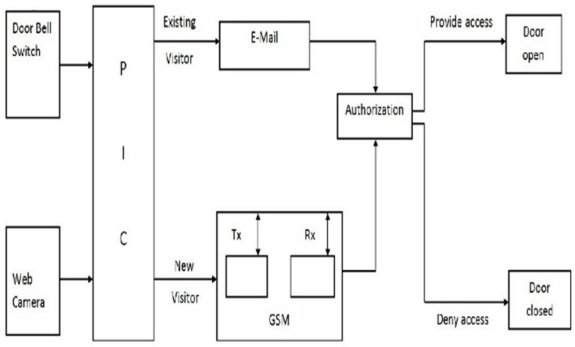

Fig.1.2: Block Diagram

II. HARDWARE REQUIREMENTS

This section is used to build the system where the functioning is done based the language in which it is coded.

A. Doorbell Switch

The switch acts as an input here. When the visitor presses it, it sends signal to PIC 16F877A since it is interfaced with it. The microcontroller continuously monitors the switch and when a visitor presses it, the web camera is immediately enabled. Then door will remain locked during this process.

Fig 2.1:Switch

B. Web Camera

This camera is used to feed streams of image on real time basis. This web camera is enabled when the switch is enabled by the visitor. The signal sent by the switch is sent to the web camera since it is interfaced with the PIC 16F877A.

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Fig2.2: Web camera

This now captures the image of the visitor and sends it as e-mail to the receptionist. When visitor is completely new to the organization, the captured image is sent further to higher authority by MMS when GSM gets activated.

C. PC & Smartphone

The captured image should be received as e-mail. A personal computer is interfaced along with the micro-controller and helps in supporting the e-mail software.

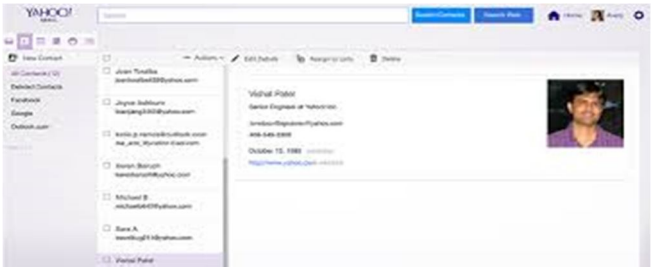

Fig: 2.3 Photo received as e-mail

Similarly, when the visitor turns out to be completely new, an MMS is received by a higher authority who can be in any part of the world.

D. PIC Micro-Controller

The PIC 16F877A CMOS FLASH-based 8-bit microcontroller is upward compatible with the PIC16C5x ,PIC 12Cxxx and PIC16C7x devices. It features 200 ns instruction execution, 256 bytes of EEPROM data memory, self programming, an ICD, 2 comparators, 8 channels of 10-bit analog-to-digital (A/D) convertor , 2 capture /compare /PWM functions, a synchronous serial port can be configured as either 3-wire SPI or 2-wire 12C bus, a USART, and a Parallel Slave Port.

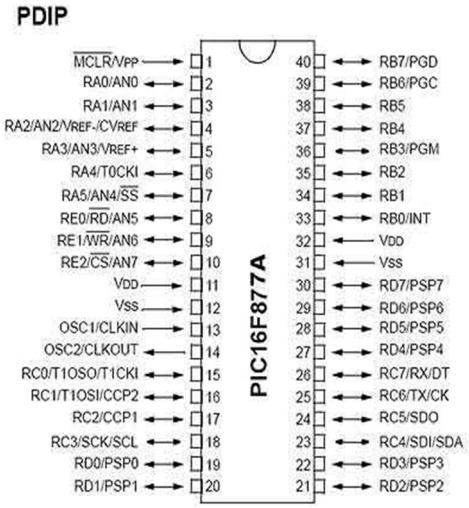

Fig:2.4 PIN diagram of PIC 16F877A

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Here the PIC micro-controller acts as the brain of the entire embedded system. All the other hardware components like the doorbell switch, web camera, PC, smartphone as well as the smart lock and the GSM unit. The following are few of its important features:

1) It follows the RISC architecture.
2) It executes instruction in every cycle except branches.
3) The operating frequency is about 0-20Mhz.
4) Power supply range is 2-5.5V
5) There are totally 5 I/O ports with 35 I/O pins
6) It follows in-circuit serial programming with 256 bytes EEPROM memory.

E. GSM Modem

A GSM Modem can be a dedicated modem device with a serial , USB or Bluetooth connection, or it can be a mobile phone that provides GSM modem capabilities.

Fig: 2.5 GSM Modem

A GSM modem exposes an interface that allows application such as SMS and MMS to send and receive messages over the modem interface. Here in this project, this is interfaced to the PIC 16F877A and gets enabled when the web camera captures a new visitor who visits the organization for the very first time.

Fig:2.6 Photo of new visitor received as MMS

Moreover an SMS is received stating “NEW VISITOR” informing the entry of a new visitor to the higher authority.

F. Solenoid Lock

This is used to provide access to the door or gate of the organization when the receptionist approves the person on the gate when the web camera captures the visitors’s photo.

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Fig:2.6 Solenoid lock

Thus when a when the receptionist approves by pressing the "PROVIDE ACCESS" tab, the solenoid lock interfaced with the PIC 16F877A gets enabled and open allowing the visitor to enter the organization. If the receptionist disproves the photo of the visitor by pressing the "DENY ACCESS" tab, the solenoid lock is not enabled and the gate remains locked.

III. SOFTWARE REQUIREMENTS

The micro-C PRO is a powerful, feature rich tool for the micro-controller PIC 16F877A.It is designed to provide with easiest possible solution to develop applications for embedded system. The program is written in embedded C language after compiling a microcontroller program in C using a 'Micro C pro'. HEX file from the program codes that is generated.

Fig:3.1 Micrc PRO Software

A. The following steps will help to start programming

1) Open 'Mikro C pro'
2) Navigate to Project>>New Project
3) 'Welcome to the New Project Wizard' window will appear. Click the Next button.
4) Choose your PIC from the drop down menu and click PIC 16F877A and then click Next.
5) Set the clock frequency and click Next. After this choose any folder to save the project by clicking the Browse button.
6) Create a name to the project and click Save , then click Next button.
7) Now add your program to the editor panel of Mikro C.
8) Navigate Project>>Build or click the build button and the .HEX file is created
9) Finally, when all the codes are corrected a message "FINISHED SUCCESSFULLY" appears at the bottom.

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IV. IMPLEMENTATION

The interfacing of the hardware and software makes up this system. Here the hardware implementation will follow the following circuit connections.

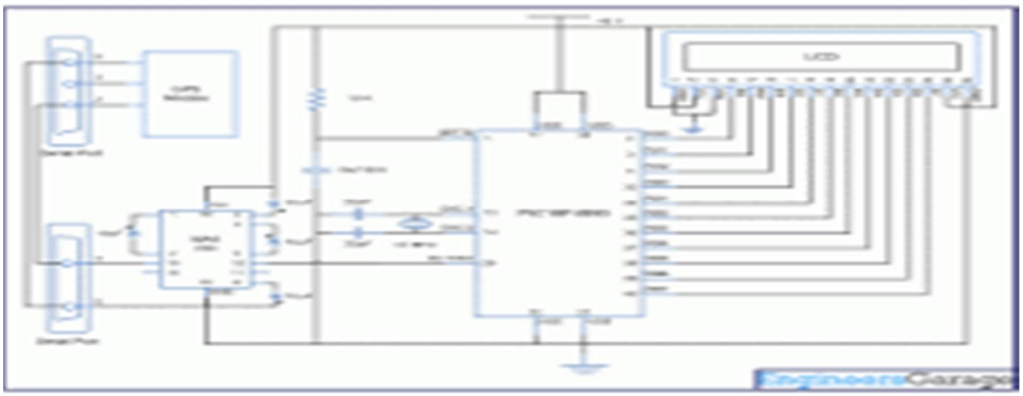

Fig: 4.1 Circuit diagram

The program code written in microC PRO is now burned in the PIC microcontroller and the hardware components are enabled when the power supply adapter is switched on. The following is the flow diagram of the security system.

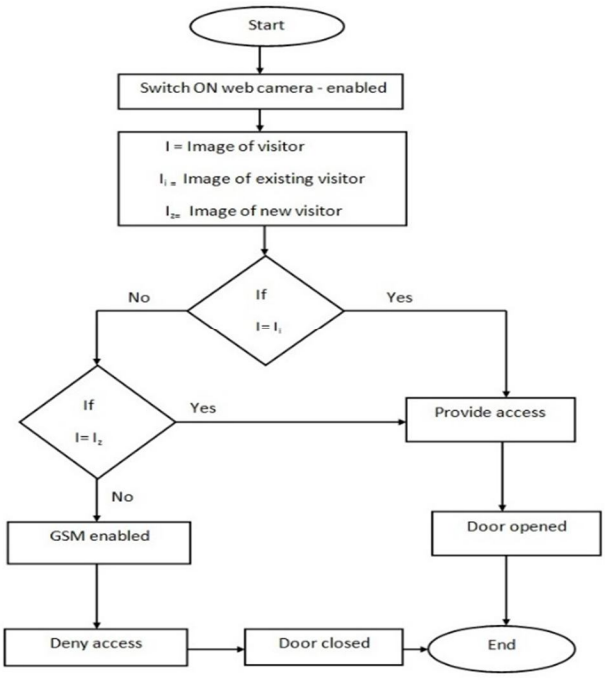

Fig:4.2 Flow diagram

The LED alerts when there is a visitor at the gate and enables the web camera to capture the photo of the visitor. When the captured image is same to one in the existing database, the PIC 16F877A enables the solenoid lock and the access is provided. If not, it remains closed. The GSM is enabled, when a visitor comes into the organization for the very first time and MMS is received stating ”NEW VISITOR”. Once, a higher authority approves, again the access is provided.

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V. RESULT & DISCUSSION

We implemented an intelligent, low cost, low power consumption wireless security system by using doorbell switch and web camera. The system will allow visitors only when the receptionist approves the photo of the visitor when received as mail if not the visitor cannot enter the organization and the system remains locked.

In this project, we have showed that accessing of the photo is done by only one receptionist. While implementing practically, the system can be designed such that there can be any no. of authorities who can view the photo of the visitor and decide whether to provide access or not

VI. CONCLUSION

This paper presents the design and implementation of a smart receptionist system for organizations using PIC 16F877A and GSM enabled wireless security system. The system has a friendly user interface so that the organization or a group of apartments can use whenever they need high security. Communication of the system is wireless and makes the system easy to install and use. The system is of low cost, low power consumption and easily operable. In addition, the wireless GSM modules enable the system to transfer other information such as voice message of the new visitor and picture rather than only SMS.

VII. FUTURE WORK

In future, this smart security system can be implemented such that it becomes fully automated where they no need of a receptionist to view the photo of the visitor when it is received as e-mail. It can be designed such that the system operation can take place only if the images match and does not need authorization. Thus this will decrease the man-power deployed.

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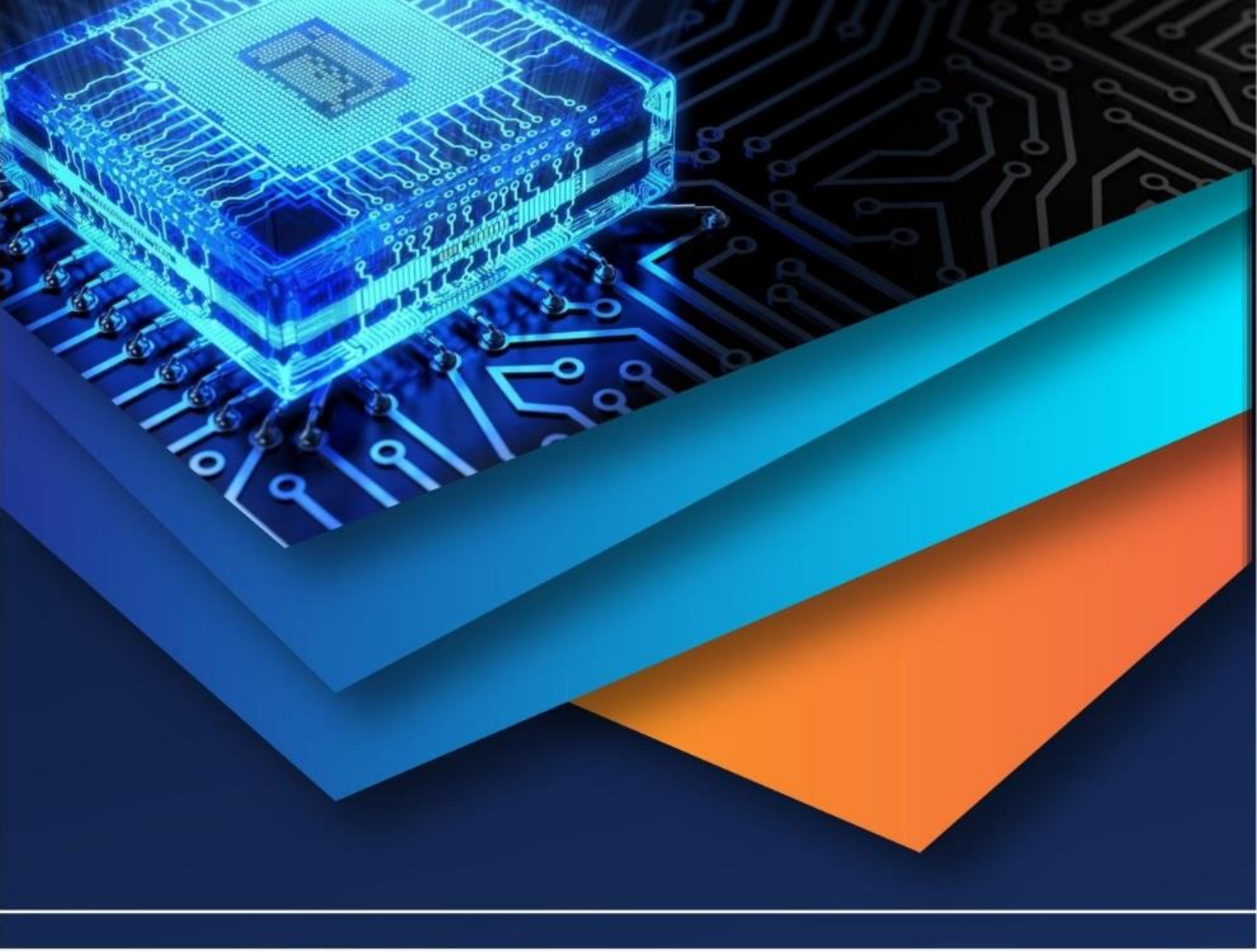

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