

Smart Residency- Apartment Security and Surveillance System

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Abstract- In recent years, considerable progress has been made in the area of face recognition. Through the work of engineers, computers can now outperform humans in many face recognition tasks, particularly those in which large databases of faces must be searched. A system with the ability to detect and recognize faces has many potential applications including crowd and airport surveillance, private security and improved human-computer interaction. An automatic face recognition system is perfectly suited to fix security issues and offer flexibility to smart house control. Algorithm for face recognition, based on viola jones, is programmed and implemented on the Matlab platform. The system is based on the criteria of low power consumption, resources optimization, and improved operation speed. This project reviews the related work in the field of home automation systems and presents the system design, software algorithm, implementation and results. The Matlab program is developed for face detection and it met the design criteria and solves the paper problem.

Index Terms- Database, Image Acquisition, Matlab, Optoisolator, Passive Infrared, Pyroelectric, Viola-jones,

1 INTRODUCTION

The physical, behavioral, biological traits of an individual can verify a person's identity. Physical traits include face, fingerprint, iris, and sclera. Behavioral traits are like gait, voice and biological include DNA. Each of these has its own advantages and disadvantages. Some traits could change over a period of time, cannot be used for recognition from a distance or can cause hygiene issues. A password may be more applicable in a particular scenario than the rest. No password is perfect or can be applied universally. Password systems compared with traditional authentication schemes are more reliable and it is difficult to copy, share or distribute them. Their characteristics have the following requirements due to which they can be used in authentication schemes.

- Universality.
- Distinctiveness

Among the cellular technologies, GSM network is preferred for the communication between the home appliances and the user due to its wide spread coverage, which makes the whole system online for almost all the time. Another advantage of using the GSM network in home automation is its high security infrastructure, which provides maximum reliability whereby other people cannot monitor the information sent or received. Hence, this research work implements SMS based control for home security using the GSM architecture without accessing the local network.

2 MAIN FEATURES AND COMPONENT DETAILS

- Image Processing in Matlab..
- Door security invisible eye- door
- SMS
- DB face, DB matched then door open auto registry update
- DB not matched then auto form open to fill and auto room suggestion will come
- SMS to respective owner, owner will send SMS to system to open door; no match - buzzer turns on
- Gas leakage in flat monitoring, water monitoring SMS to respective person
- flats database

2.1 Microcontroller

The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the industry-standard 80C51 instruction set and pin out. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with in-system programmable Flash on a monolithic chip, the Atmel AT89S52 is a powerful microcontroller which provides a highly-flexible and cost-effective solution to many embedded control applications. The AT89S52 provides the following standard features: 8K bytes of Flash, 256 bytes of

RAM, 32 I/O lines, Watchdog timer, two data pointers, three 16-bit timer/counters, a six-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry. In addition, the AT89S52 is designed with static logic for operation down to zero frequency and

supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port, and interrupt system to continue functioning. The Power-down mode saves the RAM contents but freezes the oscillator, disabling all other chip functions until the next interrupt or hardware reset.

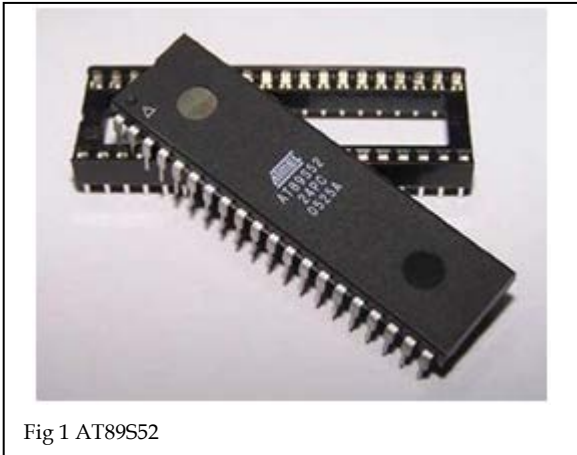


Fig 1 AT89S52

2.2 USB TO TTL

The cable is easiest way ever to connect to your microcontroller/Raspberry Pi/Wi-Fi router serial console port. Inside the big USB plug is a USB<->Serial conversion chip and at the end of the 36" cable are four wire - red power, black ground, white RX into USB port, and green TX out of the USB port. The power pin provides the 5V @ 500mA direct from the USB port and the RX/TX pins are 3.3V level for interfacing with the most common 3.3V logic level chipsets.



Fig 2. USB to TTL

2.3 WEBCAM

It is used to capture the image so as to give input in MATLAB for sound output and convert into notepad. A webcam captures and recognizes an object in view and

tracks the user's hand gestures using computer-vision based techniques. It sends the data to the computer. The camera, in a sense, acts as a digital eye, seeing what the user sees. It also tracks the movements of the thumbs and index fingers of both of the use hands. The camera recognizes objects around you instantly.

Image Processing with MATLAB:

Images are everywhere, from everyday devices like cameras and smartphones to specialized devices for medical imaging, automotive safety, industrial automation, and more. Each of these uses for image processing has unique challenges. MATLAB and Image Processing Toolbox provide a flexible environment to explore design ideas and create unique solutions for imaging systems.

Matlab toolboxes used in the project are as follows:

1. Image acquisition Toolbox.
2. Image processing toolbox

Image Acquisition toolbox

The Image Acquisition Toolbox is a collection of functions that extend the capability of the MATLAB® numeric computing environment. The toolbox supports a wide range of image acquisition operations, including:

- Acquiring images through many types of image acquisition devices, from professional grade frame grabbers to USB-based Webcam.
- Viewing a preview of the live video stream.
- Triggering acquisitions (includes external hardware triggers). Configuring callback functions that execute when certain events occur.
- Bringing the image data into the MATLAB workspace.

Image processing Toolbox:

Image Processing Toolbox provides a comprehensive set of reference-standard algorithms, functions, and apps for image processing, analysis, visualization, and algorithm development. You can perform image enhancement, image deblurring, feature detection, noise reduction, image segmentation, geometric transformations, and image registration. Many toolbox functions are multithreaded to take advantage of multicore and multiprocessor computers. Image Processing Toolbox supports a diverse set of image types, including high dynamic range, gigapixel resolution, embedded ICC profile, and tomographic visualization functions let you explore an image, examine a region of pixels, adjust the contrast, create contours or histograms, and manipulate regions of interest (ROIs). With toolbox algorithms you can restore degraded images, detect and measure features, analyze shapes and textures, and adjust color balance.

2.4 GSM

GSM stands for Global System for Mobile Communications. It is a standard set developed by the European Telecommunications Standards Institute (ETSI) to describe protocols for second generation (2G) digital cellular networks used by mobile phones. A Modem is a device which modulates and demodulates signals as required to meet the communication requirements. It modulates an analog carrier signal to encode digital information, and also demodulates such a carrier signal to decode the transmitted information.

A GSM Modem is a device that modulates and demodulates the GSM signals and in this particular case 2G signals. The modem we are using is SIMCOM SIM300. It is a Tri-band GSM/GPRS Modem as it can detect and operate at three frequencies (EGSM 900 MHz, DCS 1800 MHz and PCS1900 MHz). Default operating frequencies are EGSM 900MHz and DCS 1800 MHz

Features:

- Quad Band GSM/GPRS: 850 / 900 / 1800 / 1900 MHz
- Built in RS232 to TTL or vice-versa Logic Converter (MAX232)
- Configurable Baud Rate
- SMA (Sub Miniature version A) connector with GSM L Type Antenna
- Built in SIM (Subscriber Identity Module) Card holder
- Built in Network Status LED
- Inbuilt Powerful TCP / IP (Transfer Control Protocol / Internet Protocol) stack for internet data transfer through GPRS (General Packet Radio Service)
- Audio Interface Connectors (Audio in and Audio out)
- Most Status and Controlling pins are available
- Normal Operation Temperature: -20 °C to +55 °C
- Input Voltage: 5V to 12V DC
- DB9 connector (Serial Port) provided for easy interfacing



Fig 3. GSM Module

2.5 LPG SENSOR

MQ-6 sensor is a simple-to-use liquefied petroleum gas (LPG) sensor, suitable for sensing LPG (composed of mostly propane and butane) concentrations in the air. The MQ-6 can detect gas concentrations anywhere from 200 to 10000ppm.

MQ-6 semiconductor sensor is Combustible Gas Sensitive. The MQ-6 gas sensor is made up of SnO₂ which has lower conductivity in clean air. A simple electro-circuit is used here which is used to convert the changing conductivity into corresponding output signal of gas concentration. Both Methane and Propane can be detected easily by MQ-6 sensor because it has high sensitivity towards Methane, Propane and Butane. It is a low cost sensor suitable for different application.



Fig 4. MQ-6 LPG Sensor

2.6 PIR SENSOR

PIR sensors allow you to sense motion, almost always used to detect whether a human has moved in or out of the sensors range. They are small, inexpensive, low-power, easy to use and don't wear out. For that reason they are commonly found in appliances and gadgets used in homes or businesses. They are often referred to as PIR, "Passive Infrared", "Pyroelectric", or "IR motion" sensors.

PIRs are basically made of a pyroelectric sensor (which you can see above as the round metal can with a rectangular crystal in the center), which can detect levels of infrared radiation. Everything emits some low level radiation, and the hotter something is, the more radiation is emitted. The sensor in a motion detector is actually split in two halves. The reason for that is that we are looking to detect motion (change) not average IR levels. The two halves are wired up so that they cancel each other out. If one half sees more or less IR radiation than the other, the output will swing high or low.

3 BLOCK DIAGRAM

The block diagram of the project is as shown below:

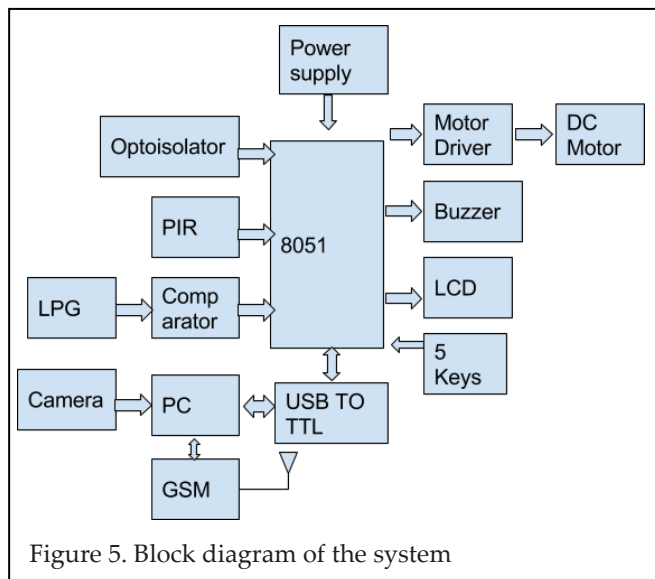


Figure 5. Block diagram of the system

4 FLOW OF WORKING

1. If any movement is captured through PIR sensor then it will send information to microcontroller. Camera will get turn on.
2. Camera will capture photo of a person and will give to PC side.
3. PC side MATLAB coding will fetch photo and compare with store database. If match is found then that message will send from PC to controller.
4. Microcontroller will send signal to Dc motor through motor driver to open the gate.
5. If match is not found then with the help of GSM Message will send to User phone to make him/her alert. If user gives permission then only unknown person get permission to enter into apartment premises.
6. There is another type of facility provided to user that is "Password" to enter into apartment premises.
7. If LPG gas detected then according to that buzzer will play and alert message will get sent to user through GSM. Same case with water level detector sensor.

5 APPLICATIONS

- Home Security systems

- Apartment
- Lockers in banks

6 MERITS

- This project provides security.
- Face detection.
- False matches inform to user.
- Password is given to authorized person.
- Home security and monitoring will be easy.
- Power consumption is less.

7 LIMITATIONS

- If you forget the password it is not possible to open the door.
- The efficiency and memory of the microcontroller can be increased if Philips microcontroller is used in place of AT89C51

8 CONCLUSION

The face detection system can combine the advantages of several biometric and result in producing higher recognition accuracy. Limitations of individual biometrics can be reduced to some extent by combining biometrics. This can be used for identification purposes.

The future enhancements to this system can be made by using algorithms that will reduce the computational time. If the task to be completed by the algorithm can be run in less time, the overall computational time can be reduced. The use of multiple passwords generally will increase the calculating time. The choice of algorithms in such a case would determine the overall efficiency of system.

Using 8051 microcontroller operation of the project performing will be easy. With the help of LPG, PIR and optoisolator sensor, it is easy to control the home and make it secure.

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