“DEVELOPMENT OF INTELLIGENT SECURITY AND AUTOMATION SYSTEM”

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ABSTRACT — Intelligent security and Automation system is a device that intends to solve the security issues and also provides automation facilities. the two aspects of security and automation are distinguished by a selector switch. the goal is to develop an intelligent security & automation system that gives the user complete security and automation services. this system can work in two modes as indoor mode and outdoor mode. in outdoor mode it provides complete security of the user place and in indoor mode, it provides user help and automation services. in indoor mode, it helps user as energy consumption indicator, light and temperature controller, home appliances controller, automatic door bell indicator etc.

Index Terms — Architecture, GSM, Indoor and Outdoor unit.

I. INTRODUCTION

With the advent of modern technology, the days of wired system have come to an end and installing a hard-wired do it yourself home security system is a wonderful way to rest easier at outside or on vacation. it is the least complicated security device that made the home security a lot easier. moreover its installation as well as its operation is relatively easier and faster. as technology keep developing, home security system also affected. gsm technology applied with security system to adopt with standard of living nowadays. gsm technology offered few advantages that enhanced performance of security and automation system. home owner able to be alerted in real time as intrusion occur through sms and calls. besides, gsm technology produces low power consumption. one system for all purposes by integrating several other systems in our security and automation systems like lamp sensors, motion sensor, temperature sensors etc. you will get a complete one in all security and automation system that alerts you in any emergency. nowadays, wireless monitoring for home security is among the cutting-edge researches in the field of international intelligent home security. to implement remote-time surveillance of the home security, the intelligent remote monitoring system was developed for home security based on gsm technology.

Intelligent security and automation system can provide safety, convenience, efficiency and entertainment for life in the 21 century. in this system, we focus on the intruder detection of the security system, and use intelligent security technique to guard the safety for life and wealth in the intelligent building. we propose an adaptive fusion method for intruder detection and uses pir sensors to detect intruder. in the intruder detection, we program the same scenario to detect the intruder. the intelligent security system transmits the message of detection information to the user using gsm modem and transmits the detection information to prefixed mobile numbers. home automation (ha) is quite a broad area and therefore has a variety of uses. some areas are very important and can greatly improve the quality of life for individuals, whilst other aspects of ha are used for convenience rather than an essential item. starting off with the more essential aspect of ha are security aspects. often times crime happens when no one is around to notice and the crooks are long gone by the time anyone does.

now a day’s so many security system and automation system are available separately in the market. in this era of marketing and advertisement the products of good performance with attractive offers are available except the security one they are costlier and less attractive to attract the peoples. the peoples often think that why they spend this amount of money for either their security or for their automation services as they think that they are secure and don’t need any security or automation system. but the complete package of automation and security system turns out to be more useful and efficient. now this system will be of dual purpose for the user and attract them to purchase this due to almost similar cost as of separate security or automation one. the idea behind designing this project is to motivate people for buying security system for their home/offices, which is very essential in today’s scenario of cities.

this system will reduce human efforts for their security and small works of daily life like turning on/off lights, fans etc. if you are using this system then there is no need to take or read electricity meter readings for billing. this system will automatically send you the electricity meter readings on a few prefixed mobile numbers. these numbers can be of electricity board office, your mobile number and also other one in your home. the system uses the gsm modem operation for this. the duration of sending energy meter readings e.g. one month or week can be fixed according to your need during programming of microcontroller and it can be changed easily by returning the changed duration code in microcontroller. this concept of energy meter data acquisition can be used electricity
board for taking reading at the end of month from user modem number by receiving an sms instead of going user’s door to door. this will reduce time, money and also any human errors in electricity bills.

often we are inside the home and forget to lock the door; this system will automatically buzzer alarm on any entry. it will confirm security in indoor mode. this application of this system is very useful in offices, banks, libraries, museums, jewelry shops where important files, documents, costly things are of prime importance.

another feature of this system is automatic on/off of fans and lights based on advance sensors, the system will automatically turns off fan below a fixed bearable temperature and vice versa. this feature saves energy. this concept is very effective in rainy season, season changing months and night time where temperature variation seen more commonly. during this duration the temperature varies on every hour of time. similarly the system will automatically turns on light on presence of any one inside the room and turns off light on absence of anyone. this feature also saves energy and reduces the person’s headache of switch on/off. this concept is very effective inside houses having large no. of rooms.

we can also insert some other enhanced features which provide much enhanced security & automation. we can make use of 3g system services for video data transmission for exact security information. but due to unavailability of 3g network everywhere in present time, this could not be made possible in this project. also the 3g systems increase the cost of the system, so that we want to use another technique for this. the one of the proposed solution for this is, if internet connection is available at user place then internet modem can be interfaced with microcontroller for video data transmission with very much reduced cost and user can receive security video message by an advance receiver like mobile phone or computer system.

at rural places where both 3g network and internet connections are not available, a cctv camera can be interfaced with microcontroller as a real time event recorder.

we can also make use of multiple ports interfacing property of microcontroller to interface other useful sensors like fire and smoke sensor, lpg gas sensor, glass break sensors etc. and we will get a complete one in all alarm system that alerts you in any emergency.

the choice of interfacing sensors may depend on your need and budget.

thus this project can surely give birth to new industry of security and automation devices like mobile phone and other electronic gadget industries. if this could be made possible to fabricate this system as single unit at nano scale level, then this could be a very popular product and can be seen in every building.

II. CONNECTION DIAGRAM

![Connection Diagram]

III. PRINCIPLE INVOLVED

The protocol used by gsm modems for setup and control is based on the hayes at-command set. The gsm modem specific commands are adapted to the services offered by a gsm modem such as: text messaging, calling a given phone number, deleting memory locations etc.
Since the main objective for this application note is to show how to send and receive text messages, only a subset of the at-command set needs to be implemented. The European Telecommunication Standard Institute (ETSI) GSM 07.05 defines the at-command interface for GSM compatible modems. From this document some selected commands are chosen, and presented briefly in this section. This command subset will enable the modem to send and receive SMS messages.

**IV. Microcontroller Architecture.**

![Microcontroller Architecture Diagram]

The architecture of a typical microcontroller is complex and may include the following:

1. A CPU, ranging from simple 4-bit to complex 64-bit processors.
2. Peripherals such as timers, event counters and watchdog.
3. RAM (volatile memory) for data storage. The data is stored in the form of registers, and the general-purpose registers store information that interacts with the arithmetic logical unit (ALU).
4. ROM, EPROM, EEPROM or flash memory for program and operating parameter storage.
5. Programming capabilities.
6. Serial input/output such as serial ports.
7. A clock generator for resonator, quartz timing crystal or RC circuit.
10. Data bus to carry information.

**IV. Microcontroller and Microcontroller Features**

1) **High-Performance RISC CPU**

1. Lead-free; Ro HS-compliant
2. Operating speed: 20 MHz, 200 ns instruction cycle
3. Operating voltage: 4.0-5.5V
4. Industrial temperature range (-40° to +85°C)
5. 15 Interrupt Sources
6. 35 single-word instructions
7. All single-cycle instructions except for program branches (two-cycle)

2) **Special Microcontroller Features**

1. Flash Memory: 14.3 Kbytes (8192 words)
2. Data SRAM: 368 bytes
3. Data EEPROM: 256 bytes
4. Self-reprogrammable under software control
5. In-Circuit Serial Programming via two pins (5V)
6. Watchdog Timer with on-chip RC oscillator
7. Programmable code protection
8. Power-saving Sleep mode
9. Selectable oscillator options
10. In-Circuit Debug via two pins

3) **Peripheral Features**

1. 33 I/O pins; 5 I/O ports
2. Timer0: 8-bit timer/counter with 8-bit pre-scaler
3. Timer1: 16-bit timer/counter with pre scalar
   - Can be incremented during Sleep via external crystal/clock
4. Timer2: 8-bit timer/counter with 8-bit period register, pre scalar and post scalar
5. Two Capture, Compare, PWM modules
   - 16-bit Capture input; max resolution 12.5 ns
   - 16-bit Compare; max resolution 200 ns
   - 10-bit PWM
6. Synchronous Serial Port with two modes:
   - SPI Master
   - I2C Master and Slave
7. USART/SCI with 9-bit address detection
8. Parallel Slave Port (PSP)
   - 8 bits wide with external RD, WR and CS controls

**Analog Features**

1. 10-bit, 8-channel A/D Converter
2. Brown-Out Reset
3. Analog Comparator module
   - 2 analog comparators
   - Programmable on-chip voltage reference module
   - Programmable input multiplexing from device inputs and internal VREF
   - Comparator outputs are externally accessible

**V. WORKING**

Intelligent security and automation system works in two modes as indoor mode and outdoor mode. In outdoor mode it provides complete security of the user place and in indoor mode it provides automation services. This system works according to user’s choice of mode by means of mode selector relay. If user is going away from home then he should select outdoor mode of operation for security of his home. If user is inside his home then he should keep this system in indoor mode for automation services based on PIR sensors and microcontroller.

**Intelligent security and automation system**

The detail working of this system in these two modes are explained below-

1. **Outdoor mode**

   If your home is left empty for a large part of the day because you are at work then you select outdoor mode for security of your home. In this mode system uses the PIR sensors to detect the intruder’s motion on main door of the home. Apparent motion is detected when an infrared source with one temperature, such as a human passes in front of an infrared source with another temperature, such as a wall. This is not to say that the sensor detects the heat from the object passing in front of it but that the object breaks the field which the sensor has determined as the "normal" state. Any object, even one exactly the same temperature as the surrounding objects will cause the PIR to activate if it moves in the field of the sensors. All objects above absolute zero emit energy in the form of radiation. Usually infrared radiation is invisible to the human eye but can be detected by electronic devices designed for such a purpose.

   This PIR sensor is interfaced with microcontroller (PIC16F877A), which is programmed in assembly instructions sets to associate with GSM modem device.

   The PIC16F877A CMOS FLASH-based 8-bit microcontroller is upward compatible with the PIC16C5x, PIC12Cxxx 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) converter, 2 capture/compare/PWM functions, a synchronous serial port that can be configured as either 3-wire SPI or 2-wire I2C bus, a USART, and a Parallel Slave Port.RS232 is used for interfacing with GSM MODEM.

   A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phone. a GSM modem is connected to a microcontroller, this allows the microcontroller to use the GSM modem to communicate over the prefixed mobile numbers.
On the detection of intruders by PIR sensor, the microcontroller enables the GSM modem to send security SMS and call to the prefixed mobile numbers. This gives the instant information of burglar activities to the user. Now the user can instantly respond to his home security.

(2) Indoor mode

If you are inside the home, then you have to put your system in indoor mode to take the benefit of automation services. In this mode it helps user as automatic appliances controller like fans, lamps etc. The PIR sensor senses the presence of human inside the room and makes the light on/off. If anyone enters inside the room, sensor detects his/her presence and the controller sends the light turn on instructions.

The temperature sensor (LM35) monitors the predefined temperature (e.g. ambient temp.) of the room and communicates with microcontroller to make on/off the fan/AC inside the room to maintain the bearable temperature. Suppose that prefixed room temperature is 30°C if room temperature overcomes this temperature, the controller will automatic turns on the fan/AC. on the other hand if room temperature is below this prefixed temperature, the controller will automatically turn off fans/ac.

The energy meter measures the energy consumption units of home appliances. By using the GSM modem functionality of SMS sending, it will send energy consumption units after prefixed duration to the prefixed mobile numbers of user, electricity board etc.

In this mode, this system also provides internal security to the user. The PIR sensor of main door will automatically ring the door bell by sensing the any entry inside the home. Suppose you are inside kitchen room or drawing room, then system will ring buzzer on and indicate you to your security.

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