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Real Time Home Automation with Security using PIC Microcontroller

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ABSTRACT: With advancement of technology things are becoming simpler and easier for us. Automation is the use of control systems and information technologies to reduce the need for human work in the production of goods and services. In the scope of industrialization, automation is a step beyond mechanization. Whereas mechanization provided human operators with machinery to assist them with the muscular requirements of work, automation greatly decreases the need for human sensory and mental requirements as well. Automation plays an increasingly important role in the world economy and in daily experience. Automatic systems are being preferred over manual system. Through this project we have tried to show automatic control of a house as a result of which power is saved to some extent. The GSM module is used to communicate with the owner of the home whenever the sensor senses a fault, a specific message is sent to the owner in order to take a necessary action.

KEYWORDS: Opto isolator, PICMicrocontroller, Smart home automation

I. INTRODUCTION

Home/office automation is the control of any or all electrical devices in our home or office, whether we are there or away. Home/office automation is one of the most exciting developments in technology for the home that has come along in decades. There are hundreds of products available today that allow us control over the devices automatically, either by remote control; or even by voice command.

II. LITERATURE SURVEY

The concept of home automation has been around since the late 1970s. But with the advancement of technology and services, people's expectations of what a home should do or how the services should be provided and accessed at home has changed a lot during the course of time, and so has the idea of home automation systems. If we look at different home automation systems over time, they have always tried to provide efficient, convenient, and safe ways for home inhabitants to access their homes. Irrespective of the change in user expectations, advancement of technology, or change of time, the role of a home automation system has remained the same.

The work of John J. Greichen discussed some of the early challenges faced by home automation systems. These include high manufacturing costs, high development costs, high installation costs, additional service and support costs, lack of home automation standards, consumer unfamiliarity with technology, and complex user interfaces. With the advancement of time, we saw a rapid development in technology and processing power which leads to a considerable reduction in device cost and size. All of these factors have contributed to the popularity of electronic



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devices today, so people are no longer confused or unsure about the use of computer, mobiles, or tablets. Moreover, a lot of home automation protocols, communication and interface standards like were defined overtime.

III. DEVELOPMENT OF HOME AUTOMATION

Home automation (also called domotics) is the residential extension of "building automation". It is automation of the home, housework or household activity. Home automation may include centralized control of lighting, HVAC (heating, ventilation and air conditioning), appliances, and other systems, to provide improved convenience, comfort, energy efficiency and security. Disabled can provide increased quality of life for persons who might otherwise require caregivers or institutional care.

A home automation system integrates electrical devices in a house with each other. The techniques employed in home automation include those in building automation as well as the control of domestic activities, such as home entertainment systems, houseplant and yard watering, pet feeding, changing the ambiance "scenes" for different events (such as dinners or parties), and the use of domestic robots. Devices may be connected through a computer network to allow control by a personal computer, and may allow remote access from the internet.

IV. NEED FOR HOME AUTOMATION

Earlier, we looked into the face of future when we talked about automated devices, which could do anything on instigation of a controller, but today it has become a reality.

An automated device can replace good amount of human working force, moreover humans are more prone to errors and in intensive conditions the probability of error increases whereas, an automated device can work with diligence, versatility and with almost zero error.

- Replacing human operators in tasks that involve hard physical or monotonous work.
- Replacing humans in tasks done in dangerous environments (i.e. fire, space, volcanoes, nuclear facilities, underwater, etc).
- Performing tasks that are beyond human capabilities of size, weight, speed, endurance, etc.
- Economy improvement. Automation may improve in economy of enterprises, society or most of humankind. For example, when an enterprise that has invested in automation technology recovers its investment, or when a state or country increases its income due to automation like Germany or Japan in the 20th Century

V. PROPOSED SYSTEM

There are many sensors we have used in this system (like temperature sensor, motion sensor, etc) . In order to make home energy efficient we also paid attention on home devices like fans and lights. The heart of this system is a PIC16F877A microcontroller which is controlling home devices. If the thermometer feels an increase in room temperature then an electrical signal is sent to microcontroller, the microcontroller takes a necessary action like turn the fan on which work as air-conditioning. In case, there is a smoke in home smoke sensor detects the smoke then send a signal to microcontroller to turn the extractor on, to take out the smoke from home. In case, the owner away from home, he turns the motion sensor on. In order to detect the motion inside home while he away from home. If it detects a motion then send a signal to the microcontroller and microcontroller send a specific SMS message to the owner through GSM module. In order to take a necessary action like call the police station.

VI. HARDWARE DESIGN AND DEVELOPMENT

Figure 1 illustrates a block diagram of the planned smart home and security system design with its hardware components involved and connections. The main components are: Microcontroller (PIC), GSM, power supply.



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1) **PIC 16F877A:**The 16F877A is one of the most popular PIC microcontrollers and it's easy to see why - it comes in a 40 pin DIP pinout and it has many internal peripherals. The only disadvantage that you could level at it is that it does not have an internal clock source like most of the other more modern PIC's. The 16F877A is a capable microcontroller that can do many tasks because it has a large enough programming memory (large in terms of sensor and control projects) 8k words and 368 Bytes of RAM.

2) This powerful (200 nanosecond instruction execution) yet easy-to-program (only 35 single word instructions) CMOS FLASH-based 8-bit microcontroller packs Microchip's powerful PIC® architecture into an 40- or 44-pin package and is upwards compatible with the PIC16C5X, PIC12CXXX and PIC16C7X devices. The PIC16F877A features 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, the synchronous serial port can be configured as either 3-wire Serial Peripheral Interface (SPI™) or the 2-wire Inter-Integrated Circuit (I²C™) bus and a Universal Asynchronous Receiver Transmitter (USART). All of these features make it ideal for more advanced level A/D applications in automotive, industrial, appliances and consumer applications.

3) **GSM Module SIM:** This device is used to communicate home with the owner through SMS "Short Message Service". GSM is a new technology that use mobile network to send and receive SMS. It accepts a SIM card and operates in mobile network. We used in this project SIM 900 which has many features. It is a module that works on different frequencies like 850 MHz, 900 MHz, 1800 MHz and 1900 MHz. It can be directly connected to PC Serial port and interfaced with PIC microcontroller.

4) **Temperature Sensing Sensor:**This circuit monitors real time temperature data from one room continuously to keep the room temperature at the desired level. The room has its setting temperature. Above this setting value, the microcontroller sends message to the user's mobile phone that the temperature is high through GSM in the same time microcontroller turns the air-condition on to restore the room temperature.

5) **IR Sensor:**

IR sensor allows sensing the entry of a person to a room/living area, so that light of the same can be turned on/off automatically.

6) **Smoke Detection Sensor:**This circuit has been used to detect smoke in case of fire in the corresponding room. In our project, we designed our own smoke detector circuit instead of buying smoke sensor for reducing cost purpose. With the advantage of electronics, we use a phototransistor and resistances as smoke sensor to detect the smoke in home; the circuit diagram is indicated in figure 4. If there is a smoke in home the detector will sense it and send signal to the microcontroller to turn the extractor on in order to take smoke out of home, furthermore, it sends a message for the owner's mobile phone number through the GSM module in order to take necessary decision.

7) **Motion Detector Circuit (PIR Sensor):**PIR sensors allow you to sense motion usually used to detect whether a human has moved in or out of the sensors range. They are often referred to as PIR, "Passive Infrared", "Pyroelectric", or "IR motion" sensors PIRs are basically made of a pyro electric sensor, which can detect levels of infrared radiation. PIR sensor detects the motion inside home if there is any motion in its range. The signal is sent to microcontroller which has two actions, the first one is to send SMS message to the owner and the other is to turn the light on.

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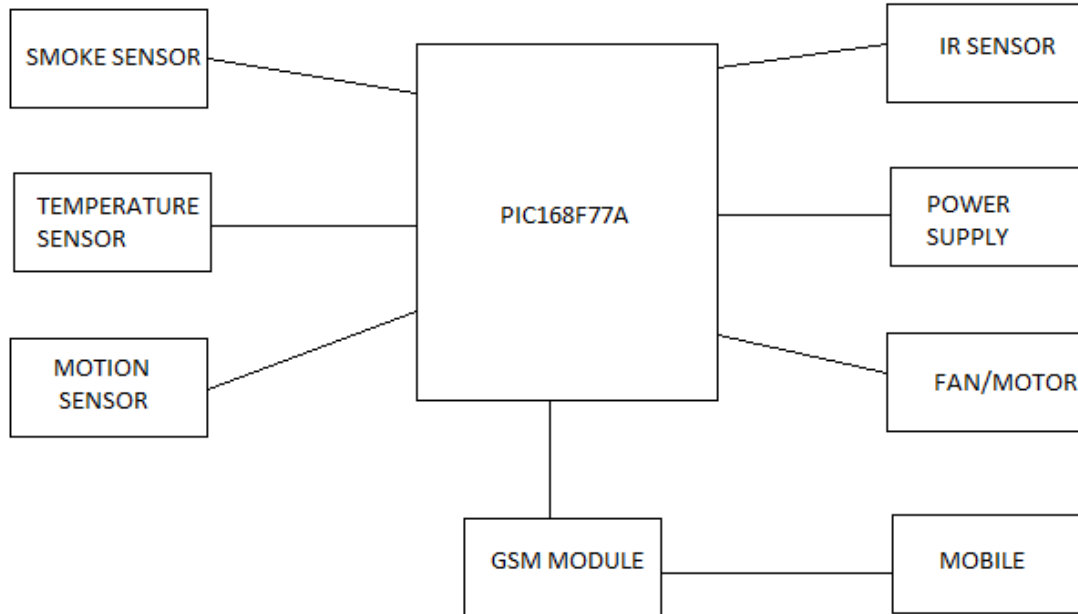


Fig 1: Block diagram of PIC Microcontroller

VII. CONCLUSION

In this paper, we have proposed a working protocol of PIC Technology based low cost, flexible and Bluetooth based solution to home automation for current and future smart home implementation. The system will facilitate users to pair any sort of Android devices with Bluetooth Sensor integrated on board to pair and control the Lights of the room.

The system is well tested and wireless communication ranges from 10-30m and the app titled "Smt Home Control" is being developed by us and very simple to operate and use providing flexibility and rich GUI interface to the users

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