

Advanced Home Automation and Monitoring System

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Abstract—In this paper an advance home automation and monitoring system is proposed which operates in three different mode, such as fully automated mode, normal mode and monitoring mode. In each mode different devices are operated and monitored with the help of a controller board. A message is sent to user with the help of a GSM module in abnormal conditions such as changes occurred while monitoring fire and monitoring gas. The functionality of the automation system depends on the mode of operation it is using. An emergency push button is used to make an emergency call to the user which is operated manually. These modes can be changed through password verification.

Index Terms—Global System for Mobile (GSM), Automated mode, Normal mode, Monitoring mode.

I. INTRODUCTION

Home automation is a process of improving the quality of resident's life. It is even more important to reduce the energy consumption. This reduction in energy consumption can be achieved through home automation in the household purpose. In this paper the home automation is operated in three different [2] modes as fully automated, normal and monitoring modes. These modes have control on the features such as fire monitoring, gas monitoring, temperature display, presence of humans, water level indication. When a person enters the room the light and fan are operated automatically. The fire, gas and water are monitored continuously and if there is any change above the threshold value an alert message is sent to the user through GSM module. An emergency button is used in the abnormal conditions to send an alert message to the user manually [1]. The three different modes have different functionality such as in automatic mode when a person is detect the lights and fan are turned on and the display of status of the appliance is shown and the status of the fire, gas and water monitoring is shown to the person and remote access is allowed. In the normal mode, when the person is detected in the room the status of the appliances is displayed to the person and the access to the appliances manually is allowed and remote access is allowed. In the monitoring mode when the person is detected, a message is sent to the user[4], the status of the fire, gas and water monitoring is displayed, and manual accesses to the appliances is allowed and remotely appliances can be controlled[3]. Here the modes can be

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changed from one to other through password verification [5].

II. HARDWARE COMPONENTS

In this system the following hardware components are used

1. ARM7 TDMI-S LPC2129 controller.
2. DC power supply unit
3. 16×2 LCD
4. Temperature sensor LM 35
5. LDR sensor OPT 101
6. GSM module
7. Relays
8. Gas sensor (MQ 135)
9. Water level float sensor
10. PIR sensor

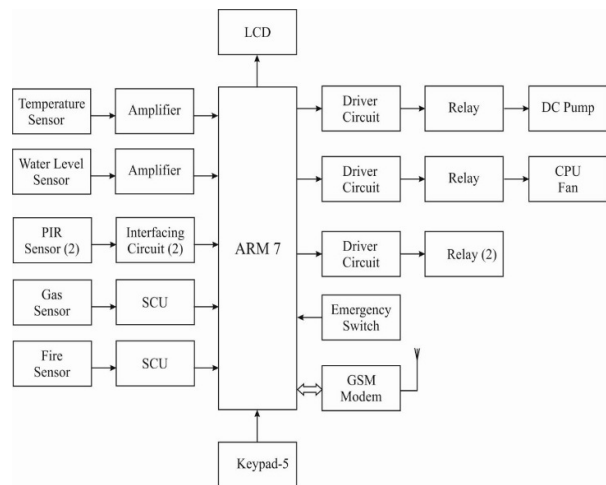


Figure.1 Block diagram of the system

A. Control unit

ARM7 TDMI-S LPC2129 controller acts as a control unit in this system. As in the above block diagram every sensor is connected to the controller and the values of the sensors are monitored by the controller. The specifications of the controller are as follows.

- 16/32-bit ARM7TDMI-S microcontroller in a tinyLQFP64 package.
- 16KB on-chip static RAM.
- 128/256KB on-chip flash program memory.
- 128bit wide interface/ accelerator enable high speed 60MHz operation.
- External 8, 16 or 32 bit bus.

- Two/four interconnected CAN interfaces with advanced acceptance filters.
- Flash programming takes 1 ms per 512 byte line.
- Single sector or full chip erase takes 400ms.
- 4/8 channel (64/144 pin package) 10 bit A/D converter with conversion time as low as 2.44ms.
- In-System Programming (ISP) and In-Application Programming (IAP) via on-chip boot-load software.
- Dual Power Supply.

B. PIR Sensor

A passive infrared sensor is used to detect the movement of the humans in this system. PIR sensors are used as proximity sensor. Here in the system the presence of human is detected using the PIR sensor. The features of the PIR sensor are given below

- Complete, fully functional motion detection.
- Wide 5 m x 5 m, 60 degree detection pattern.
- Sensitivity control via simple hardware configuration.
- SLEEP mode for low power applications.
- No temperature compensation required.
- Operates from 2.7 V to 3.6 V power supply.
- Simple 8-pin interface.

C. Temperature and Light sensor

In this system a light sensor is used to calculate the intensity of light in the room and the acquired intensity is converted from analog to digital and passed to the controller. Here when the presence of human is detected by the PIR sensor the intensity of the light in the room is calculated and the 'on' and 'off' of the light depends on the acquired value. Similarly the temperature values are calculated by the temperature sensor and are converted from analog to digital and those digital values are passed to the controller. Here the 'on' and 'off' of the fan depends on the values obtained from the temperature sensor.

D. Relay

In this system a relay is used as an electric switch that uses electromagnet to move the switch from 'off' to 'on' position. It takes a very small amount of power to turn on the relay. These relays are used to switch "on" and "off" the appliances like light, fan, GSM module, etc.

E. Gas sensor

This sensor is used to detect the content of the gasses like LPG, methane, hydrogen and smoke in the air. If the presence of any of this gas is detected beyond the threshold value the controller will send a message to the user through the GSM module. The features of the gas sensor are as follows.

- Wide detecting scope.
- Stable and long life.
- Fast response and High sensitivity.

F. Liquid level float sensor

Float Sensor is an electrical ON/OFF Switch, which operates automatically when liquid level goes up or down with respect to specified level. The Signal thus available

from the Float Sensor can be utilized for control of a Motor Pump.

G. GSM module

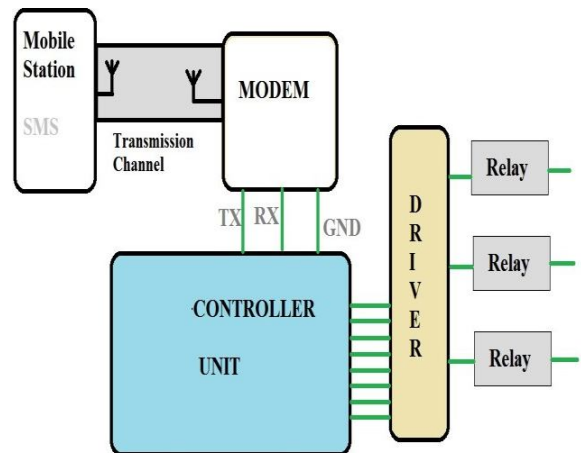


Figure.2 Block diagram of GSM module

A GSM module is used to send the messages to the user in this system. When any abnormalities are observed by the sensors then the controller passes the values from the sensors to the GSM module and they are transferred to the user through a message. The GSM module is controlled by controller board through the 'AT' commands. The features of the GSM module are given below.

- Single supply voltage 3.2V to 4.5V.
- MT, MO, CB, text and PDU mode, SMS storage: SIM card.
- SIM300 tri-band.
Supported SIM Card: 1.8V, 3V.

III. WORKING OF THE AUTOMATION SYSTEM

The working of the home automation is mainly depends on the following three modes.

- Automated mode
- Normal mode
- Monitoring mode

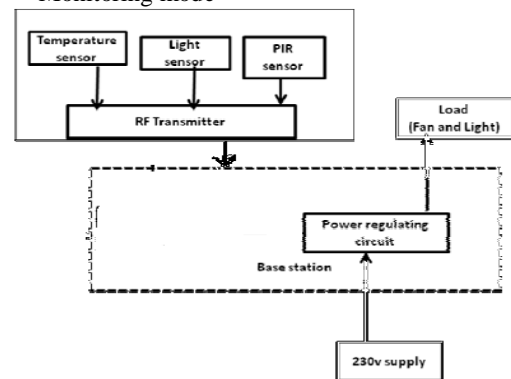


Figure.3 Block diagram of control unit

A. Full Automated mode

In this mode the system is controlled by the controller without any human interference. The temperature and the gas sensors are used to monitor the fire and gas alerts. When there is a change in these values above the threshold value a

message is sent to the user using the GSM module. And when a person is detected by the PIR sensor the values of the LDR sensor and the temperature sensor is considered and the 'on' and 'off' of the light and fan depends on these sensors. The water flow can be monitored by using the float sensor. These appliances are made 'on' and 'off' using the relays.

Here in the automated mode the status of the appliances is displayed to the user. And the user can remotely accesses the appliances. And when an emergency button is pushed an interrupt arises and an emergency message is sent to the user.

B. Normal mode

In this mode the system is controlled manually. When a person is detected by the system the status of the appliances is shown to the user and complete manual accesses is given to the user. Here when the values are above the threshold values an emergency message is sent to the user.

In emergency conditions when an emergency button is pushed an interrupt occurs and a message is sent to the user through GSM module

C. Monitoring mode

In this mode when a person is detected a message is sent to the user as an alert. And the appliances can be manually operated in this mode. The fire and the gas monitoring is done continuously through the sensors and the remote access to the appliances can be made by the user.

In this design the system can change from one mode to the other mode through the password verification. When a user has to change from one mode to the other he have to give a correct password to the system

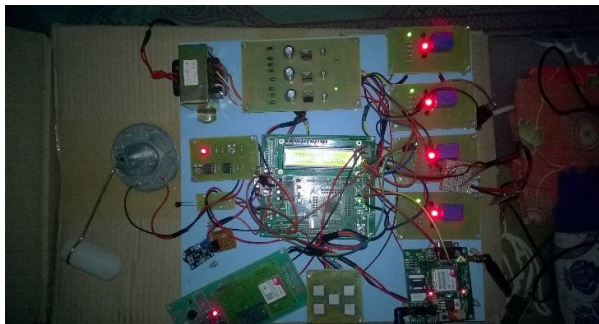


Figure. 4 Working model of the system

IV. RESULTS

The system can monitor the fire and gas conditions in the region. The appliances like fan, light and water level condition can be made 'on' and 'off' in all the three different modes of the system, and when there is an intruder or a value is above the threshold a message is sent to the user using the GSM module

V. CONCLUSION

The system can work in all the three modes and all the appliances can be made on and off using the relays according to the conditions.

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