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Environmental Aware RF Based Home Automation System

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Abstract : A home automation system integrates electrical devices in a house with each other. In this work, a system is developed to control the home appliances in accordance with the environmental parameter. The lighting and fan speed are controlled by the environmental parameters. Control of appliances is done through the RF transmitter for the short range. The power savings could be achieved based on the environmental variables.

Keywords : home automation system; PIC Microcontroller; Radio Frequency; smart home; environmental awareness.

INTRODUCTION

Home automation includes centralized control of lighting, appliances, and other systems, to provide improved convenience, comfort, energy efficiency and security. If the home appliances are controlled with respect to environment, the power savings could be achieved easily. Fig.1 shows the block diagram of the home automation system.

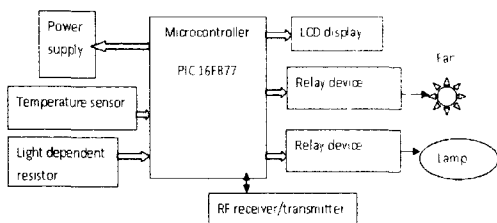


Fig. 1: Block diagram of home automation system

PROBLEM STATEMENT

All the home automation system introduced so far only controls the on/off feature of the home appliances. They are not intending to control the appliances with the environment.

OBJECTIVES

Designing the home automation system using the radio frequency operated relay switches to control the intensity of the lamp and the speed of fan, in accordance with the environmental variables such as brightness and temperature, which in turn reduces power consumption automatically.

BACKGROUND STUDY

J.A. Nazabal *et al.*, [1] developed a low cost home automation based sensor system for remote monitoring the behaviour of elder people at their own homes. H.Alshu *et al.*, [2] have reported the overall design of a wireless home automation system which has been built and implemented. The system presented in the article of M.A Zamora-Lzquiero *et al.* [3] considers user requirements, including novel advances, an integral home automation solution suitable for many services.

SYSTEM DESIGN

The Home Automation System which has temperature based fan speed controller and LDR based light intensity controller using PIC 16F877 is designed. The on/off control is done with the help of radio frequency waves. The dc power supply unit, transmitter section and the receiver section are designed and tested.

The home automation system consists of hardware and software section. The hardware is designed with the following requirements. First the environment is studied by the sensors. The temperature of the room is sensed by the temperature sensor LM35. The room brightness is sensed by the light dependent resistor. These two sensors are interfaced with the microcontroller PIC 16F877. These sensed variables are analysed by the microcontroller for different values such as normal, low and high. The normal value, high value and low values are transmitted by the RF IC to the receiver. At the receiving section, for high received value the speed of fan is high and intensity of light is low. For received low value, the speed of fan is low and the intensity of light is high. The normal speed and normal intensity is maintained for normal value received. The normal, high and low values are set by the user at the transmitter side. The software

is designed for receiving input from user, processing, comparing and transmitting the values.

DESIGNING THE HARDWARE AND SOFTWARE OF TRANSMITTER SECTION

The sensors which used to sense the environmental variables are interfaced with the microcontroller IC 89c52. The switches are interfaced with the microcontroller to receive the desired input temperature and brightness values from the user. The software is designed for processing different values such as normal, low and high. The normal value, high value and low value are transmitted by the RF IC to the receiver. Fig. 2 shows the transmitter section.

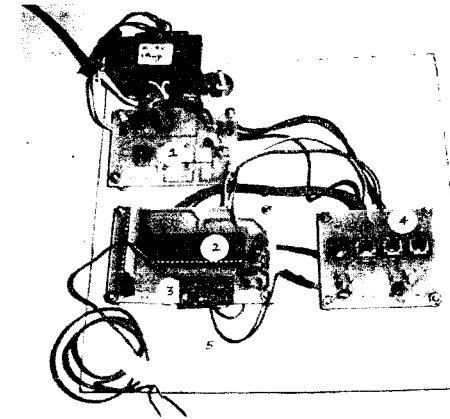


Fig. 2: Transmitter unit. 1. Power Supply Unit, 2. IC89C52 Microcontroller, 3. Antenna, 4. Switch section, 5. Transmitter

DESIGNING THE HARDWARE AND SOFTWARE OF RECEIVER

The hardware of the receiver section is designed to interface voltage variable regulator, relay devices to control home appliances such as fan, light etc., LCD, RF module to receive information from the transmitter. Fig.3 shows the receiver section.

WORKING PRINCIPLE

The home automation system is constructed along with the temperature based fan speed controller. The constructed set up consists of two divisions. First one is operating a buzzer or light and another switch which control the fan, where controlling the speed of fan is obtained through the IC LM 35.

When first switch is made ON, the lamp attached with the relay switch is made ON within 2-3 seconds and when the second switch is made ON, the fan is made to run. When the devices are made ON, the LCD display attached with the receiver

section displays 'ON'. Also when the temperature is increased by external means, the fan speed is the temperature sensor LM35, and the LCD displays 'HIGH' and when the temperature is decreased 'NORMAL'. In the same way, the fan speed is decrease in the room temperature and the LCD displays 'LOW'. The same principle is used to control light and the values are display at the LCD.

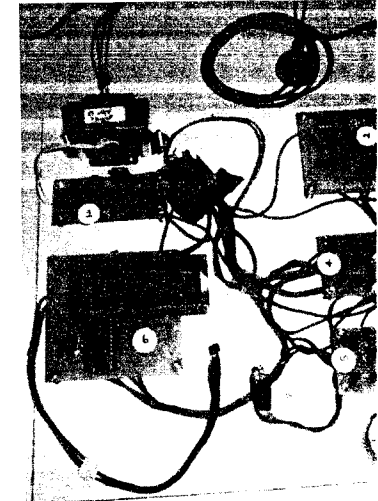


Fig. 3: Receiver unit. 1. Power Supply Unit Section 3. LM 317 Variable Voltage Regulator Device Two Fan Speed Controls 5. Relay Operated Lamp 6. IC PIC16F877 and LCD

CONCLUSION

The home automation system automates the environment and controls the appliances. The consumption is reduced by the system automation of appliances is done through the RF transmitter range. This system improves the quality of home automation system is constructed along with the fan speed controller and brightness controller.

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