

Home Power Saving using Heartbeat

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ABSTRACT

This System consists of the heartbeat sensor which detects a person heartbeat and according to the heartbeat turn on or off the appliances. I have designed this project with respect to a student and feeded the system with the heartbeat of a normal student. I also know that with age, heartbeat of a person decreases and in different condition and different way of sleeping the heartbeat differs. But in my project, I have only assumed a student or a normal person of age limit from 20 to 30 years. By comparing the standard heartbeat with the present heartbeat, the appliances are controlled according to the heartbeat of a person the AC appliances (bulb/light) start or stop working as follows
if heartbeat count is greater than 70: lights remain on.
if heartbeat count is less than 70: lights turn off.

But, in the real implementation, logic used is according to the fact that whenever a healthy person falls asleep, his heartbeat decreases by 15 beats per minute. So, programming the Microcontroller with a threshold of around 60 beats per minute will turn off the appliances except fan or AC may be whenever the heartbeat sensor senses the threshold falling to 60.

KEYWORDS: HEARTBEAT, MICROCONTROLLER, BLUETOOTH, PLETHYSMOGRAPHY

I. INTRODUCTION:

In today's world, most of the things in home equipment are manually driven which need a remote or buttons, so there is lots of wastage of electricity if we often leave the room without switching off the electrical appliances. Through this project I am trying to merge the use of embedded systems with the home electrical appliances. Today, every second new gadgets implement microcontroller in its system. A microcontroller essentially consists of I/O pins, timers and counter memory, analog to digital convertors on a single chip. With this single chip integrated circuit design of the microcontroller the size of control board is reduced and power consumption is low.

I.1. BACKGROUND OF STUDY

In the last 15 years, the entertainment equipment in homes were subject to radical changes. It went from a system with mostly analogical devices and media contents to a system mostly digital. Nowadays, songs, pictures, books, newspapers, and movies are available in digital formats. Television and radio shows are broadcast in digital formats as well. Often, all these media are also available over the Internet. A building automation system (BAS) is a large concept that regroups all the systems to control buildings environment. The first interest comes from large organization and it is mainly used in industrial buildings (offices, factories, laboratories, shopping centers,). However, they are also used now in recent houses as part of a home automation system. The lighting control system is also part of the BAS family. It is responsible of commanding when, where, and which lights are to be used. It can include (light and motion) sensors, switches, dimmers, clocks, motorized blinds, and controllers. Such a system offers a better management and control of the

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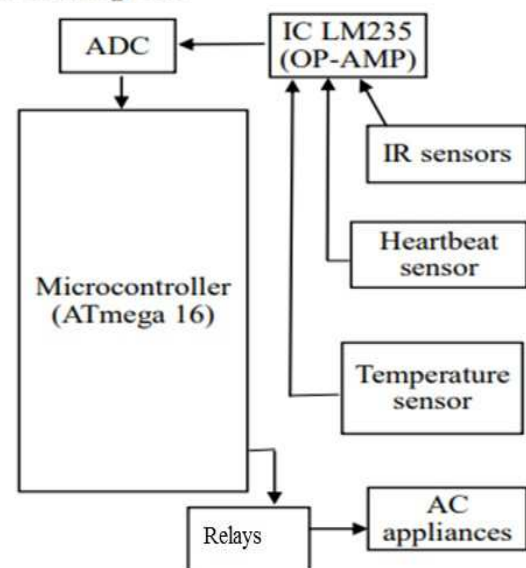
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different lights. Additionally, it usually proposes new functionalities. Finally, it helps controlling the energy consumption of the building.

II. BLOCK DIAGRAM

Block diagram –



As we can see in the block diagram it consists of a microcontroller ATMEGA 328 along with three sensors firstly the heartbeat sensor, secondly the temperature sensor and thirdly the IR module. These all sensors are connected with the operational amplifier which determine when a high signal and when a low signal should be given to the microcontroller on coming in contact with an input.

Along with the operational amplifier an ADC is connected to the microcontroller whose input is given by the op-amp and out of the ADC is fed to the microcontroller because we know that the controller accepts digital values only.

The microcontroller is connected with the relay by which the output is seen. The relay connects the controller with the AC appliances like Fans, lights, Air conditioner etc. When a signal is fed through the sensors the microcontroller takes the decision and simultaneously switch on and off the AC appliances connected to it.

The microcontroller is powered by a 5V supply which is regulated and step down by using transformer, rectifier and voltage regulator.

III. WORKING

By my project Home Power Saving Using Heartbeat I am using three parameters of the home to control the appliances. I am using the IR module in order to switch on and off the appliances if any one enters the room. Secondly, I am using the temperature sensor LM35 to detect the temperature and accordingly increase or decrease the fan speed. And thirdly the heartbeat sensor which we use to switch the appliances when a person went to sleep unintentionally.

The working of my project starts with the use of the sensors that is heartbeat sensor, temperature sensor and the IR sensor which are interfaced to microcontroller and connected to the home appliances with the relay. Our project/model consists of one light/bulb, two fans, two doors with IR sensors to detect the person entering or leaving, an LCD which shows us the status of all the sensors and the parameters and the count of members in the room.

When a person enters the room the IR module detects the person entering and increases the count by one and turn on the lights and fan of the room, at the same time if person exit the room the count decreases by one and the lights are turned off. I have kept the maximum count of the room equals to 10, that is if there is maximum strength present in the room then all the appliances will be on including 2 fans and a bulb. Along with this I have programmed the controller in such a way that if there are less than 5 people in the room the only one fan will operate and if more than 5 people are present the both the fans will operate. Not only this but if the temperature of the room is high then LM35 that is the temperature sensor detect the temperature and display it on the LCD and accordingly increase the speed of the fan, and if the temperature is low then the speed of fans is accordingly adjusted.



Figure 2

The speed of the fans is adjusted by using the microcontroller. The fans we use are actually DC motors. The same condition will be applied that is if number of person is less than 5 then only one fan will work and only that fan speed will be adjusted and if more than 5 person are present then both fan will work and both fans speed will be adjusted.

The most important feature which we have added in our system is the use of heartbeat sensor to control the appliances. We all know that when a person sleeps then the heartbeat of that person decreases. By using this phenomenon, we have used the heartbeat sensor in such a way that if the person heartbeat decreases below a specified value may be 70 then the lights and other AC appliances like TV, AC etc. will be turned off.

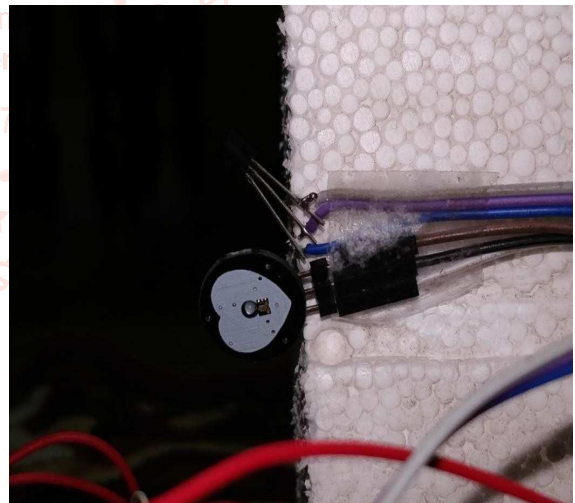


Figure-3



Figure-1



Figure 4

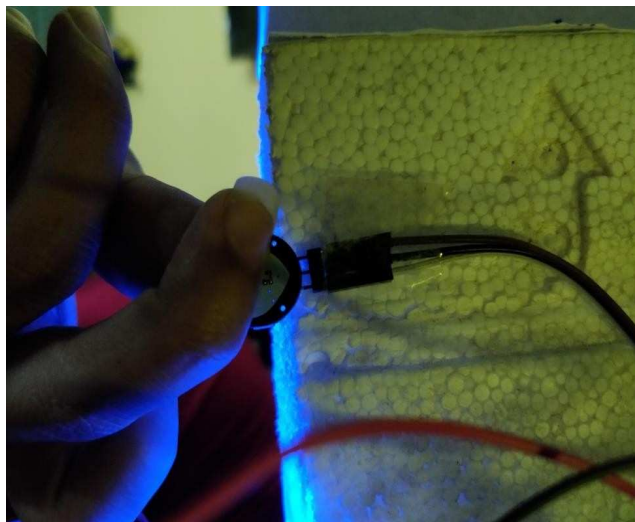


Figure-5 Using heartbeat sensor

IV. PERFORMANCE ANALYSIS

The IR sensor used in the project works in room light, if it is kept in sunlight then IR sensor starts working. To remove this effect, I had to calibrate the sensor by using variable resistor. Yet another factor affecting the project is the distance which the IR sensor can sense in the counter module at the door. The distance that the IR sensor can sense is less but we can increase the distance by using variable resistances. Instead of using IR sensor I could have used Ultrasonic sensor which can determine the object at different distance with different frequency but due to its high price and long coding ultrasonic sensor is difficult to interface hence I have used IR sensor. I could also have used PIR sensor in place of IR sensor, which would be placed inside the room in order to detect any movement in the room and work accordingly. But this sensor can be activated if any object or any animal come in line of sight of the sensor. Hence it was not used.

I am also using the heartbeat sensor which work on the principle of photo plethysmography. It measures the change in volume of blood through any organ of the body which causes a change in the light intensity through that organ (a vascular region). This causes problem of fluctuation of heartrate even when we are not measuring the heartbeat. This makes our project very fluctuating. To remove this fluctuation, I could use a more accurate heartrate monitor which will make my project better working and problem free.

LM35 is the temperature sensor I am using which detect the temperature change and send the temperature reading to the LCD to be monitored. This sensor can sense any warm body near it which can increase the surrounding temperature. Hence it should be kept in the place away from any warm object so that there is no fluctuation even when any warm object is introduced in the environment.

V. CONCLUSION

Home Power Saving Using Heartbeat is the project I have tried to implement.

What I can conclude from this thesis is that if this project entitled Home Power Saving Using Heartbeat is implemented on practical level then it will turn out be an effective method to eradicate the obvious energy crisis.

This project has proposed the idea of smart home that can support a lot of home automation systems. A smart home contains a connection between wireless communication, sensors, monitoring and tracking. Some sensors I am using are heartbeat sensor, IR sensor and temperature sensor.

In this project, an efficient approach for smart homes was proposed and implemented. Embedded C programming language and ATMEGA AVR microcontroller have been used to connect the sensor circuit to the home.

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