JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue

JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)

An International Scholarly Open Access, Peer-reviewed, Refereed Journal

Microcontroller Based Power Management System

1st Dr.Mamta Kurvey
Electronics & telecommunication
A.P. Shah Institute of technology
Thane, India
mpkurvey@apsit.edu.in

2nd Saloni Pradhan
Electronics & telecommunication
A.P. Shah Institute of technology
Thane, India
pradhansaloni71@gmail.com

3rd Nandini Sharma
Electronics & telecommunication
A.P. Shah Institute of technology
Thane, India
sharmanandini861@gmail.com

4th Samrudhi Kudtalkar
Electronics & telecommunication
A.P. Shah institute of technology
Thane, India
samrudhikudtalkar4@gmail.com

5th Asavari Kenjale
Electronics & telecommunication
A.P. Shah institute of technology
Thane, India
asavarikenjale221@gmail.com

***Abstract*—In today's world electricity has become a major part of everyone's life without which we cannot imagine to survive. Considering this we can take a few steps to save this crucial part of our life by designing a system which saves electricity due to its features of low power consumption. In this module, we have developed a power management system that can be controlled automatically with the help of sensors depending on the presence of people in the room. Also a website has been designed to show the display of the system. The Wi-Fi module is used to communicate between the microcontroller and the website. MSP430 microcontroller is used due to its low power consumption compared to PIC microcontroller and ARM microcontroller. It can be implemented in classrooms, offices and residential complexes. By using this module, we can efficiently make use of electricity.**

***Keywords*—MSP430, Wi-Fi Module, PIR, LDR, LM35, Light, Fan.**

I. INTRODUCTION

Electricity is at the heart of modern economies and it is providing a rising share of energy services. As power consumption is rapidly increasing, there is a need to conserve energy to save on utility bills and protect the environment. Moreover, wastage of power consumption occurs when the human being is not even present in the room. Automation is a term for technology applications where human input is minimized. This system principally works in 4 grids, when a person enters a grid the appliances like fan, and light switches ON accordingly to the surroundings of the room/grid. When there is no one present in the room the system switches OFF the appliances, hence reducing unnecessary power consumption.

In the research article, the author has developed Smart Home Automation and Security using MSP430 which focuses on creating low-cost home automation with the MSP430 microcontroller and Wi-Fi module. The system is proposed with the goal of conserving energy by using sensors to control the light and fan. [1].

In"Modern Multipurpose Security And Power Management System" the author has developed the idea of automatic detection of human. The Energy saving room architecture has been designed to reduce power consumption and make the room easily controllable with an IR remote control of a home appliance[2].

The author has proposed a solution for reducing power use and preventing electricity waste in "an Intelligent Energy Saving System for Classroom based on Pic microcontroller" . Institutions, classrooms, and shopping / business areas can all benefit from this system. The classroom is divided into grids, and the camera is positioned accordingly. As there is any human presence detected in a particular grid, the light and fan will switch ON for the same grid [3].

In "Low Cost Automation System for Smart Houses based on PIC Microcontrollers", the author employed two microcontrollers: a PIC16F877A for managing temperature and air pollution, and a PIC18F4550 for controlling lighting and human motion detection. The overall control unit consumes less energy and costs less money as a result of its approach [4].

An author has developed An IOT based Mechanism for Automatic Classroom Electricity Saving. IoT is being used as it is considered as the biggest frontier and which improves our life in many possible ways. This idea is being implemented using arduino uno and thermal sensors [5].

The researcher has developed an Energy Management System for Office/Home Automation. When a system should be ON for 24x7, then the life time of the battery reduces and the system becomes less durable and reliable. So, to overcome this problem, the author has used two systems. First: RTC will give a count of time and the system 1 will switch for every 2 hours to system 2 automatically and after 2 hours it will switch back to system 1 automatically. Second: Depending on the room temperature the fan is controlled[6].

II. Methodology

In this project we have designed a system with the perspective of low power consumption. We have used a Microcontroller MSP430F5529 which is a very low power consuming microcontroller. Sensors like PIR for human motion detection, LDR to determine the intensity of Light, Temperature Sensor LM35 to measure the Temperature of the room have been used which are interfaced with the microcontroller. Wi-Fi Module ESP8266 is being used for the communication between the microcontroller and the website to display the results. We have used a single sided PCB. Ferrous chloride solution has been used for the PCB etching process. The track has been developed on one side of the PCB and components have been mounted on the other side. We have used energia software to program the MSP430 microcontroller.

A. FLOW CHART

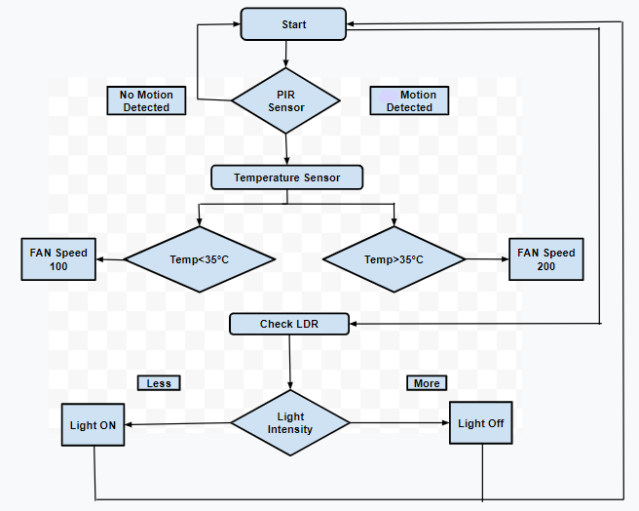

Fig 1. Flowchart of the System

This system can also be called an auto operated system as the working of fans and lights completely depend on the sensors. As shown in flowchart of fig.1 if the PIR sensor senses any human presence in any of the grid then the fan for that particular grid will start working otherwise it will be in OFF condition[1]. If Light outside the window is insufficient then only the bulb will glow otherwise it will be in OFF condition as shown in flowchart of Fig 1.

B. *Block Diagram*

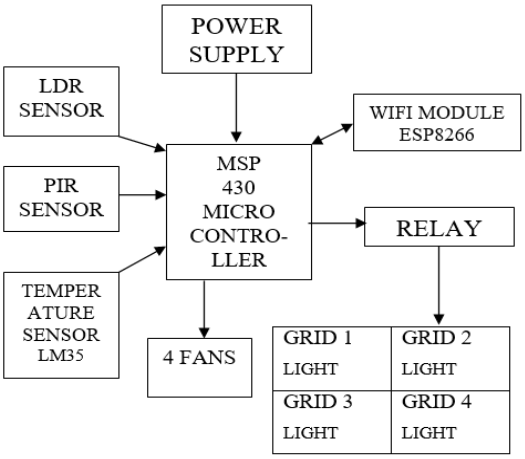

Fig 2. Block Diagram of Proposed System

C.Hardware Setup

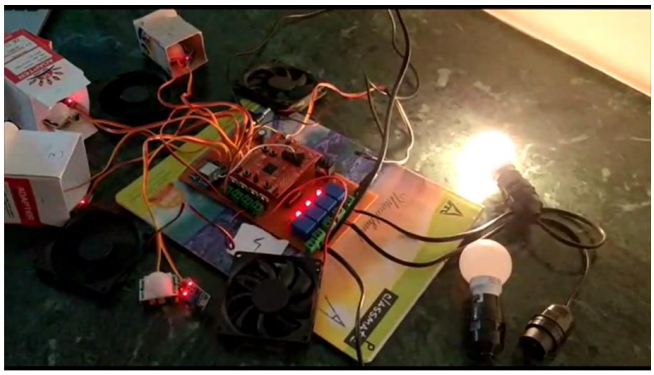

Fig 3. Hardware Of the Proposed System with the condition of presence of human in the room and light glow

We have divided the setup into four grids. Each grid contains one PIR sensor and one LDR sensor as shown in Fig 2. Only one temperature sensor is used as the temperature for the room is the same. When the PIR sensor in any of the grid senses any human presence, the fan will be switched on for the particular grid and if the temperature is below its threshold value that is 35°C then fan will run at normal speed but if the temperature crosses its threshold value, then fan will run at higher speed. On the basis of the intensity of the light present in the room, the bulb will get switched ON/OFF as shown in fig 3. The results of this working will be displayed on a website in tabular form as well as for a particular grid.

D. Software

Website has been created to show the results i.e. grid wise tabular format for displaying which appliances are ON/OFF and to show temperature of the room and motion detected as shown in Fig 4.

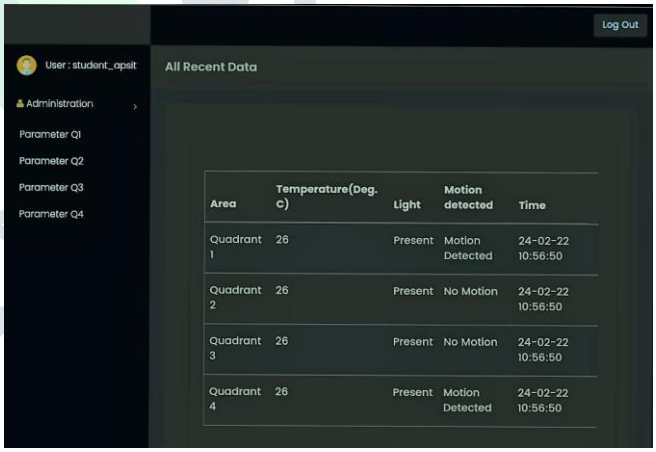

Fig 4. Website Showing Results For All Grids

.

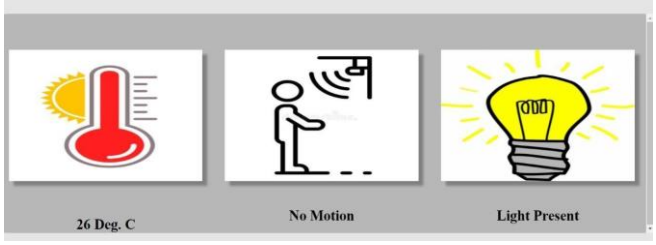

Fig 5a. Display Result of Grid 1

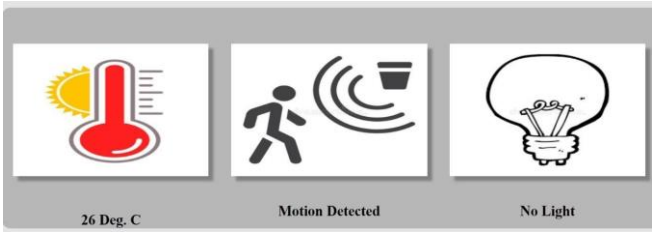

Fig 5b. Display Result of Grid 2

- If we want to see the result for a particular grid then also we can access it by clicking on a specific quadrant as shown in fig 4.
- If we click on to view status for a particular grid then three images will be displayed for temperature, motion detection and Light. The images that will be displayed will vary according to the status of the sensor as shown in fig 5a and fig 5b. The first image of 5a displaying the temperature of the room i.e 26°C. The second image shows that no human presence is detected by the PIR sensor. The third image shows that the bulb is glowing as there is no presence of light in the grid. The first image of 5b displaying the temperature of the room i.e 26°C. The second image shows that there is human presence which is detected by the PIR sensor. The third image shows that the bulb is not glowing as there is presence of light in the grid.

III. Results and Discussion

In the Below mentioned table the test results for the power management system are shown as the motion is detected for a grid and light is present the fan is in ON condition and Bulb is in OFF condition. When there is no motion detected and the light is not present then the fan is in OFF condition and the bulb is in ON condition as given in Table 1.

Table 1. Test result of the system.

PIR	***LDR***	***FAN***	***BULB***
Motion Detected	Light Present	ON	OFF
Motion Not Detected	Light Present	OFF	OFF
Motion Detected	Light Not Present	ON	ON
Motion Not Detected	Light Not Present	OFF	ON

IV. Conclusion

From the above results we can conclude that this designed power management system can be implemented in offices, classrooms and in residential complexes. We have used the MSP430 microcontroller due to its low power consumption compared to PIC microcontroller and ARM microcontroller. Electricity bills are reduced as the system turns off the appliances when no one is present in the room. When a person enters the room, the system turns the appliances ON based on sensor output. This is a huge convenience for the society, as you have complete control of household appliances, without any extra effort.

REFERENCES

[1] Nikita Meshram, Punam Mohite, and Pratiksha Nazirkar, “Smart Home Automation and Security using MSP430,”IRJET, vol.6, April 2019.

[2] Mohanaprakash, Sathya Dhanabal, “Modern Multipurpose Security And Power Management System", International Journal of Engineering Research and General Science Volume 3, Issue 2, March-April, 2015.

[3] Suresha Nayak K, Ashwin Kumar, “Intelligent Energy Saving System for Classroom Based on Pic Microcontroller”, Volume 3, Issue 5, May – 2018, International Journal of Innovative Science and Research Technology.

[4] Fathia Chekired, Smail Houtti, Constantinos Bouroussis, “Low Cost Automation System for Smart Houses based on PIC Microcontrollers” IEEE,August 2020.

[5] Kaustav Mani Pathak, Priyanka Jain, Swati Yadav, Veena Mittal , Prateek Jain, “An IOT based Mechanism for Automatic Classroom Electricity Saving,”IEEE, February 2019.

[6] Divyashree D A, B R Sujatha, “Energy Management System for Office/Home Automation”, International Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181 NCETESFT - 2020 Conference Proceedings

[7] Jai Krishna Mishra, Shreya Goyal, Vinay Anand Tikkiwal, Arun Kumar“An IoT Based Smart Energy Management System”,2018, ICCCA.

[8] Somnath Saha, Tushar Tyagi, Dhananjay V. Gadre, “ARM® Microcontroller based Automatic Power Factor Monitoring and Control System”, 2013 Texas Instruments India Educators' Conference.

[9] Himanshu Singh, Vishal Pallagani, Vedant Khandelwal and Venkanna U, “IoT based Smart Home Automation System using Sensor Node”, 4th Int’l Conf. on Recent Advances in Information Technology | RAIT-2018

[10] Matthew Simeon , Amuta Elizabeth , Wara S.TAnthony Adoghe, Orovwode Hope,”Efficient Energy Management System Using Pir Sensor ", 2018, IEEE.

[11] Mohammad Hanif , Nur Mohammad, Bijoy Harun”An Effective Combination Of Microcontroller And Plc For Home Automation System”, 2019, ICASERT .