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SMART POWER FLOW MONITORING AND CONTROLLING USING RASPBERRY PI

Mr.Abilash.S[2] , Mr.Ashok.K[3]
Dept of Electrical and Electronics Engineering,
SNS College of Engineering,Coimbatore,India

Asst.Professor Ms.S.Sharmila, Dept of Electrical and Electronics Engineering.,
SNS College of Engineering, Coimbatore, India [1].

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ABSTRACT— *With the ever growing demand for electrical energy across the world, we, as electrical engineers, are put in a state of responsibility to conserve the energy as Energy Saved is Energy Generated. In today's world, power saving is very important and difficult. Though there are many power generation methods, it has become very difficult due to insufficient resources. So saving of power is the need for our society. For that this work consists of monitoring the home appliances system through Wi-Fi based communication and also through the sensors. And the sensors used in it are PIR sensor, Temperature sensor LM35, LDR (Light Dependent Resistor). Based on the sensor detection it works. Our current scenario primarily depends on electrical inspectors to frequently check the home applicants. It also unwanted work, even the system working well. It intimates and updates the problem in internet by using Wi-Fi. However, this system should enable the sensor network and real time status reports. In the proposed system, the current, voltage and the power are measured and monitored continuously by a processor and the values will be sent to the webpage by the WI-FI system. Each individual can be monitored their current status whether they are in ON state or in OFF state and the values also been shown in the web page by the WI-FI where with the help of the IP address we can monitor in browser anywhere and by the usage of the PIR sensor if any human interference is detected means it will sent the signal to the other two sensors and based on the light intensity and temperature the home appliance will turn ON and turn OFF. In this proposed method the wastage of the electrical energy can be consumed.*

Keywords— Raspberry PI, WI-FI, Controlling, Monitoring, Sensor

1, INTRODUCTION

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1. INTRODUCTION

The Power Monitoring and Control System (PMCS) is a fully customizable/configurable, user friendly, integrated solution for reliable and accurate energy management. The system solution centralizes acquisition data, monitoring and controlling, disturbance recording and providing a virtual window into the system for analysis and reporting through an integrated network of metering and protection devices across a single or multiple facility locations are also parts of the process.

1.1 .1 Measurement

Measurement is one of the important concepts in Power system Automation. The real time information about equipment is collected and displayed in the mobile or personal computer and stored in a data base for further manipulations.

The information collected can assist in doing network studies like load flow analysis, planning ahead and preventing disturbances in the Power network. Previously the word 'Measurement' refer to voltage, current and power, and the word 'Metering' refer to power, reactive power and energy (KWh). The different terms used because different instruments were used for these applications, now the two functions are integrated in modern devices hence the terms are used interchangeably in the text.

1.1.2Monitoring

Monitoring is specified for the maintenance of the Power System Automation. It monitors the sequence of records, status and condition of the system, maintenance information and relay settings etc. The information can help in fault analysis, when and where it happened. It is used to reduce the power wastage of the system.

1.1.3 Control

Control application of a Power system Automation includes local and remote control. Local control consists of actions the control device can logically take by itself (switching sequences, and synchronizing check).Human intervention is limited and the risk was greatly reduced. Commands can be given directly to the remote control devices. This eliminates the personnel performance switching operations, actions can be performed faster.

1.2 POWER SYSTEM AUTOMATION

Power System Automation is a system for managing, controlling and protecting the various components connected to the power network. It obtains the real time information from the system, local and remote control applications with advanced electrical system protection.

The core of power system automation stands on local intelligence, data communications with supervisory control and monitoring. The functional structure of power system automation shown in Fig 1

- Electrical Protection
- Control
- Measurement
- Monitoring
- Data Communication

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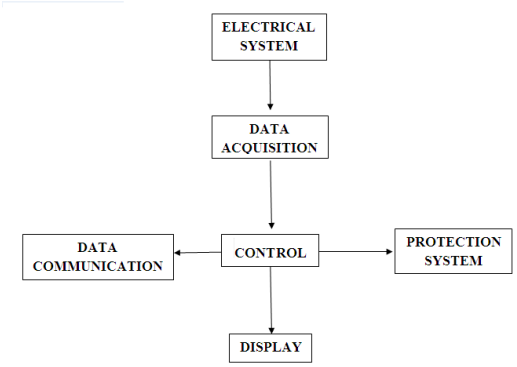

Fig 1 Functional Structure of Power System Automation

1.3 ELECTRICAL PROTECTION

Electrical Protection is the most important concept of the Power system Automation, to protect the equipment and personnel and to limit the damage at fault condition. It is a local function and it has the capability to function independently from the automation if necessary, although it is a part of Power system Automation the function of electrical protection never restricted in Power system Automation.

1.4 BENEFITS OF POWER SYSTEM AUTOMATION

Important benefits of automation can be listed as follows

1. Improved quality of service and reduced manpower requirements
2. Improved reliability with reduced system implementation costs
3. Maintenance/expansion of customer base and Reduced operating costs
4. High value service provider and reduced maintenance costs
5. Added value services with the ability to defer capacity addition projects
6. It easy to access the customer's information
7. Enterprise information accessibility along with improved information for planning decisions
8. Flexible billing options and reduced customer outage minutes.

2. EXISTING SYSTEM

2.1 INTRODUCTION

In olden days, Power monitoring is calculated by analog meter. There exists a lot of human error, approximate calculations, Billing isn't proper, total voltage consumed is not known. In this chapter it describes about the monitoring technology in existing system.

2.2 MONITORING AND METERING TECHNOLOGY

Metering Energy metering provides owners, operators and energy managers with the information needed to meet energy-efficiency goals and improve building operations. Installing energy meters is not an energy conservation measure itself, but it provides valuable data for supporting energy improvements.

Common uses of metered data include:

1. Energy billing

2. Tracking historical energy use over time
3. Calibration of building energy simulation model
4. Energy use benchmarking: comparison of a building's energy use to the performance of other similar buildings
5. Operations and troubleshooting diagnosis
6. Performance optimization through trending, observation and analysis of metered data
7. Measurement and verification of energy savings and utility
8. Electric bill reduction.

2.2.1 Electric Meters

Meters track energy use over time by measuring the electrical current and voltages for each phase or wire coming into the meter. An electric meter installation consists of a number of subcomponents as shown in Figure 1 below and explained here. Either a voltage tap or circuit breaker supplies power to operate the meter and serves to provide the voltage reference. If a voltage tap is Used, fuse blocks are required to provide over current protection to the meter. Current transformers mounted on each conductor provide the current reference to the meter. Current transformers are readily available in mill volt and 5 ampere varieties. Milli volt CTs are safer and do not require shorting blocks, but are more expensive.

Meter Types: There are many types of meters available from a wide variety of manufacturers. The most basic power meter is capable of measuring the quantity of power being used

2.3 OVERCOME OF LIMITATIONS

The existing system limitation is overcome by the digital meters, for accurate and exact reading. And it can reduce the manpower and there can be a exact value will be displayed. It can be monitored and controlled by using the mobile or personal computer by using the Raspberry PI with the Wi-Fi module is in-built in the kid. It can also locate the fault occurred place where in the past we are using the GSM (Global System for Mobile communication) module where it can locate the area where the fault has been occurred but in our proposed system we are using the GPS (Global Positioning System) by using this it can locate the particular building or the exact place about the fault and the intimation will be shown in the webpage in the browser can be displayed in mobile or by the personal computer.

2.4 CONCLUSION

Here in this Existing system, different types of analog meters for measuring the voltage, current, power are replaced by Digital meters and can locate the exact location about the fault.

3. PROPOSED SYSTEM

3.1 INTRODUCTION TO SMART POWER FLOW MONITORING AND CONTROL

A smart power monitoring and control system is a technique which is used for monitoring the electrical parameters such as voltage, current, power and to take appropriate control actions, when the measured parameters exceed their limits the relay will get tripped and the intimation will be given to controller and that can been seen in the browser by the help of the IP address that we are using in the micro controller and the exact status of the loads and power

3.1.1 Proposed System

Following are the major function of the proposed system

1. Voltage sensing through voltage transformer and its associated components.
2. Current sensing through current transformer and its associated components.

3. Total power consumed can also be displayed with accurate value.
4. To trip off the loads hierarchically in the event of current exceeding the set value.
5. The system can be controlled by using the Wi-Fi module which has been in-built in the Raspberry PI.
6. It can be controlled from anywhere in the globe through the mobile or by the personal computer by using the IP address.
7. It can also automatically turned ON and OFF by the sensor Passive Infrared sensor, Light Dependent Resistor and Temperature sensor.
8. We can also monitor each individual home appliances about their current status and their power consumption also been monitored in the web page.
9. At first the sensor will detect the human interference in the place if the person is not detected by the sensor means the output will be displayed as the no person is detected.
10. If any person has been detected means then the Passive infrared sensor will sent the signal to the Light Dependent Resistor and then to the Temperature sensor and if that sensor senses the value beyond to the base value means the lamp and then the fan will automatically turned ON or otherwise it will be remains in the OFF condition state.

3.2 BLOCK DIAGRAM OF THE PROPOSED SYSTEM

The block diagram for the Proposed system has been plotted in the following ways

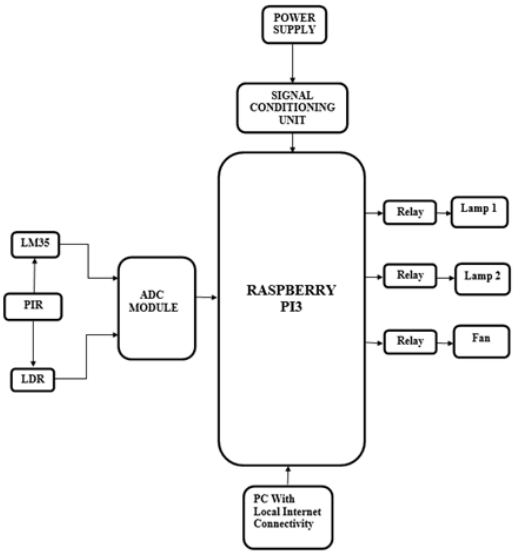

Fig.2 Block diagram of the proposed system

4.PROTOTYPE

Fig 3 displaying the parameters of voltage, current those were measured by using Raspberry PI and the value will be displayed in the web page and then it can be monitored and also it can be controlled by turning it by ON and OFF through by switching it in the web page itself with its associated programs.

And then Fig 3 is displaying the Raspberry PI compiling page and in that page it will display the light intensity, temperature, current, voltage and then the person is presented there or not it will be displayed in the compiling page itself. The fabrication of hardware is shown in fig 4

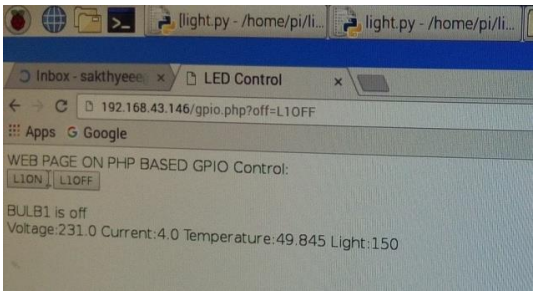

Fig. 3 displaying in the web page

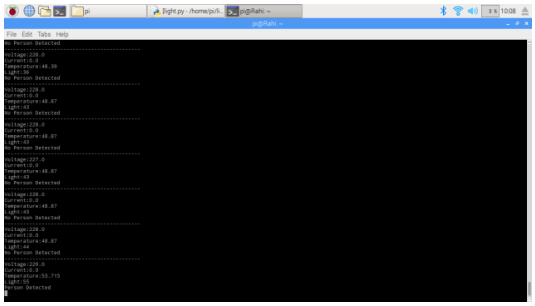

Fig. 4 Compiling page in Raspberry PI

Fig 5 Implementation of the Hardware

Total setup of the hardware, web page monitoring and then by controlling through the web page and also the automatic turn ON and OFF is been shown in the pictures individually and also combined together also been displayed.

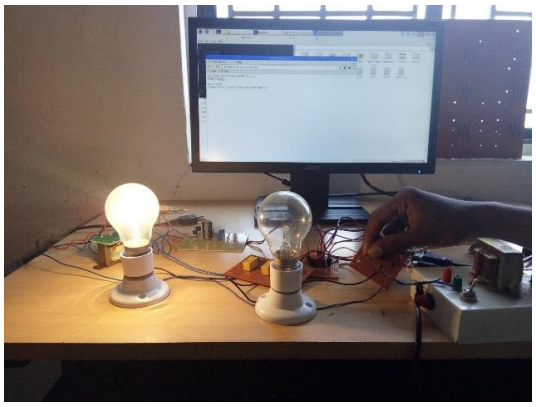

Fig 6 Detecting the Light Intensity

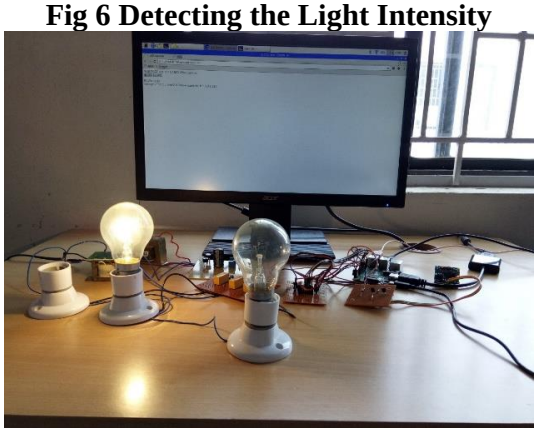

Fig. 7 Controlling by Web page

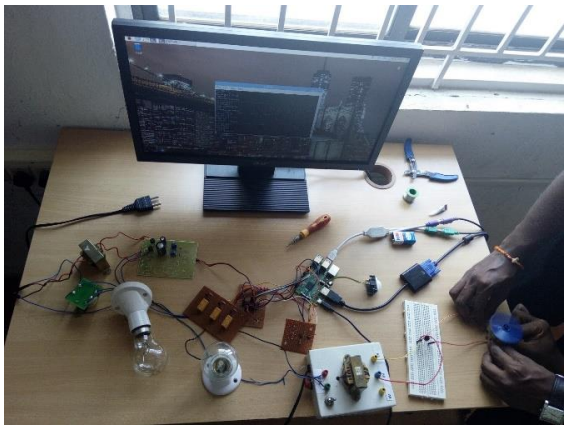

Fig. 8 Controlling Fan by Temperature

4. ADVANTAGES

- Monitoring can be done in web page by using Wi-Fi
- Accuracy is good
- Real Time Monitoring
- It will sense the human interference and gives the intimation to the processor then the lamp turns ON.

5. CONCLUSION

Thus we have designed the project on smart power flow monitoring and controlling using raspberry pi for monitoring the home appliances. voltage, current, and the status of each component and their power consumption are calculated and the values are shown in the web page by using the ip address and also controlled through the web page also and by using the sensor it can turn on and turn off by the human interference that has been detected and the signal is sent to the raspberry pi by that we can control it and reduce the power wastages.

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AUTHOR BIOGRAPHY

Ms.Sharmila.S received the B.E. degree in Electrical and Electronics Engineering in 2009 from K.S.R College of Engineering, Tiruchengode and received M.E. degree in Applied Electronics, 2011, K. S. Rangasamy College of technology, Tiruchengode. She is working as Assistant Professor in SNS College of Engineering, Coimbatore. Her research area of interest is Embedded Systems.

Mr.Ashok.K undergoing B.E Degree in Electrical and Electronics Engineering in 2013-2017 at SNS College of Engineering.

Mr.Abilash.S Undergoing B.E Degree in Electrical and Electronics Engineering in 2013-2017 at SNS College of Engineering.