

Wireless Home Automation Using R-Pi for Future Generation

T.Jaya, Mugesh Kumar.T, Priyadhashan.R, V.Rajendran

Abstract: - This paper deals with Home Energy Management (HEM) system plays an important role in realising the consumers need. It provides homeowner automatically perform the load controls and priority. This system provides the communication time delay to perform the load control along with its residential energy consumption. The main aim of this project is to check each load (i.e.), how much it is running and being controlled by the HEM and measure the units for different loads in the home. Demand response(DR) which is defined as the change in electricity according to the demand of the consumers from their normal consumption to reducing the price of electricity. HEM system provides the both monitoring and controlling for the consumer. The Load controllers provide the information of the consumed data through the IOT Wi-Fi module to their mobile phones as a Short Message Service. This system provides a gateway between the load, power consumption and message.

Keywords: Raspberry-Pi3, Load, IOT Wi-Fi module, Short Message Service.

I. INTRODUCTION

Nowadays, many technologies have been improved in the wireless technology. One of the most common thing but developing in a rapid manner is the Home Automation System. So many applications have been developed in the home automation system, one of its application is the energy management. By knowing the amount of energy consumption electricity bills also can be reduced. The energy monitoring system using IOT is an efficient one that allows the users to manage and monitor their electricity usage. This helps to detect the extra usage of power consumption. This is achieved by interconnecting devices like raspberry-pi, Wi-Fi module, Relay, Dc motor(load),

Bridge rectifier (voltage regulator filter), transformer. This R-Pi upload the data to online database and then performing the calculation in the android application using the data from the database. This process of bringing together various components together is known as Internet of Things. The background process of this application is carried out by raspberry pi which is small board having so much of advantages. The collector data is send to the online data base . Raspberry pi is not capable of directly getting the reading

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from live wire, therefore ADC differential pi which converts the analog signal into digital reading. This is the reading that is uploaded by raspberry pi. After this an short message service is sent to the user. The ultimate goal of this project is to deduct and reduce the amount of current .This can also be extended to real time with improved technology.

II. PROPOSED SYSTEM

This paper deals with monitorization of the load. By monitoring load it sends the current unit to the mobile as a SMS using the IOT Wi-Fi module.so, thereby current and also the current bill gets reduced. The R-Pi and the Wi-Fi module will produce the interface. It transports the protocols through the UART interface. Internet of Things is a wireless network that helps to transmit the data in a faster manner to the users. A wireless through the fixed line will transmit and receive data through the radio waves. When the sensors senses the presence of object it starts to run the load which ever we want to run, then the R-Pi will transmit the data to the Wi-Fi module which is the detected energy that will be shown in the system and that it would be sent as the message to the users or the consumers. The operator wants to know the load condition, a predefined message has to be sent to the modules which is interfaced with the R-Pi that remain the consumer.

1. Sensing of object and running of load (voltage, current)
2. Create webpage using PHP for IOT connection.
3. Passing SMS to the consumer at the end of the day.

This is the embedded project that connects both the software and hardware. The hardware consists of microprocessor or micro-controller. Here Raspberry-Pi which is processor is used. Along with

this some of the electrical components. Once the load starts to run it sends the consumption of power as a message at the end of the day. So that if there is any increase of the unit in current it will be reduced to its consumer knowledge.

We have designed the overall system based on the R-Pi processor as all the electrical components are connected to each other and assembled in the form of program in the R-Pi. This will sense the essential sensors and make the load to run. The transmitted signal are received from the main station and passed to the PC. The values of the voltage and current of the transformer is connected to the port A. Along with this the Wi-Fi module is connected in Port B. The monitoring PC is connected to the R-Pi and captures the current and voltage till

the end of the day and stores it in the R-Pi. The monitored voltage and current of the transformer is transmitted. The voltage level is reduced using stepdown transformers, relay and transferred to the load. A message has been received at the end of the day.

III. METHODOLOGY:

The methodology of the proposed Home Energy Management system can be described in the following figures A, B and C. This system is useful in many of the ways like controlling and monitoring the load , reduction in the electricity bills . This can also be extended to some other applications also like deduction of temperature , automatic shutdown of power when there is in no use of power etc., therefore Smart Home Management can be useful in many of the ways.

The fig1 shows block diagram represents how the system has to be designed first for the further process to be taken. In this block it consists of three units namely system overview, mobile phones and destination. The system overview block consists of the home appliances(load), sensing units and these sensing units are connected with the raspberry pi which is having the different ports in it. This system overview is connected to the mobile phones which will be receiving the consumption message. At the end the destination which transmit the data to the phones and deduction of the energy.

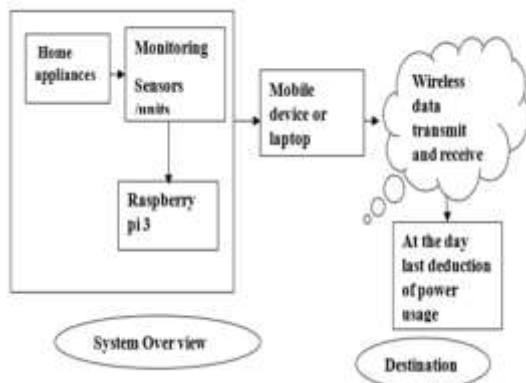


Fig1: Block Diagram Of HEM System

The Fig2 describes the flow of the HEM system . Firstly the home appliances which considered here in this paper as a load using the three DC motors is connected with the sensors and actuators which decides that which load has to run. This sensing unit consists of two loops one is if there is no detection the load will not run another one is if there is any detection the load starts to run which it is connected with the raspberry pi. Mobile devices are connected with the R-Pi and the webpage has been created and the messages has been pre-defined in the processor. Once the energy has been detected after running the program the energy detected will be shown in the mobile using the Wi-Fi module. At the day last consumption of energy will be displayed.

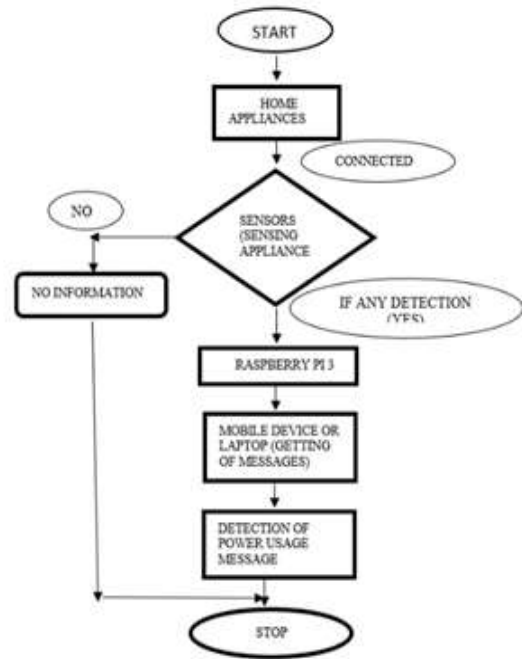


Fig 2: Flow Chart Of System

The Fig.3 is the design of the system consists of two main sections: Transmitter and the receiver side. In the transmitter side it consists of various components like transformer, rectifier, relay, load, R-Pi and these things are connected with the receiver side which will be having the mobile phones or laptops.

Let us consider about the transmitter side. In this side it consists of a transformer which is static device which produces the current by creating the electromagnetic flux. Here it consists of two sides primary and secondary side. It has two types of transformer step up and step down . In this paper step down transformer is used as this deals with the home energy management system. The step down transformer will be having more number of turns in the primary side and less number of turns in the secondary side. Once the supply is ON that it receives the high voltage(230V) and low current and step down to the low voltage (12V/5V) and high current. From the transformer it sends the AC current to the bridge rectifier which consists of four diodes are connected in a closed loop manner which produces the full cycle circuit that tends to produces the DC current. This DC current is rectified properly using the voltage regulator which regulates the DC voltage properly and changes the noisy DC to the pure DC current . This DC current is passed to the relay which is an electronic switch that will gets on. The R-Pi has given power and once the relay also gets ON the sensors gets the power.

The R-Pi has four ports and the program also embed in it after flashing the Raspbian OS into a SD card. Each port is connected with PC hardware parts like mouse, keyboard and monitors. Once it is connected the R-Pi OS starts to run. If the sensor has been sensed it starts to run continuously and if it has not detected anything else the sensor gets stop and the load also stop running. A Wi-Fi IOT module is used to transmit the message to the receiver side (i.e.,) mobile phone.



Now coming to the receiver side, to get the energy consumption message a website has to be created using the header name with the help of php website. For this the message should be already predefined in the content. After running the program the energy will be deducted and it will be shown in the mobile phone to users or consumers every end of the day.

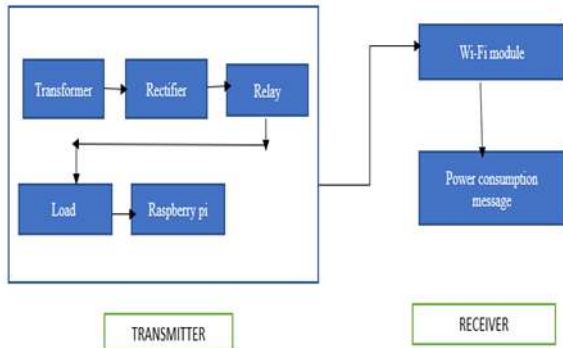


Fig 3: Design of HEM System

IV. RESULT AND DISCUSSION



Fig 4: Hardware of Home Energy Management System

The hardware is made before running the program in the fig4. It shows the electrical components like the transformer, sensor, load, rectifier, relay, R-Pi, Wi-Fi module etc.,

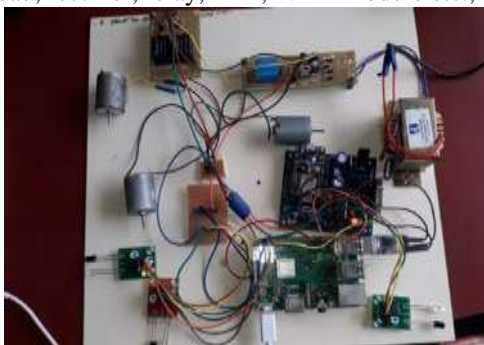


Fig 5: Hardware of Home Energy Management System-during Simulation

After the connection power supply is given to the transformer and R-Pi. Once the supply is given to the transformer it converts the high voltage and low current to the low voltage and high current which is a step down transformer. The transformer produces the AC current to the rectifier to convert it in to pure DC current. This current gets pass to the relay which is an electronic switch that gets ON. It supplies power to the sensors and load. Once sensor sense the object it statrts to run.The table 1 shows the total power

consumption vs time for loads.

Table 1: Output-Power Consumption

Energy Consumption(Joules)	Log date	Log Time
Energy:207	06/03/2019	15:02:45
Energy:218	03603/2019	15:05:06
Energy:1613	04/04/2019	12:44:55
Energy:2628	04/04/2019	12:45:47
Energy:3397	04/04/2019	12:47:00

After running the load the IOT module has to be connected with the mobile phone for that a website has been created using the PHP application. The program in the R-Pi is runned and the energy is detected and the message is received as message to the users to their mobile phones. That is shown in the fig6.

Energy is calculated in terms of joules.

$$\text{Energy}=\text{Power}*\text{time}$$

$$\text{Power}=\text{voltage}*\text{current}$$

So that power can be calculated in terms of unit also.

V. CONCLUSION

We have proposed a effective energy management system in the smart home using the IOT. There are many works related to the energy management. we have developed this project using electrical components, R-Pi 3 model and IOT module. After running the hardware using program the detected energy is received as a message to the consumers to their mobile. So therefore , if there is detection of high consumption of power the consumer can reduce it and also the electricity charges also can be reduced.

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