ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijareeie.com

Vol. 8, Issue 12, December 2019

A Real Time System for Computation of Current Consumption in Each Device

R.Aandal[1], R.Monica[2], L.T.Renuga Devi[2], M.Saran Anusuya[2], S.Sherlin[2].

Assistant Professor, Department of EEE, Francis Xavier Engineering College, Tirunelveli, India[1]

UG Student, Department of EEE, Francis Xavier Engineering College, Tirunelveli, India[2]

ABSTRACT: In the recent years , demand side management (DSM) has become an essential element of the rapidly developing smart grid; mainly as a result of increasing penetration of intermittent and variable renewable energy sources such as solar photovoltaic(PV) and wind. Due to the unpredictable nature of the generation, maintaining the second-by- second balance between demand and generation has become a challenging task, if an expensive reserve service is not maintained. As a viable solution to this problem, DSM is considered. DSM tries to reduce/increase the demand either by shifting or reducing the consumption, so that the available generation can be utilized efficiently while maintaining a minimum reserve. Direct Load Control (DLC) is one of the attractive option for DSM which helps the utility to shape the customer energy consumption profile by remotely controlling customers pre-agreed set of controllable appliances such as heat, ventilation, air-conditioning and smart (HVACS) systems. This paper proposes a solution to this problem in the form of a Load Monitoring (LM) method that can predict the amount of flexible load available at consumer premises.

I. INTRODUCTION

Smart grids (SGs) that attract intensive attention are reliable power grids having self-healing ability, comprising the consumers producing their own energy based on renewable energy sources with minimum cost and allowing the use of available infrastructure with full capacity. In addition, SGs give the opportunity for consumers to operate demand response programs independently so that the optimal matching between source and load can be spread to each region of the horizontal time axis by considering consumer habits.Demand response programs, considered as a power system resource and an essential part of SGs currently, bring economic benefits to the consumers and utility by spreading the consumption of electrical loads to the time axis, and they also enhance the reliability and sustainability of power grids. In many countries, incentives are given directly or indirectly to encourage the use of demand response programs.

While industrial and commercial buildings make use of demand response opportunities all around the world, the vast majority of residential buildings cannot use these opportunities. It is the opinion that dwelling comfort may be reduced and energy consumption habits are the biggest obstacle for the implementation of demand respond programs at homes. However, intelligent home energy management systems have gained popularity in recent years with the aim of enhancing the dwelling comfort in parallel with the advances in information and internet technologies. Therefore home energy management studies play a crucial role in enabling demand response programs to be used effectively in residences.

It has an effect upon the accuracy of demand response studies. Thus, several methods were used to generate the load profile and power consumption of home appliances precisely. The bottom-up approach is often used to generate real electricity consumption data of a residence in the literature. To date, in many publications, representative data and statistical averages of the consumption of electrical appliances have been used to overcome this problem. Then, the produced load models were compared with real models and they classified the houses by the number of rooms they had described the electrical home appliances using machine learning algorithms with the information gathered from power consumption data of home appliances with fast and high precision. This modelling was accomplished for the vast majority of the devices, but there is a need for more sample consumption and training of the algorithm in order to achieve the same success in the devices that contain complex operating modes.

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II. EXISTING SYSTEM

This paper proposes a novel Non-Intrusive Load Monitoring (NILM) method which incorporates appliance usage patterns (AUPs) to improve performance of active load identification and forecasting. In the first stage, the AUPs of a given residence were learnt using a spectral decomposition based standard NILM algorithm. Then, learnt AUPs were utilized to bias the priority probabilities of the appliances through a specifically constructed fuzzy system. The AUPs contain likelihood measures for each appliance to be active at the present instant based on the recent activity/inactivity of appliances and the time of day. Hence, the priori probabilities determined through the AUPs increase the active load identification accuracy of the NILM algorithm. The proposed method was successfully tested for two standard databases containing real household measurements in USA and Germany. The proposed method demonstrates an improvement in active load estimation when applied to the afore mentioned databases as the proposed method augments the smart meter readings with the behavioural trends obtained from AUPs. The total demand of an five was successfully utilizing the proposed AUP based technique.

III. PROPOSED SYSTEM

In recent years, the increment of distributed electricity generation based on renewable energy sources and improvement of communication technologies have caused the development of next-generation power grids known as smart grids. The structures of smart grids have bidirectional communication capability and enable the connection of energy generated from distributed sources to any point on the grid. They also support consumers in energy efficiency by creating opportunities for management of power consumption. The information on power consumption and load profiles of home appliances is essential to perform load management in the dwelling accurately.

The detailed power consumption analysis and load profile were executed for each home appliance. The obtained data is not only the average power consumption of each appliance but also characterizes different operating modes or their cycles. In addition, the impact of these devices on home energy management studies and their standby power consumptions were also discussed. The acquired data is an important source to determine the load profile of individual home appliances precisely in home energy management studies.

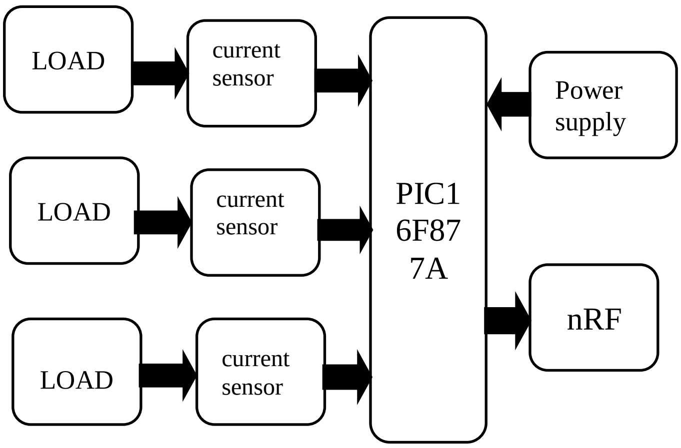

Fig:1Block diagram ofTransmitter Unit

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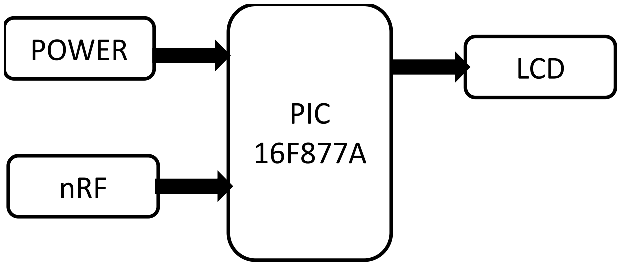

Fig:2 Block Diagram Of Receiver Unit

IV. COMPONENTS USED

- PIC16F877A MICROCONTROLLER
- NRF24L01
- CURRENT SENSOR
- LIQUID CRYSTAL DISPLAY(LCD)
- LAMP LOAD

V. METHODOLGY

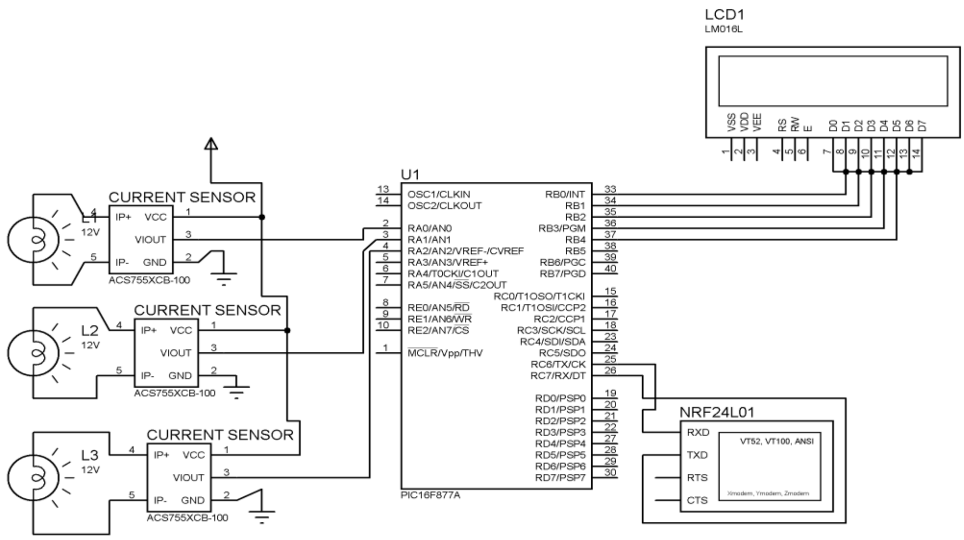

Fig:3 Circuit diagram of Transmitter Unit

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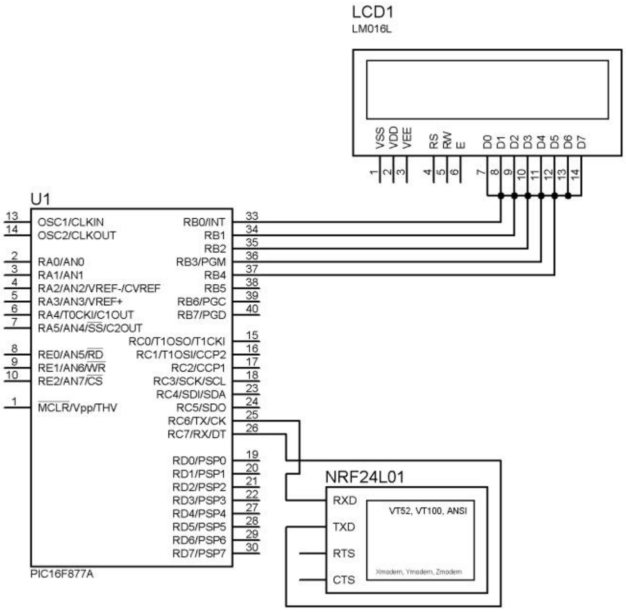

Fig:4 Circuit Diagram of Reciever Unit

Our project proposes the idea of current consumption from each device and calculates the amount and find outs the high consuming load device. The board consists of the components such as PIC , current sensor nRF transmitter and receiver, controller, LCD, and three lamps. The lamps name as L1=40w, L2=100W, L3=60W. There are three current sensors and ratings are about 5 Amps each. There are two ports in the current sensors A0 &Aout. From the A out the analog output is taken. The analog output is taken from the controller as 5volts.

The analog output in ADC will be convert to digital output as 1's & 0's to display in LCD.If RA2 is high the lamp C hexadecimal value is 12.Then it modulated frequency as 1100.After when it is transferred nRF receiver it gets demodulated. Then the controller has the coding value for each characters. The nRF receiver will dump the data the LCD will be connected at the port B. The LCD will read and write from the controller If any of the characters enters the controller then the coding will be printed for the particular lamp and the value will be calculated and printed. Then the current consumption will be measured and the amount will be displayed in LCD.The current sensors output 5V will be taken as input for the controller which has the inbuilt ADC. The port A is called analog port(i.e) it converts analog into digital. The controller reads the output as 1 and checks the pin from which the output is takes that is RA0,RA1 and RA2.

It checks which pin is high and transfers the high output from the controller. It transmits through RS232 or through TTL (Transistor Transistor Logic)The PIC controller on the other side has port B, TTL, RX and Tx, GND Port C 25,26 UART connection . The UART connections is given to transmit the data to serial(ie) bit to bit since the parallel communication is slow serial communications is preferred. These pins 25&26 converts the data to nRF. The nRF acts as both transmitter and receiver. The controller Tx is connected to nRF and vice versa such as,If the pin25 in the controller acts as transmitter, the nRF acts as the receiver.

If the nRF acts as transmitter, the pin 26 acts as receiver. The nRF modulates the data into frequency.For example If the character C enters the controller the coding will detect as lamp L3 and value will be calculated. If the current consumption lamp L3 is 50W, hen amount for the consumption will be displayed.

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VI. RESULT

The hardware setup consisting of switches, lamps, nRf receiver & transmitter, pic microcontroller and LCD, L1=40w, L2=100w and L3=60w.The LCD will read and write from the controller If any of the characters enters the controller then the coding will be printed for the particular lamp and the value will be calculated and printed. Then the current consumption will be measured and the amount will be displayed in LCD.

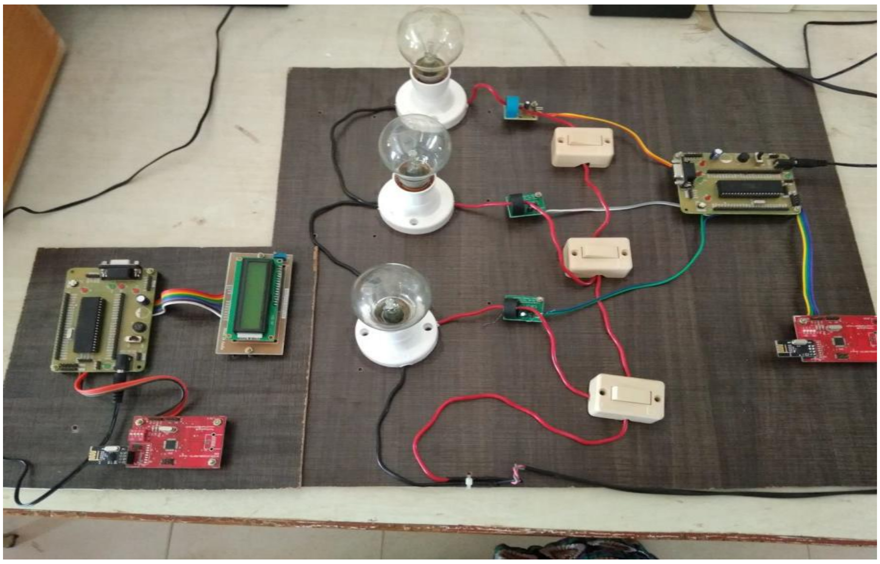

Fig :5 Hardware Overview

VII. CONCLUSION

With an advanced technology of an embedded system containing the PIC16F877microcontroller nRf receiver and transmitter implementation will help to detect the high load consumption in each device, high cost, low reliability and maintenance and enabling the protection of that device. Thus, it is very essential to have high efficiency, high reliability and high service quality in the power consumption system.

This study gives remedies from the difficulties of determining fault occurring causes in appliances and it overcomes the drawbacks of previous working methods. The project focuses mainly on the efficiency of consuming power of the devices by using LCD display. The nRf helps in better way of communication which enhances the improvement steps in this process. So, use of PIC16F877A microcontroller makes the system real time embedded system and aids very much in industry needs. The system hardware was constructed from the available components. The experimental results came out as expected.

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