ISSN 2321-6905

IJSEAT International Journal of Science Engineering and Advance Technology

Smart House Controlling system for Time Critical Appliances Controlling Smart House system with ease Real Time Appliances

[1]M.Sunil,[2]S.I.Siva Jyothi

[1]M.Tech(pursuing),[2]Assistant professor in Dept. of Electronics and Communication Engineering

Kakinada Institute of Engineering & Technology-II,Korangi,A.P,India

Email:sunil.m777@gmail.com;pragiyodev.s@gmail.com

Abstract: The problem of power consumption sounding an audible siren, only the solution is just a modern system would help. The "smart house" concept is a sample of what can be done with home automation these days, and why it's worth doing. The fundamental goal of Smart House is to provide integrated wiring for all current home services and to include provisions for home automation technology. Smart House is promoted for the following major home automation applications: entertainment, lighting, HVAC control, interface between an existing security system and a Smart House control panel. I have been effectively proving by considering both energy consumption and generation. By using of controlling system automatic performances are performed in the Smart house. This system utilizes different sensors to control household appliances. This system also provides the ability to perform automation on smart load controls based on utility signals to the user, customer‘s preference and load priority signals received from

HMs. It provides user to know the Demand of the appliances using wireless technology Bluetooth. Consideration of any power cuts or failing of main supplies will switch to the solar system .

I. Introduction

Smart homes (also known as domotic) can be described as introduction of technology within the home environment to provide convenience, comfort, security and energy efficiency to its occupants [3]. With the introduction of the Internet of Things, the research and implementation of home automation are getting more popular [4]. Various wireless technologies that can support some form of remote data transfer, sensing and control such as Bluetooth, Wi-Fi, RFID, and cellular networks have been utilized to embed various levels of intelligence in the home [5].

The studies in [2, 6] have presented Bluetooth based home automation systems using Android Smart phones without the Internet controllability. The devices are physically connected to a Bluetooth sub-controller which is then accessed and controlled by the Smart phone using built-in Bluetooth connectivity. Demand response (DR) is defined as changes in electricity use by demand-side resources from their normal consumption.

The fact that there has not been a mature time-varying tariff for residential customers, the DR concept for our hardware demonstration is based on the incentive based DR program which involves a customer receiving some sorts of load control signals from a service provider. In this case, a homeowner has the freedom to choose what loads to manage and for how long. This is different from a pre-set load (kW) reduction target set by a local electric utility company indirect load control programs.

Note that for this kind of DR programs, economic incentives should have already been written into the contract between consumer and the utility. In order to realize the proposed DR feature, it is necessary to deploy a fully automated DR solution, which can be made possible through the use of a hardware affirmation of a home energy management system for demand response applications (HA- HEMS -DRA) system. Today, interests in HEM systems have grown significantly. Various HEM systems are designed based on different communication schemes, such as Bluetooth transceiver & power-line carriers.

II. Description of Hem System

A. HEM System

It is shown in Fig. 1. The overall system comprises that provides monitoring and control functionalities for a homeowner, that gather electrical consumption data from selected appliances and perform local control based on command signals from the HEM system. A gateway, such as a smart meter, can be used to provide an interface between a utility and a homeowner in a real-life HEM deployment. In such a scenario, the gateway receives a DR signal from a utility, which is used as an input for our HEM unit.

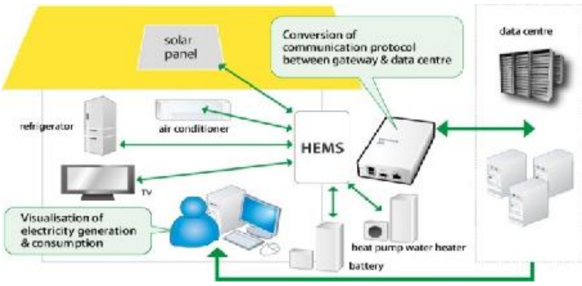

Fig. 1 HEM system

In this, focus on controlling power-intensive household appliances using HEMS, namely water heaters, air conditioners, TVs, refrigerators and other electric systems with solar panel.

B. HEM Architecture

In general, an HEM unit comprises

i) An embedded PC running a software application: It includes a DR algorithm that serves as the brain of the

HEM system. It makes a decision to switch ON/OFF selected end-use appliances based on the utility signal received, as well as homeowner's load priority and preference settings.

ii) HEM communication module: This provides communication paths between the HEM unit and its load controllers. This module is attached to the HEM unit and enables the HEM unit to send load control commands to all load controllers, and receive responses back. Mobile with a Bluetooth-enabled communication module is used as the HEM unit for this demonstration.

C. Load Controller Architecture

A load controller provides an interface between the HEM unit and a selected appliance. It provides basic power management functions (i.e., monitor, control, communicate) via a standard electrical outlet. Architecture-wise, it contains:

i) Data capturing and processing module:

It collects and calculates real-time electrical consumption data, such as voltage, current, apparent power, real power, and power factor from appliances.

ii) Control module:

It is simply an electronic relay circuit that provides the capability to switch a selected appliance ON/OFF, depending on the command sent by the HEM unit.

iii) Communication module:

It is responsible for providing communication paths between a load controller and the HEM unit. This is to allow the collected electrical consumption data from a load controller to be sent to the HEM unit; commands from the HEM unit to be received by a load controller; and response signals from a load controller to be sent to the HEM unit commercial off-the-shelf load controller product is selected for the HEM demonstration. This product is capable of controlling power-intensive load.

D. HEM System communications

In any HEM systems, two types of communication modules are needed. One is integrated with the HEM unit (as discussed in Section II-B); and the other is built-in in each load controller (as discussed in Section II-C). The type of communication modules selected will impact the overall system's data communication rate, range, cost, and its residual power consumption. Under a typical home area network/smart-device platform, one or a combination of the following communication technologies may be deployed: Wi-Fi (802.11/n), Bluetooth (802.15.1), ZigBee (802.15.4), and Power Line Carrier (PLC). According to the evaluation study of various communication technologies, we select Bluetooth transceiver to demonstrate the HEM system. Due to this Bluetooth transceiver is a low-cost, low-power consumption option, and does not require an extensive new infrastructure.

III. Description of Smart House

The overall block diagram of the Smart House system is shown in below fig.

a) Microcontroller (LPC 2148)

The LPC2148 microcontrollers are based on a 32/16 bit ARM7TDMI-S CPU with real-time emulation and embedded trace support, that combines the microcontroller with embedded high speed flash memory ranging from 32 kB to 512 kB. A 128-bit wide memory interface and an unique accelerator architecture enable 32-bit code execution at the maximum clock rate.

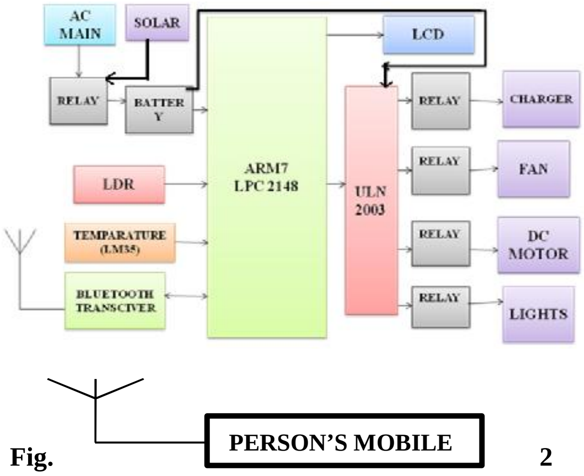

Fig. 2 Block Diagram of Smart House

For critical code size applications, the alternative 16-bit Thumb mode reduces code by more than 30 % with minimal performance penalty. Due to their tiny size and low power consumption, LPC2141/2/4/6/8 are ideal for applications where miniaturization is a key requirement, such as access control and point-of-sale. A blend of serial communications interfaces ranging from a USB 2.0 Full Speed device, multiple UARTS, SPI, SSP to I2Cs and on-chip SRAM of 8 kB up to 40 kB, make these devices very well suited for communication gateways and protocol converters, soft modems, voice recognition and low end imaging, providing both large buffer size and high processing power. Various 32-bit timers, single or dual 10-bit ADC(s), 10-bit DAC, PWM channels and 45 fast GPIO lines with up to nine edge or level sensitive external interrupt pins make these microcontrollers particularly suitable for industrial control and medical systems.

b) Temperature Sensor (LM35)

The LM35 series are precision integrated-circuit LM35 temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 sensor thus has an advantage over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling. The LM35 sensor does not require any external calibration or trimming to provide typical accuracies of ±¼°C at room temperature and ±¾°C over a full -55 to +150°C temperature range. Low cost is assured by trimming and calibration at the wafer level. The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy.

c) LDR

A photo resistor or Light Dependent Resistor or CdS Cell is a resistor whose resistance decreases with increasing incident light intensity. It can also be referred to as a photoconductor. A photo resistor is made of a high resistance semiconductor. If light falling on the device is of high enough frequency, photons absorbed by the semiconductor give bound electrons enough energy to jump into the conduction band. The resulting free electron (and its hole partner) conduct electricity, thereby lowering resistance.

d) ULN 2003

The driver makes use of the ULN2003 driver IC, which contains an array of 7 power Darlington arrays, each
capable of driving 500mA of current. At an approximate duty cycle, depending on ambient temperature and number of drivers turned on, simultaneously typical power loads totalling over 230w can be controlled. The device has base resistors, allowing direct connection to any common logic family. All the emitters are tied together and brought out to a separate terminal. Output protection diodes are included; hence the device can drive inductive loads with minimum extra components. Typical loads include relays, solenoids, stepper motors, magnetic print hammers.

e) SPDT RELAY

A relay is an electrically operated switch used to isolate one electrical circuit from another. In its simplest form, a relay consists of a coil used as an electromagnet to open & close switch contacts. Since the two circuits are isolated from one another, a lower voltage circuit can be used to trip a relay, which will control a separate circuit that requires a higher voltage or amperage. Relays can be found in early telephone exchange equipment, in industrial control circuits, in car audio systems, in automobiles, on water pumps, in high-power audio amplifiers and as protection devices.

f) Solar Panel

Solar panel refers to a panel designed to absorb the sun's rays as a source of energy for generating electricity or heating. A PV module is a packaged, connected assembly of typically 6×10 solar cells. Solar PV panels constitute the solar array of a photovoltaic system that generates and supplies solar electricity in commercial and residential applications. Each module is rated by its DC output power under standard test conditions, and typically ranges from 100 to 320 watts. The efficiency of a module determines the area of a module given the same rated output – an 8% efficient 230 watt module will have twice the area of a 16% efficient 230 watt module. There are a few solar panels available that are exceeding 19% efficiency. A single solar module can produce only a limited amount of power; most installations contain multiple modules. A photovoltaic system typically includes a panel or an array of solar modules, an inverter, and sometimes a battery and/or solar tracker and interconnection wiring.

Fig. 3 Solar Module

Solar modules use light energy (photons) from the sun to generate electricity through the photovoltaic effect. The majority of modules use wafer-based crystalline silicon cells or thin-film cells based on cadmium telluride or silicon. The structural (load carrying) member of a module can either be the top layer or the back layer. Cells must also be protected from mechanical damage and moisture. Most solar modules are rigid, but semi-flexible ones are available, based on thin-film cells. These early solar modules were first used in space in 1958.

Electrical connections are made in series to achieve a desired output voltage and/or in parallel to provide a desired current capability. The conducting wires that take the current off the modules may contain silver, copper or other non-magnetic conductive transition metals. The cells must be connected electrically to one another and to the rest of the system. Externally, popular terrestrial usage photovoltaic modules use MC3 (older) or MC4 connectors to facilitate easy weather proof connections to the rest of the system. Bypass diodes may be incorporated or used externally, in case of partial module shading, to maximize the output of module sections still illuminated.

Some recent solar module designs include concentrators in which light is focused by lenses or mirrors onto an array of smaller cells. This enables the use of cells with a high cost per unit area (such as gallium arsenide) in a cost-effective way.

IV. Flow chart of HEM System

Fig. 4 Flow chart for HEM System

V. Results

Fig. 5 HEM Peripherals Initialization

Fig. 6 Temperature values

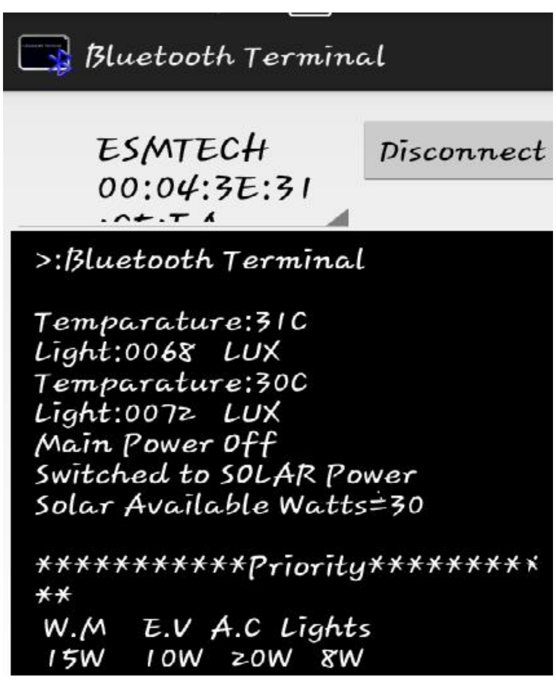

Fig. 7 Bluetooth terminal data

Future Scope

A 30 watts solar panel is being used in this project the capacity of panel and can be increased to accommodate fume electrical appliances.

Bluetooth Technology is being used in this project it can be operated only from within a distance of 10 mtrs from the kit and its circuits this operating distance can be increased by using advanced technologies like Zigbee, GSM etc., Similarly ARM 7 can be replaced by R9 to be increased the speed and decreased the time delay.

This project which is demonstrated as home energy management system can be utilized for big purpose as an industries, offices.

Conclusion

By utilizing intelligent lighting system and multi sensors we can control the usage limit of power consumption. The user can easily operate the devices in short period based on his preference. The cost will be reduced by utilizing the solar energy saved in rechargeable battery. The real-world implementation of this system will benefit electric power distribution companies by helping to avoid distribution transformer overloads with the presence of new power-intensive loads, like electric vehicles.

References

[1] Data from PJM's hourly load data" J. E. Runnels and M. D. Whyte, "Evaluation of demand-side management," *Proc. IEEE*, vol. 73, no. 10, pp. 1489–1495, Oct. 1985.

[2] C.W. Gellings, "The concept of demand-side management for electric utilities," *Proc. IEEE*, vol. 73, pp. 1468–1470, Oct. 1985.

[3] Federal Energy Regulatory Commission, "Assessment of demand response and advanced metering"

[4] M. Pipattanasomporn, M. Kuzlu, and S. Rahman, "An algorithm for intelligent home energy management and simulation for demand response analysis," *IEEE Trans. Smart Grid*, accepted for publication.

[5] M. A. Piette, D.Watson, N.Motegi, S. Kiliccote, and E. Linkugel, "Automated demand response strategies and commissioning commercial building controls," in *Proc. 14th Natl. Conf. Building Commissioning*, San Francisco, CA, Apr. 2006.

[6] D. Han and J. Lim, "Design and implementation of smart home energy management systems based on ZigBee," *IEEE Trans. Consum. Electron.*, vol. 56, no. 3, pp. 1417–1425, 2010.

[7] Y. S. Son, T. Pulkkinen, K. Y. Moon, and C. Kim, "Home energy management system based on power line communication," *IEEE Trans. Consum. Electron.*, vol. 56, pp. 1380–1386, 2010.

[8] J. Li, J. Y. Chung, J. Xiao, J.W. Hong, and R. Boutaba, "On the design and implementation of a home energy management system," in *Proc. 6th Int. Symp.Wireless Pervasive Comput. (ISWPC)*, Feb. 23–25, 2011, pp. 1–6.

[9] J. Han, C. S. Choi, W. K. Park, and I. Lee, "Green home energy management system through comparison of energy usage between the same kinds of home appliances," in *Proc. 15h IEEE Int. Symp. Consum. Electron. (ISCE)*, 2011, pp. 1–4.

[10] M. Erol-Kantarci and H. T. Mouftah, "Wireless sensor networks for cost efficient residential energy management in the smart grid," *IEEE Trans. Smart Grid*, vol. 2, no. 2, pp. 314–325, 2011.