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AN ENERGY AWARENESS IN SMART CITY LESSONS LEARNED FOR EFFICENT POWERMANAGEMENT

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ABSTRACT: The SmartCity concept is becoming widely accepted and describes the usage of ICT for increased quality of life and also for a sustainable usage of natural resources. This paper describes a system architecture for monitoring of electrical energy consumption, and visualization of usage patterns to raise users' awareness of their energy usage which we field trialled over several months. The information collected of each household includes kWh, emission of carbon dioxide emissions and it also relates a household's consumption to other households attending the trial. Our results indicate that a fraction of the participants was interested in a detailed comparison with others whereas other participants had their main interest in not performing worse than the average household. Further, a large fraction had a demand for knowing the total energy usage of their household through an easily accessible visualization. These results indicate that there is support to embed sensing and feedback services to daily life for involving the residents of a SmartCity more.

Keywords—**smart city, sensing, visualization**

I. Introduction:

Demand response (DR) is defined as changes in electricity use by demand-side resources from their normal consumption patterns in response to changes in the price of electricity, or to incentive payments designed to induce lower electricity use at times of high wholesale market prices or when system reliability is jeopardized. The proposed method will be as follows. Energy awareness in smart city 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 smart energy system. A gateway, such as a smart meter, can be used to provide an interface between a utility and the data base for the electrical consumption and also maintain cost based on units are also maintained through internet and also Wi-Fi terminals. Here one more option we can also monitor the co2 concentration of particular home appliances we will maintain in the internet services.

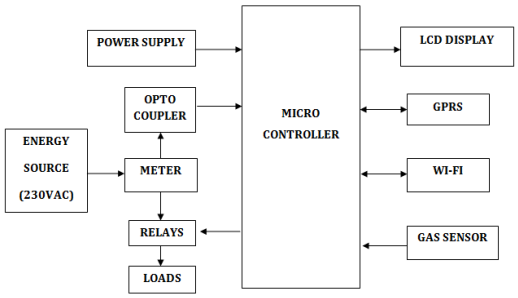
II. Hardware system

Micro controller: This section forms the control unit of the whole project. This section basically consists of a Microcontroller with its associated circuitry like Crystal with capacitors, Reset circuitry, Pull up resistors (if needed) and so on. The Microcontroller forms the heart of the project because it controls the devices being interfaced and communicates with the devices according to the program being written.

ARM7TDMI: ARM is the abbreviation of Advanced RISC Machines, it is the name of a class of processors, and is the name of a kind technology too. The RISC instruction set, and related decode mechanism are much simpler than those of Complex Instruction Set Computer (CISC) designs.

Liquid-crystal display (**LCD**) is a flat panel display, electronic visual display that uses the light modulation properties of liquid crystals. Liquid crystals do not emit light directly. LCDs are available to display arbitrary images or fixed images which can be displayed or hidden, such as preset words, digits, and 7-segment displays as in a digital clock. They use

the same basic technology, except that arbitrary images are made up of a large number of small pixels, while other displays have larger elements.

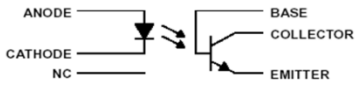


Block diagram

In this project we required operating voltage for ARM controller board is 12V. Hence the 12V D.C. power supply is needed for the ARM board. This regulated 12V is generated by stepping down the voltage from 230V to 18V now the step downed a.c voltage is being rectified by the Bridge Rectifier using 1N4007 diodes. The rectified a.c voltage is now filtered using a 'C' filter. Now the rectified, filtered D.C. voltage is fed to the Voltage Regulator. This voltage regulator provides/allows us to have a Regulated constant Voltage which is of +12V. The rectified; filtered and regulated voltage is again filtered for ripples using an electrolytic capacitor 100µF. Now the output from this section is fed to microcontroller board to supply operating voltage. LCD is interfaced to the controller Port 0. Relay is connected to port 1.

III. Board hardware resources features

Optocoupler: There are many situations where signals and data need to be transferred from one system to another within a piece of electronics equipment, or from one piece of equipment to another, without making a direct electrical connection. Often this is because the source and destination are (or may be at times) at very different voltage levels, like a microcontroller which is operating from 5V DC but being used to control a triac which is switching 230V AC. In such situations the link between the two must be an isolated one, to protect the microprocessor from over voltage damage. Relays can of course provide this kind of isolation, but even small relays tend to be fairly bulky compared with ICs and many of today's other miniature circuit components. Because they are electro-mechanical, relays are also not as reliable ó and only capable of relatively low speed operation. Where small size, higher speed and greater reliability are important, a much better alternative is to use an Optocoupler. These use a beam of light to transmit the signals or data across an electrical barrier, and achieve excellent isolation.

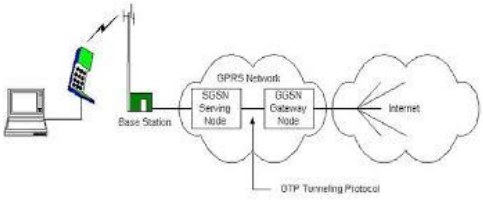


Optocoupler

GPRS: GPRS is expected to profoundly change the mobile data services that GSM, CDMA and TDMA (ANSI-I36) network operators can offer. GPRS will increase opportunities for higher revenues and enable new, differentiated services and tariff dimensions to be offered (such as a charge for the number of kilobytes of data transferred). GPRS combines mobile access with Internet protocol (IP)-based services, using packet data transmission that makes highly efficient use of radio spectrum and enables high data speeds. It gives users increased bandwidth, making it possible and cost-effective to remain constantly connected, as well as to send and receive data as text, graphics and video.

The key drivers for operators to evolve to GPRS networks are to:

· increase revenues by moving into the mobile data market, especially since the voice market has had profit margins squeezed with the commoditization of voice services gain new subscribers who require mobile data services or do not want to invest in aPC to gain Internet access retain current subscribers by offering new services reduce costs due to the efficient use of network resources Ease of adapting applications for mobile users because high data speeds mean that middleware is no longer required to convert fixed applications for mobile use.



GPRS network

GAS SENSOR: A gas sensor is a device that detects the presence of gases in an area, often as part of a safety system. This type of equipment is used to detect a gas leak and interface with a control system so a process can be automatically shut down. A gas detector can sound an alarm to operators in the area where the leak is occurring, giving them the opportunity to leave. This type of device is important because there are many gases that can be harmful to organic life, such as humans or animals.

Gas detectors can be used to detect combustible, flammable and toxic gases, and oxygen depletion. This type of device is used widely in industry and can be found in locations, such as on oil rigs, to monitor manufacture processes and emerging technologies such as photovoltaic. They may be used in firefighting.

Gas sensor

WI-FI: We have enormous flexibility that a wireless connection brings to an embedded application. The addition of wire-less provides more choices for monitoring, control and the dissemination of information. Practically speak- ing, remote locations become more accessible and costs drop. The following list summarizes some of the benefits of a Wi-Fi network.

• Wireless Ethernet. Wi-Fi is an Ethernet replacement. Wi-Fi and Ethernet, both IEEE 802 networks, share some core elements.

• Extended Access. The absence of wires and cables extends access to places where wires and cables cannot go or where it is too expensive for them to go.

• Cost Reduction as mentioned above, the absence of wires and cables brings down cost. This is accomplished by a combination of factors, the relatively low cost of wireless routers, and no need for trenching, drilling and other methods that may be necessary to make physical connections.

• Mobility. Wires tie you down to one location. Going wireless means you have the freedom to change your location without losing your connection.

• Flexibility. Extended access, cost reductions, and mobility create opportunities for new applications as well as the possibility of creative new solutions for legacy applications.

Wifi module

IV. CONCLUSION

The project developed can be used to provide an interface between a utility and a home owner in a real life HEM deployment with efficient usage of power generation and transmission assets. These results indicate that we need to embed sensing and feedback services into daily life in a natural style in order to stimulate a high user involvement. For instance, it may be good to use multiple media: summarized information on their energy usage pattern might be pushed to a user's smartphone and more detailed information such as changes in consumption pattern, consumption history and consumption trend could be shown in a web browser in a pull-based information delivery manner.

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