IOT BASED ENERGY DEVICES MONITORING AND CONTROLLING SYSTEM

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Abstract: Many potential applications have been developed in the fields of analysis and automation. In this paper, a platform was designed to connect sensor data with users daily life. As an application of it, Any Control - a home appliances monitoring and controlling system was implemented. Although home appliances are becoming more intelligent day by day. Not only are manufacturers promoting new smart appliances; there are also many smart phone oriented remote controller products. However current products always have platform compatibility problems, additionally, user interaction in such systems is becoming more and more complex. This work proposes an approach to enhance old appliances and the controlling experience through an IoT based Home Appliance Controlling System. With current monitoring sensors, the appliances can be controlled environment condition trigger. The current sensor data are processed by single-board computer and delivered to web applications through wireless Ethernet connection. The results of implementation and experimentation has shown the proposed system and platform can provide more IoT application possibilities daily life.

Key words-Raspberry Pi, Current sensor

I. INTRODUCTION

Identifying and reducing energy waste is challenging when there is limited information about which devices are using how much energy. With the proliferation of smaller energy using devices in residential and commercial buildings (i.e., plug loads), the number of individual devices and their aggregate energy use is increasing. In homes and commercial buildings, plug loads represent 30% of the total electricity use Moreover, the amount of electricity used by plug loads is growing faster than any other load category in both sectors .A large fraction of these loads are electronics, and electronic devices present a unique and excellent opportunity to

leverage the Internet of Things (IoT) for understanding and reducing energy use. The problem is especially acute for the large number of small, energy-using devices that are present in both residential and commercial buildings. Most of these products use a switching ac to dc power supply to operate electronic and other internal components. A “communicating power supply” (CPS), to enable the communication of energy and control information between the device and a building management system or other central entities will be developed.

II. BLOCK DIAGRAM

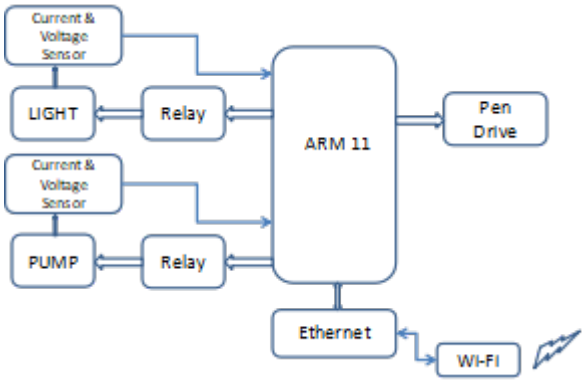

Fig.1 Block diagram of the project

A) Existing System

In the existing system, the method implemented is using a wireless radio transmission to transfer the data to the server, which makes the procedure complex and also an external server has to be deployed in order to access and control the appliances.

B) Proposed System

Proposed system incorporates an advance Linux based device, will design and developed our own web server to acquire the consumption data and display on the webpage for monitoring, also will control the appliances turn on/off from web and based on consumption threshold values. Including storing all the log data of the consumption in a Pen Drive will be achieved.

C) Block diagram Description

Reducing the energy use of plug loads becomes increasingly important, as the number of electronic devices grows and the end uses in buildings become more efficient. However, nowadays solutions for saving energy are based on either long-term energy policy methods or transitional technologies that do not perform as consumers expect or desire. Reducing the energy use of plug. In order to implement this a raspberry board with ARM 11 processor has been used along with AC loads i.e bulb and motor. This devices are connected to gpio pins of the board. Ethernet router is connected to the board to enable the wireless data transfer of the values and controlling the load on/off. A USB pen drive is used to store the log data of the device with power consumption in a text file periodically.

III. SOFTWARE

A) QT

The software is used to design and developed is QT creator which is used to make efficient GUI application. Qt Creator is a good example of an application that mixes different user interface technologies. In fact, it uses all of the three different approaches described below. Qt Creator uses the traditional Qt Widgets such as menus and dialogs as a basis of the user interface, Qt Quick amongst others for the welcome screen, and Qt Web Kit for presenting the Qt reference documentation. Qt Creator includes a project manager that uses a cross platform project file format (.pro). A project file can contain information such as what files are included into the project, custom build steps and settings for running the applications. Qt Creator includes a code editor and integrates Qt Designer for designing and building graphical user interfaces (GUIs) from Qt widgets. The code editor can parse code in C++ and QML languages... It is possible to compose and customize the widgets or dialogs and test those using different styles and resolutions directly in the editor. Widgets and forms created with Qt Designer are integrated with programmed code, using the Qt signals and slots mechanism.

B) Raspbian Operating System

Raspbian is a free operating system based on Debian optimized for the Raspberry Pi hardware. An operating system is the set of basic programs and utilities that make your Raspberry Pi run. However, Raspbian provides more than a pure OS: it comes with over 35,000 packages; pre-compiled software bundled in a nice format for easy installation on your Raspberry Pi. The initial build of over 35,000 Raspbian packages, optimized for best performance on the Raspberry Pi, was completed in June of 2012. However, Raspbian is still under active development with an emphasis on improving the stability and performance of as many Debian packages as possible. The Raspberry Pi primarily uses Linux

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kernel-based operating systems Raspbian (recommended) – Maintained independently of the Foundation; based on ARM hard-float (armhf)-Debian 7 'Wheezy' architecture port, that was designed for a newer ARMv7 processor (or one with Jazelle RCT/ThumbEE, VFPv3 and NEON SIMD extensions built-in) whose binaries would not work on the Raspberry Pi, but Raspbian is compiled for the ARMv6 instruction set of the Raspberry Pi making it work but run more slowly. It provides some available deb software packages, pre-compiled software bundles. A minimum size of 2 GB SD card is required, but a 8 GB SD card or above is recommended. There is a Pi Store for exchanging programs. The Raspbian Server Edition is a stripped version with other software packages bundled as compared to the usual desktop computer oriented Raspbian.

IV. HARDWARE

A) Raspberry Pi (ARM 11)

The Raspberry Pi is a credit-card sized computer that plugs into your TV and keyboard. It is a capable for little projects, and for many of the things that your desktop PC does, like spreadsheets, word-processing and games. It also plays high-definition videos. We want to see it being used by kids all over the world to learn how computers work, how to manipulate the electronic world around them and, how to program. The original Raspberry Pi is based on the Broadcom BCM2835 system on a chip (SoC), which includes, Video Core IV GPU, RAM of 512 MB. The system has Secure Digital (SD) socket for boot media and persistent storage. A SoC consists of the hardware, described above, and the software controlling the microcontroller, microprocessor or DSP cores, peripherals and interfaces. The design flow for Soc aims to develop this hardware and software in parallel

Fig 2: Raspberry Pi Board

B) Current Sensor

A **current sensor** is a device that detects electric current (AC or DC) in a wire, and generates a signal proportional to it. The generated signal could be analog voltage or current or even digital output. It can be then utilized to display the measured current in an ammeter or can be stored for further analysis in a data acquisition system or can be utilized for control purpose. There are a wide variety of sensors, and each sensor is suitable for a specific current range and environmental condition. No one sensor is optimum for all applications.

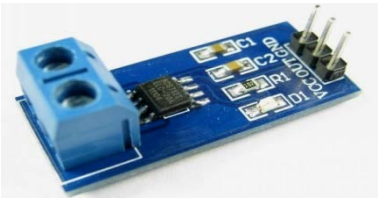


Fig.3 Current sensor

C) Relays:

A relay is an electrically controllable switch widely used in industrial controls, automobiles and appliances. The relay allows the isolation of two separate sections of a system with two different voltage sources i.e., a small amount of voltage/current on one side can handle a large amount of voltage/current on the other side but there is no chance that these two voltages mix up.

Operation:

When a current flow through the coil, a magnetic field is created around the coil i.e., the coil is energized. This causes the armature to be attracted to the coil. The armature's contact acts like a switch and closes or opens the circuit. When the coil is not energized, a spring pulls the armature to its normal state of open or closed. There are all types of relays for all kinds of applications.

V. RESULTS

Fig.4 Hardware Assembly of the project

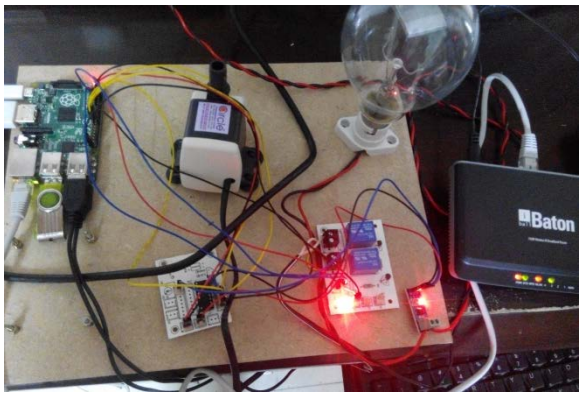
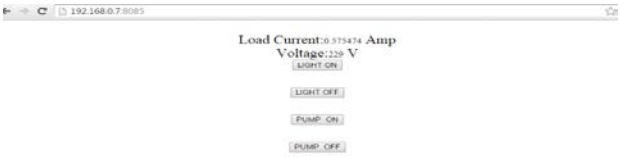


Fig:4 shows the assembled kit of the



implemented project which contains the Raspberry Pi is a credit-card sized computer that plugs into your TV and keyboard ,2 channel relay board ,ac pump,mcp3208,current sensor connected to raspberry pi board.

Fig.5 Display over monitor

Fig.5 displays the web page in which the user can view the load current and voltage and can also turn on and turn off the loads

VI.CONCLUSION

We presented an Internet-connected system of CPSs that enables improved energy awareness of devices and users. We believe that CPS technology is the future of energy monitoring for plug loads, and that all energy-using devices will one day be aware of their identity and share energy information over IP networks. The CPS concept we have shown here demonstrates that this concept is valid at reasonable price points even for quite low-cost devices. Energy awareness enables new sets of interactive energy-saving behaviors where devices control their power state to meet user needs while minimizing energy use. Unlike existing technologies, CPS devices are integrated into the product to provide native controls and automatically include product identity information. The low cost, reduced configuration burden, and tight coupling with the powered product make CPSs an excellent application of IoT concepts.

VII.FUTURE SCOPE

In the near future the Internet and wireless technologies will connect different sources of information such as sensors, mobile phones and cars in an ever tighter manner. The number of devices which connect to the Internet is – seemingly exponentially – increasing. These billions of components produce consume and process information in different environments such as logistic applications, factories and airports as well as in the work and everyday lives of people. The society need new, scalable, compatible and secure solutions for both the management of the ever more broad, complexly-networked Internet of Things, and also for the support of various business models.

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