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Web Based Power Management in Home using Wireless Sensor Networks

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Abstract: ***Power plays a major role in human life. Now a day we are wasting much power we can't know how much power we consumed until we get electricity bill. To overcome this we are using wireless sensors. By using sensors we can monitor and control the power usage. The sensors networks are programmed with various user interfaces suitable for users of varyingability and for expert users such that the system can be maintained easily and interacted with very simply.***

Keyword: Energy management, home automation, intelligent control system, wireless sensor network, ZigBee

1. Introduction

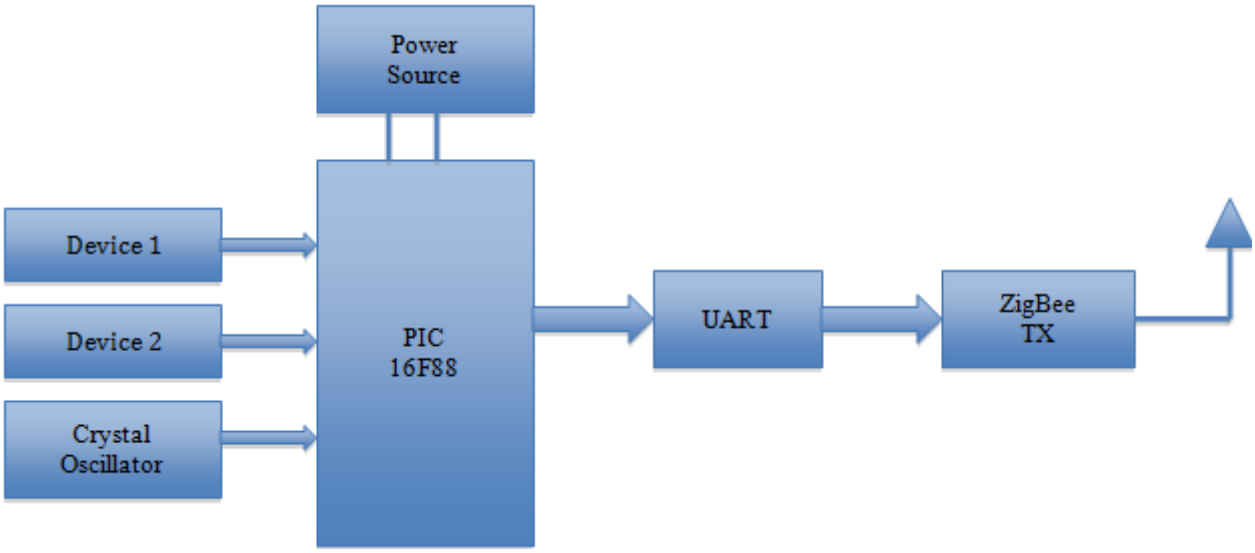
Wireless sensors networks have become increasingly important because of their ability to monitor and manage situational information for various intelligent services. Due to those advantages, WSN's have been applied in many fields such as military, industry and health care [1]-[2]. The WSN's are increasingly being used in the home for controlling services. Regular hose hold appliances for monitored and controlled by WSN's installed in the home [3]. The advantages of this method have faster sensor switching, simplest control system and have communication losses less. We have designed and implemented a ZigBee based intelligent home management and control services because it has low power and low cost characteristic, whichenable it to be widely used in home and building environments [4].

2. Existing Method

Huiyong et al. [5] examined the integration of WSN with service robot for smart home monitoring system. But it has limitation with respect to true home automation such as energy consumption control mechanism Is limited to only certain devices like light illuminations, where as several house hold appliances can be controlled, Energy control is based on fixed threshold power consumption, controlling the home appliances through network management functions.

3. Proposed Method

In the proposed system we introduce ARDUINO based smart power monitoring and control system of an intelligent building. The sensor network is programmed with various user interfaces suitable for users. By monitoring consumption of power appliances, data are collected by a smart Zigbee coordinator, which saves all data in the system for processing as well as for future use. The parameter will be entered in the data coordinator in the software from appliances include voltage, current and power. These parameters will be stored in the database and analyzed. Collected will be displayed on the computer through graphic user interface (GUI) window. So that the approximate action can be taken from the GUI. We can monitor through mobile. Developed system is low cost, flexible in operation. Proposed system has faster sensor switching, simplest control system and has communication losses less.



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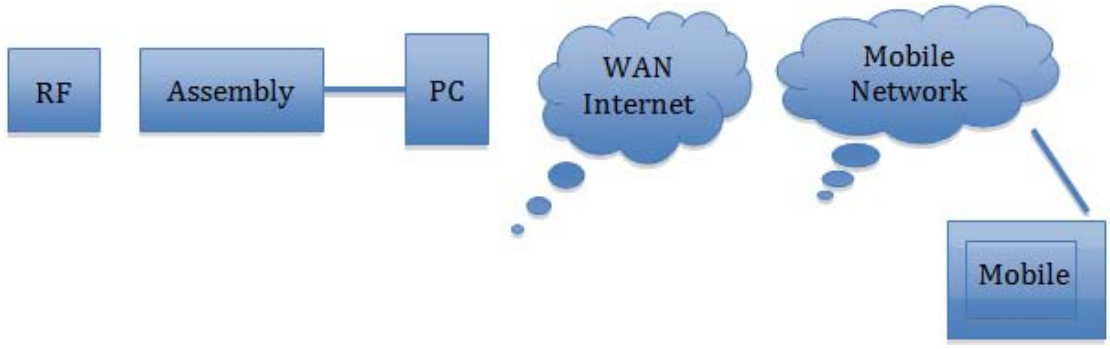
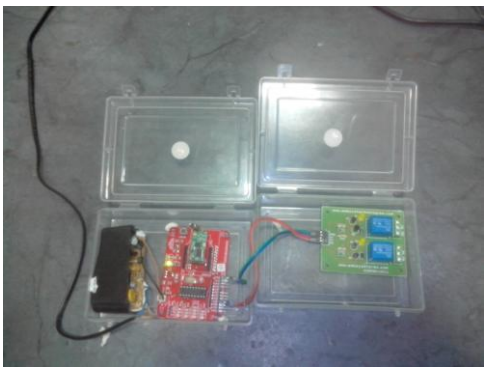
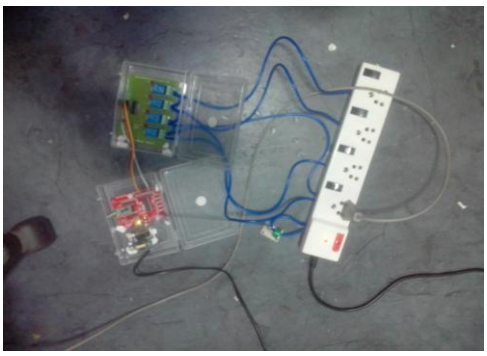


Figure: Architecture of proposed web based power management

4. System Structure





A new web based system has been designed for measurement of electrical household appliances.

5. System Hardware

Hardware components include PIC16F88, CT coil current sensor, RF transceiver ULN2003, relay, and CH340 serial USB converter

PIC16F88
This powerful (200 nanosecond instruction exestuation) yet easy-to-program (only 35 single word instructions) CMOS Flash-based 8-bit microcontroller packs Microchip's powerful PIC architecture into an 18-pin package. The PIC16F88 features 8 MHz internal oscillator, 256 bytes of EEPROM data memory, a capture/compare/PWM, an Addressable USART, a synchronous serial port that can be configured as either 3-wire Serial Peripheral interface (SPI) or the 2-wire inter-Integrated Circuit(I^2C^{TM}) bus, 7 channels of 10-bit Analog-to-Digital converter.

CT coil current sensors
Current transforms are used extensively for measuring current and monitoring the operation of the power grid. CT's are specified by there current ratio from primary to secondary.

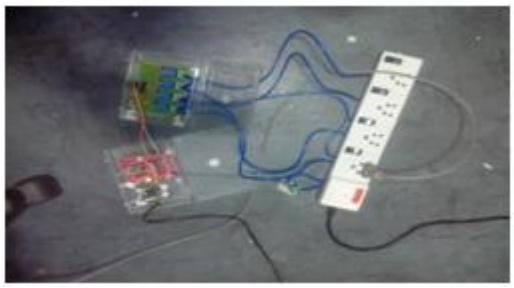
RF Transceiver
The pc or laptop has USB communication but our RF module has UART communication. So we gateway are translator to convert the UART communication to USB communication. So we are using CH340 IC, which is a UART to USB converter, where UAAT side we can connect our RF module and another side which, is a USB we connect with PC or laptop.

ULN2003
UNL2003 is known for its high-current, high-voltage capacity. The drivers can be paralleled for even higher current output. The main specifications are 500 mA rated collector current (single output) and 50 V output (there is a version that supports 100 V output).

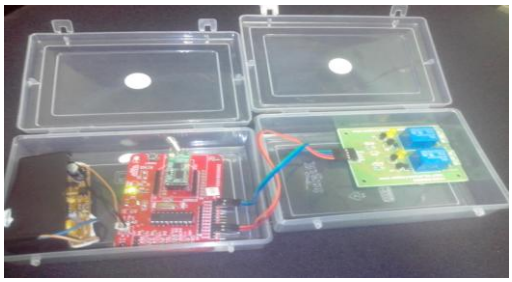
6. Result and Conclusion

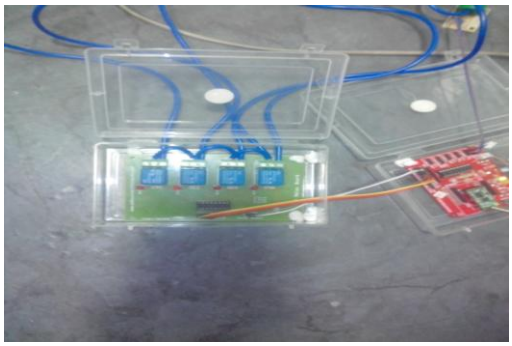
This developed program is successfully burned on the kit using USB programmer. Collect the web based power management kit and setup the connections approximately. Interfacing with fabricated sensing modules does the measurement of electrical parameters of home appliances. Important functions to the system are the ease of modeling, setup, and use. Interfacing with fabricated sensing modules does the measurement of electrical parameters of home appliances. To calculate how much power we consumed can be calculated by installing the software and drive and insert the USB cable to the host computer. Go to the device manager and find the port number and open the software and give the port number and click start. Give the power supply to the kit and extension box. In the extension box all the switches must be in OFF position. Now connect any devices in the extension box like light, fan, computer etc., in the software click the device once and the device will ON and click once again device will OFF.

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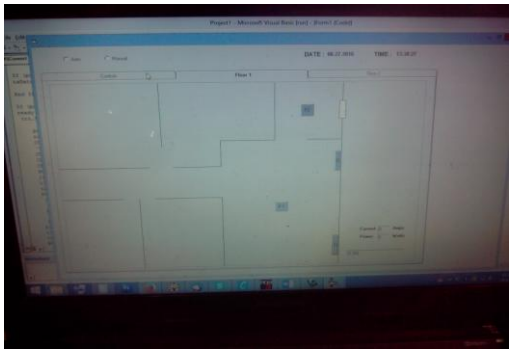


Here we are taking two nodes1 and node2

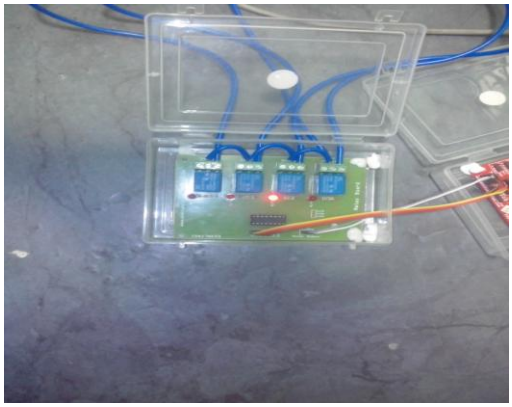




Here we are taking florr1 and florr2. When no devices ON the data should not be displayed on the computer through graphic user interface window.



Here we didn't give any power supply so it showing zero current and power.



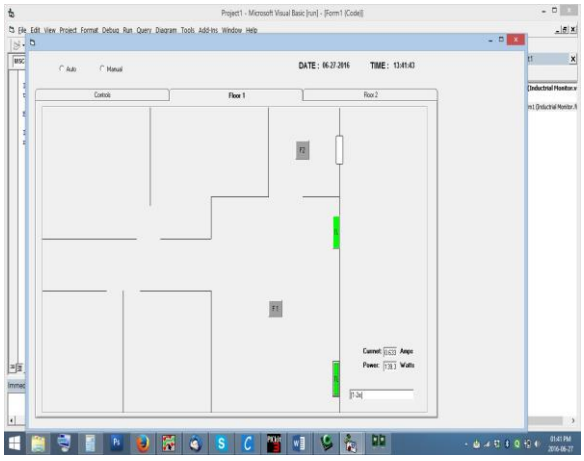
Here we are taking only one device so only one LED bulb is ON.



By monitoring consumption of power appliances data are collected by a ZigBee coordinator, which save all data in the system for processing as well as for future use. The parameters will be stored in a database and analyze. The collected data will be displayed on the graphic user interface. Here we are taking only one device so we can calculate only that device power and current.



Here we are taking two devices so two LED bulbs are ON. So that we can calculate two devices power and current.



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Here we can calculate current and power of two devices by that we can see how much power consumed by the user.



Here we developed an Android app to monitor the smart home power management system. Here we can see only which devices are ON or OFF through mobile application.



We developed an android application only to monitor, which devices are ON or OFF. Here control should be local. Can't control from the remote only building administrator can monitor the status from anywhere.

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