EFFICIENT ANALYSIS OF POWER CONSUMPTION BEHAVIORS OF EMBEDDED WIRELESS IOT SYSTEMS

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I. ABSTRACT

This paper presents a comprehensive model for the power consumption of wireless sensor IOT nodes that accounts for all the energy expenditures at system-level: communications, acquisition and processing. The model is only based on parameters that can be empirically quantified, once the platform (i.e., technology) and the application (i.e., operation conditions) are defined. This results in a new framework for the study and analysis the energy live-cycle within the applications, suitable to determine in advance the specific weight of application parameters and to understand the tolerance margins and trade-offs in the system. A study of wireless technologies for IoT applications in terms of power consumption has been presented in this paper. The study focuses on the importance of using low power wireless techniques and modules in IoT applications by introducing a comparative between different low power wireless communication techniques such as current sensors and voltage sensors, devices and their modules to conserve power and longing the life for the IoT sensors.

Keywords: *microcontroller, current sensor, voltage sensor, slide switches, devices.*

II. INTRODUCTION

Energetically autonomous wireless sensors are the backbone of the Internet of Things (IoT). To implement this concept each sensor node must be able to harvest, buffer and consume the energy available in the environment, in an efficient manner. In this work, we will attempt to develop a model to predict the power consumption of applications running on an embedded hardware platform. In this system we are using various sensors voltage sensor and current sensors. A voltage sensor can in fact determine, monitor and can measure the supply of voltage. We are using GPRS module. Low power consumption and GPRS (global system for mobile communication /general packet radio service) based wireless system. In this wireless security system. To Consumer behavior is

primarily based on individual decisions, which is often driven by external factors such as economic incentives, existing demographics, environmental variables, social norms and infrastructure. Thus, it is important to understand behavior by taking into consideration specific contexts. An overview of the various factors that contribute to power consumption from the perspective of a consumer. These activities can be processing data, transmitting packets, reading sensor values, actuating a device. To generalize this energy consumption prediction model for various hardware platforms and communication protocols, we need to parameterize the model. Because the current consumption, the processing speed, and the transition duration from one state to the other will be different for different hardware platforms.

III. BLOCK DIAGRAM

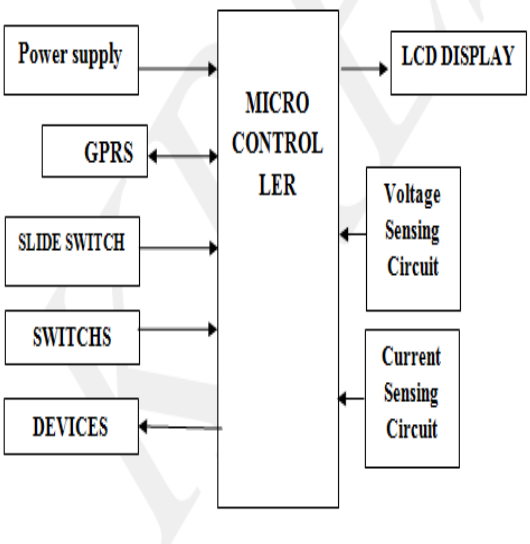

Fig 3.1: System block diagram

System Overview

Power Supply:

This section is meant for supplying Power to all the sections mentioned above. It basically consists of a Transformer to step down the 230V ac to 9V ac followed by diodes. Here diodes are used to rectify the ac to dc. After rectification the obtained rippled dc is filtered using a capacitor Filter. A positive voltage regulator is used to regulate the obtained dc voltage.

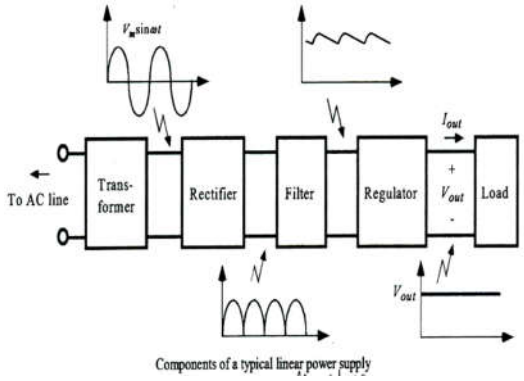

Fig (3.1): functional block diagram of power supply

Microcontroller:

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. 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.

Fig (3.2) lpc2148 pin diagram

LCD Display:

This section is basically meant to show up the status of the project. This project makes use of Liquid Crystal Display to display / prompt for necessary information.

Fig (3.3): Liquid crystal display

Switches:

In electronics, a switch is an electrical component that can break an electrical circuit, interrupting the current or diverting it from one conductor to another. The most familiar form of switch is a manually operated electromechanical device with one or more sets of electrical contacts. Each set of contacts can be in one of two states: either 'closed' meaning the contacts are touching and electricity can flow between them, or 'open', meaning the contacts are separated and non-conducting.

GPRS:

This section consists of a GPRS modem. The modem will communicate with microcontroller using serial communication. The modem is interfaced to microcontroller using MAX 232, a serial driver. The Global Packet Radio Service is a TDMA based digital wireless network technology that is used for connecting directly to internet. GPRS module will help us to post data in the web page directly.

Fig (3.4): GPRS modem (SIM800L)

Current sensor:

Measuring a voltage in any system is a “passive” activity as it can be done easily at any point in the system without affecting the system performance. However, current measurement is “intrusive” as it demands insertion of some type of sensor which introduces a risk of affecting system performance. Current measurement is of vital importance in many power and instrumentation systems. Traditionally, current

sensing was primarily for circuit protection and control. However, with the advancement in technology, current sensing has emerged as a method to monitor and enhance performance.

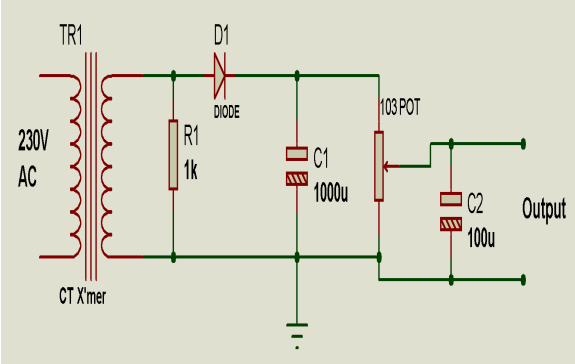

Fig (3.5): Current sensor circuit diagram

Voltage sensor:

Voltage sensors measure AC and/or DC voltage levels. They receive voltage inputs and provide outputs as analog voltage signals, analog current levels, switches, or audible signals. They can also provide frequency and modulated frequency outputs. For example, some electrical voltage sensors produce sine waves or pulse trains.

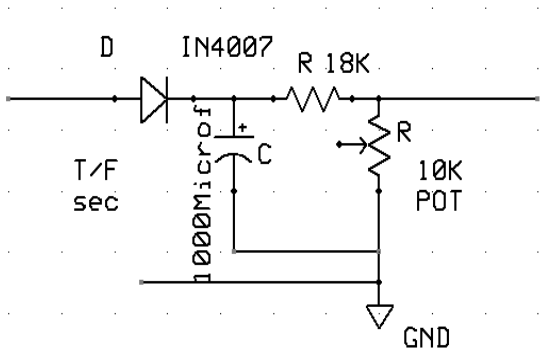

Fig (3.6) voltage sensor circuit diagram

IV. IMPLEMENTATION

In the proposed system we have to measure current and voltage of the main supply line, so that we used current transformer for measuring load current and a resistive ladder for line voltage. The power line voltage signal v(t) is sensed by the high voltage AC electronics. A resistive ladder is used as a voltage divider, a differential voltage develops.

In this system we are designed power supply section to provide +12V DC as well as +5V DC. The all electronics devices required power supply to operate, so we have to power up all the devices according to their requirement. The main device is microcontroller board, to operate it requires +12V so we directly connected to the 12V supply. The relays are requires 12V. The GPRS module requires 12V and sensors are requires 5V.

The current transformer and resistive ladder circuit used as current & voltage sensor to monitoring parameters of power line. These both circuits are interfaced with microcontroller but output of those circuits is analog format so that we have to convert into digital format, here we are using LPC2148 microcontroller so that it contain inbuilt ADC converter. The converted digital signal is compared with predefined threshold value, if output signal is greater than threshold value then microcontroller generate abnormal signal to the LCD. Here we used LCD

display to display supply line parameters and also it will indicate abnormal condition.

In the proposed system we used IOT technology, so we can monitor supply line parameters by using web server, here we can control devices in two modes one is manual mode and another one is GPRS mode, we can select these modes by using mode switch. If we select manual mode then we can control devices by using manual switches. If we select GPRS mode then we can control devices from anywhere in the world.

V. RESULTS:

Fig (4.1) Hardware arrangement

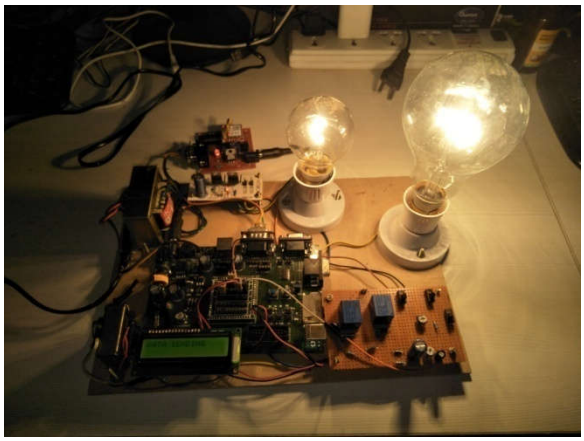

Fig (4.2): GPRS data sending shown on LCD display

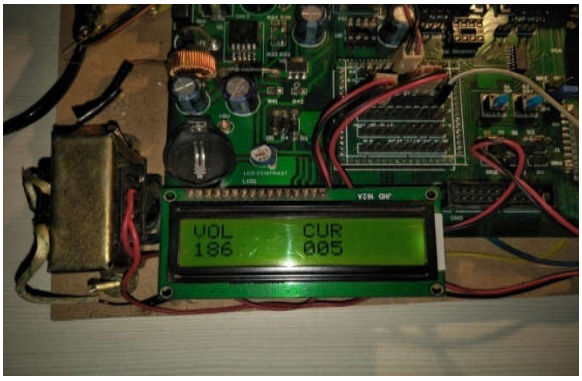

Fig (4.3): voltage and current sensor values displayed on LCD

Fig (4.4) Parameters (Bulbs ON condition) are display on web server

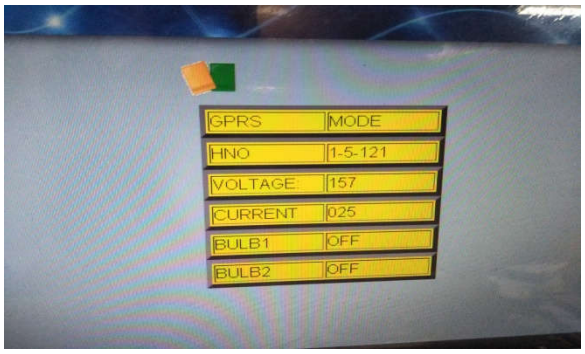

Fig (4.5) Parameters (Bulbs OFF condition) are display on web server

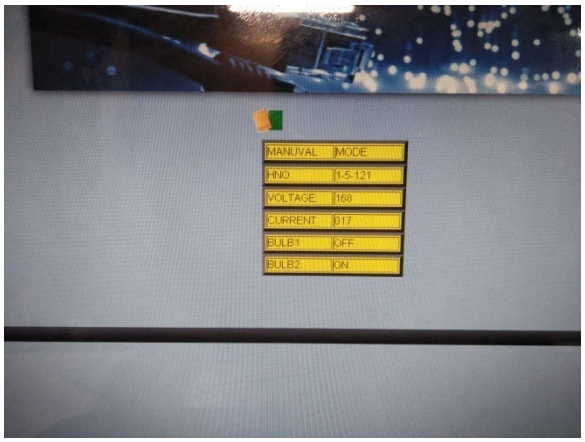

Fig (4.6): parameters (Bulbs are ON, OFF condition) are display on web server

VI. CONCLUSION

A study of wireless technologies for IoT applications in term of power consumption has been presented in this paper. It's seen that the choice of module for each protocol plays a vital role in battery life due to the difference of power consumption for each module/protocol. So, the evaluation of protocols with each other depends on the module used. For short range connectivity the maximum range for transmission and receiving depends on modules and protocols type. So, in sense of distance effect on power consumption, there is no certain module or protocol can be candidate for IoT applications, because the distance depends on the nature of application.

V. REFERENCES

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