

# Harvested Power Wireless Sensor Network for Disaggregated Current Estimation in Large Buildings

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**Abstract-** In modern economies, large service buildings are responsible for an important part of the global electrical energy consumption. The implementations of energy saving strategies can benefit from disaggregated consumption monitoring. To tackle this problem, a number of technological solutions exist, being however, expensive in equipment, installation and maintenance. Because of its decentralized operation principle, wireless sensor networks (WSNs) are an important tool to implement disaggregated electrical energy monitoring. The development of a self-powered, battery-free current sensor node for large WSNs may contribute to the implementation of monitoring solutions for large buildings. In this paper, a solution to monitor disaggregated consumption is presented, based on a contact-less power source for ZigBee nodes using a split-core toroidal coil current transformer (SCCT).

**Keywords-** Current, energy harvesting, estimation, IEEE 802.15 standards, wireless sensor networks

## I. INTRODUCTION

An embedded system is a special-purpose computer system designed to perform one or a few dedicated functions, sometimes with real-time computing constraints. It is usually embedded as part of a complete device including hardware and mechanical parts. In contrast, a general-purpose computer, such as a personal computer, can do many different tasks depending on programming. Embedded systems have become very important today as they control many of the common devices we use.

Since the embedded system is dedicated to specific tasks, design engineers can optimize it, reducing the size and cost of the product, or increasing the reliability and performance. Some embedded systems are mass-produced, benefiting from economies of scale.

Physically, embedded systems range from portable devices such as digital watches and MP3 players, to large stationary installations like traffic lights, factory controllers, or the systems controlling nuclear power plants. Complexity varies from low, with a single microcontroller chip, to very high with multiple units, peripherals and networks mounted inside a large chassis or enclosure.

In general, "embedded system" is not an exactly defined term, as many systems have some element of programmability. For example, Handheld computers share some elements with embedded systems — such as the operating systems and microprocessors which power them — but are not truly embedded systems, because they allow different applications to be loaded and peripherals to be connected.

An embedded system is some combination of computer hardware and software, either fixed in capability or programmable, that is specifically designed for a particular kind of application device. Industrial machines, automobiles, medical equipment, cameras, household appliances, airplanes, vending machines, and toys (as well as the more obvious cellular phone and PDA) are among the myriad possible hosts of an embedded system. Embedded systems that are programmable are provided with a programming interface, and embedded systems programming is a specialized occupation.

Certain operating systems or language platforms are tailored for the embedded market, such as Embedded Java and Windows XP Embedded. However, some low-end consumer products use very inexpensive microprocessors and limited storage, with the application and operating system both part of a single program. The program is written permanently into the system's memory in this case, rather than being loaded into RAM (random access memory), as programs on a personal computer are.

## II. MICROCONTROLLERS FOR EMBEDDED SYSTEMS

In the Literature discussing microprocessors, we often see the term Embedded System. Microprocessors and Microcontrollers are widely used in embedded system products. An embedded system product uses a microprocessor (or Microcontroller) to do one task only. A printer is an example of embedded system since the processor inside it performs one task only; namely getting the data and printing it. Contrast this with a Pentium based PC. A PC can be used for any number of applications such as word processor, print-server, bank teller terminal, Video game, network server, or

Internet terminal. Software for a variety of applications can be loaded and run. Of course the reason a pc can perform myriad tasks is that it has RAM memory and an operating system that loads the application software into RAM memory and lets the CPU run it.

In an Embedded system, there is only one application software that is typically burned into ROM. An x86 PC contains or is connected to various embedded products such as keyboard, printer, modem, disk controller, sound card, CD-ROM drives, mouse, and so on. Each one of these peripherals has a Microcontroller inside it that performs only one task. For example, inside every mouse there is a Microcontroller to perform the task of finding the mouse position and sending it to the PC.

### BLOCK DIAGRAM:

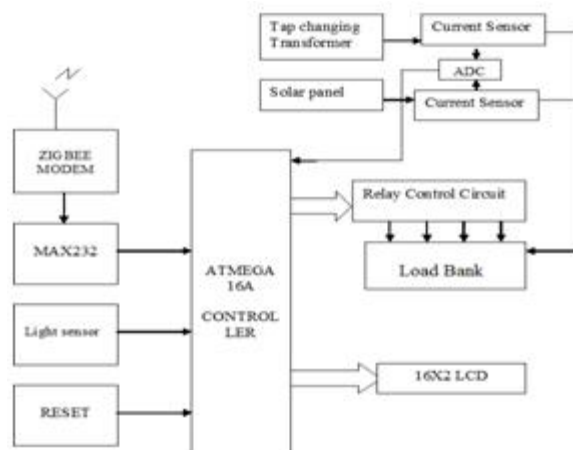


Fig 1. Block diagram of current estimation

### III. SYSTEM ANALYSIS

#### Hardware

- ❖ Power Supply
- ❖ Microcontroller – ATmega 8A
- ❖ Solar panel
- ❖ Light sensor
- ❖ LCD – 16\*2
- ❖ ZigBee
- ❖ Current transformer
- ❖ Relays [SPDT]

#### Software

- ❖ Platform - AVR STUDIO
- ❖ In System Programmer - ProgISP 172
- ❖ Compiler – Win AVR
- ❖ Simulation – Proteus 7.7sp2

### IV. RESULT

The project “Harvested Power Wireless Sensor Network Solution for Disaggregated Current Estimation in Large Buildings” has been successfully designed and tested.

It has been developed by integrating features of all the hardware components used. Presence of every module has been reasoned out and placed carefully thus contributing to the best working of the unit.

Secondly, using highly advanced IC’s and with the help of growing technology the project has been successfully implemented.

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