DEVELOPMENT OF A LOW POWER CONSUMPTION SMART EMBEDDED WIRELESS SENSOR NETWORK FOR THE UBIQUITOUS ENVIRONMENTAL MONITORING USING ZIGBEE MODULE

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ABSTRACT

An emerging ubiquitous technology has called for the development of a Smart Embedded Wireless Sensor Networks (SEWSN), which has gained a tremendous attention over the years but has a shortcoming including power consumption, mobility, and end-to-end communication. The ability of environmental conditions monitoring is fundamental to research about climate variability in the greenhouse, gardens, zoology, pharmaceutical process and others. Being able to document a baseline and changes in environmental parameters monitoring and weather condition in a real-time at a remote location is increasingly essential which has not been addressed totally. In this paper, we proposed the development of an experimental Smart Sensing Platform (SSP) for a real-time monitoring of environmental parameters using ZigBee module (IEEE 802.15.4). It also introduces an approach to achieved low power consumption in a wireless sensor system. The embedded system consists of a digital humidity and temperature sensor (DHT11) for acquiring the environmental parameters, the XBee module for RF transmitter and receiver, ATmega328 for control unit and so on. The practical results show that the system achieved a real-time data acquisition, efficient energy management and ends-to-ends communication, which capable of storing data and dynamically plot the graphical information for statistical analysis. The transmitting current of the module is determined to be 25.8 (mA), the sleeping mode current is at 1 (µA) and the current used in listening mode was 31.5 (mA).

Keywords: ATmega328, Greenhouse, Wireless Sensor Network, Ubiquitous technology, ZigBee module

INTRODUCTION

The implementation of an intelligent and automation system has improved the human livings in this era compared to the last decade by transforming several activities that are labour intensive, time wastes and others into simple touch control and remote monitoring using embedded system wireless technology [Aboaba et al., 2015]. The development of an embedded system based wireless sensor networks (WSNs) using different physical and media access control layer technology (such as ZigBee, Z-Wave, Bluetooth and Wi-Fi) in the internet of thing architecture has play significant roles of applications in the environment monitoring and surveillance, domestic home appliances control, medical systems, pharmaceutical process and robotic exploration [Liu L. et al., 2012].

The Internet of Things (IoT) is a universal network technology that allows things to be connected and communicate to each other over the 6LowPAN platform. It enables things, devices to be monitoring and control of the physical environment by collecting data, processing