

Design and Implementation of Zigbee Protocol in Wireless Sensor Networks

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Abstract– Recently, there has been a growing demand to incorporate multimedia content delivery over the Wireless Sensor Networks (WSNs). This feature could not only enhance several existing applications in the commercial, industrial, and medical domains, but could also spur an array of new applications. However, the efficient gathering of still images, audio, and video information in WSNs imposes stringent requirements on the throughput and energy consumption. Most wireless communication standards with high or moderate data throughputs do not focus primarily on energy efficiency. The IEEE 802.15.4 WPAN standard provides a widely accepted solution for low-cost and low-power wireless communication, with a potential to cater to many types of application scenarios. To design a wireless interactive data acquisition and control system is a challenging part of any measurement, automation and control system applications. Advancement in technology is very well reflected and supported by changes in measurement and control instrumentation. Data acquisition and control system based on AVR microcontroller (Atmega168) is presented. This makes use of the built in ADC of the microcontroller and thus the resolution is 10 bits i.e. one part in 1024. . The controlling program on an arduino read this input at pre-decided time intervals. The controlling program reads these values and process accordingly. Microcontroller programs are also developed and tested successfully.

Keywords: - WSNs, Zigbee, Data acquisition, Controlling, 802.15.4

I. INTRODUCTION

Many believe that Wireless Sensor Networks (WSNs) are an indispensable part of the latest wave that will revolutionize the way we do computing today. WSNs will enable our transition from the notion of “personal computing” to a technology infrastructure that allows us to integrate computing into the environment, a concept coined as “pervasive and embedded computing”. In this scenario, multimedia data with multiple modalities, such as still image, audio, and video, may be more influential than a large amount of conventional data observed and gathered from the physical environment. Consequently, the scope of its applicability and functionality goes beyond what traditional applications, such as habitat and healthcare monitoring, target tracking and military surveillance, and home automation and control, have to offer. Wireless Interactive Data Acquisition and Control system plays the major role in the rapid development of the fast popularization and control in the field of measurement and control systems. It has been designed with the help of many electrical, electronic and low voltage equipment’s it makes the system more complicated and not reliable.

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It makes the system more reliable and avoids more complication. It is the great demand in consumer applications and many industries. This system replaces various complex cables which are used for data acquisition and it uses ARDUINO and Atmega168 processor for data acquisition and controlling. Data acquisition system is extensively employed in a number of automatic test and measuring equipment’s. They are used to collect the required data from any peripheral input devices, such as meters, sensors and etc. This data acquisition system makes use of a 10 bit fast ADC available in AVR microcontroller Atmega168. The data acquisition system presented makes use of two analogue inputs out of which one can be used for sensing the temperature and the other can be used for sensing the humidity.

II. SYSTEM OVERVIEW

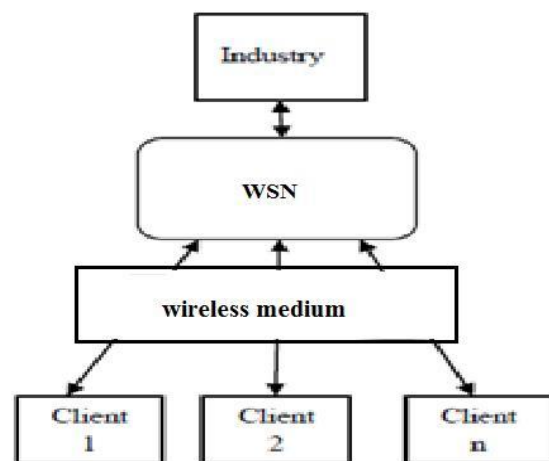


Fig: System overview

Own system using internet. During signal measurements Analog to digital converter is very important, because almost every external source is giving analog signal only. This system has an inbuilt 10-bit ADC with 6 –analogue input channels.

2.1 ARCHITECTURE

IDACS design is the major part in hardware. Atmega168 processor is a Centre core of this system. The general hardware structure of the IDACS is shown in Fig 2. The present data acquisition system makes use of a 10 bit ADC available in AVR microcontroller Atmega168. The ATmega168 has 16K bytes of Flash Program, 512 bytes EEPROM and 1K byte SRAM. This system can measure any kind of electrical and non-electrical signals locally as well as remotely. And it can able to control the devices remotely.

6.1 HUMIDITY SENSOR

Based on a unique capacitive cell, these relative humidity sensors are designed for high volume, cost sensitive applications such as office automation, automotive cabin air control, home appliances, and industrial process control systems. They are also useful in all applications where humidity compensation is needed.

FEATURES

- Full interchangeability with no calibration required in standard conditions
- Instantaneous desaturation after long periods in saturation phase
- Compatible with automatized assembly processes, including wave soldering, reflow and water immersion (1)
- High reliability and long term stability

6.2 PIR SENSOR

A passive infrared sensor (PIR sensor) is an electronic sensor that ensures infrared (IR) light radiating from objects in its field of view. They are most often used in PIR-based motion detectors. A PIR-based motion detector is used to sense movement of people, animals, or other objects. They are commonly used in burglar alarms automatically activated lighting systems. They are commonly called simply "PIR," or sometimes "PID," for 'passive infrared detector'.

VII. ZIGBEE TECHNOLOGY

ZigBee is the only standards-based wireless technology designed to address the unique needs of low-cost, low-power wireless sensor and control networks in just about any market. Since ZigBee can be used almost anywhere, is easy to implement and needs little power to operate, the opportunity for growth into new markets, as well as innovation in existing markets, is limitless.

VIII. RESULTS & DISCUSSIONS

We have tested the complete wireless data acquisition system. And successfully got the results as shown below:



IX. CONCLUSION AND FUTURE SCOPE

Over the years, the IEEE 802.15.4 standard has made a reputation as a prominent technology, with the potential to cater to many types of application scenarios. Moreover, advancements in image technology encourages combining image data with conventional sensing data to leverage

existing Wireless Sensor Networking applications. However, multimedia communication over resource-constrained networked sensors imposes a new set of challenges, where higher data throughput with lower latency is demanded without compromising energy efficiency.

With the rapid development of the field of industrial process control and the wide range of applications of network intelligence, digital distributed control System, it is necessary to make a higher demand of the data accuracy and reliability of the control system. Wireless interactive data acquisition and control system based on an AVR microcontroller Atmega168 from Atmel Corporation is designed developed and tested.

This system can be widely applied to electric power, petroleum, chemical, metallurgy, steel, transportation, Electronic & Electrical industries, Automobiles and so on. The system is flexible in design so that it can be adapted to a wide variety of experiments requiring continuous monitoring of several signals under program control. This system can also be implemented by different sensors.

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