AN INTERNET BASED INTERACTIVE EMBEDDED DATA ACQUISATION

INTRODUCTION:

Eliminating the physical cabled connection between a data acquisition system and the data processing unit brings flexibility and robustness to every system, especially when this system is located in an industrial environment. This project investigates the possibility to build a small-sized, low-cost wireless data acquisition system with improved power saving capabilities.

The aimed computational platform is the PDA (Personal Digital Assistant) while the chosen wireless communication standard is ZigBee. Data acquisition, storage and communication are implemented in microcontroller architecture with integrated A/D converter and UART interface and an external PC. This project presents development of embedded wireless system to replace wired systems. Zigbee wireless system is developed to replace wired electrophysiology system.

The present invention relates, generally, to wireless data acquisition systems for data communications and, more particularly, to wireless data acquisition systems which employ small size, low power and low cost components and which may be adapted for different applications by software programming.

All data acquisition systems generally operate in a similar fashion. They receive an external input from some type of sensing device, condition and/or convert the input to a format suitable for transmission, as necessary, and transmit it to another piece of equipment usually a monitor or controller, which may be a computer, and more specifically, a personal computer. The external input is generally an analog signal, although digital signals, frequently on-off switching, pulse-width modulation, or serial data protocols, are also involved. The Computer then transmits the data over the internet.

INTRODUCTION:

With the advent of the new low-cost wireless technologies, the functionality of data acquisition systems can be enhanced eliminating the burden of cabled connection between the system itself and the data processing unit. Especially in the industrial environment, where every supplementary plug implies design and financial efforts, a wireless link between a data acquisition module (sensor with signal conditioning and digital conversion) and a data processing unit (PC, Laptop or PDA) brings flexibility and robustness to the entire design.

The goal of this project was to investigate the possibility to build a small-sized, low-cost wireless data acquisition system with improved power saving capabilities. The aimed computational platform was the PDA (Personal Digital Assistant) while the chosen wireless communication standard was Zigbee.

In the case of a wired system the analog input can be transmitted directly over interconnecting wiring with the major concern being that the interconnecting wires be suitably shielded to prevent interference by nearby electromagnetic sources. Signal conditioning becomes critically important for wireless systems, though. This is especially so when considering power consumption, size and cost factors. Because electronic inputs can have different characteristics (e.g.: high frequency or low frequency) and ranges (e.g.: microvolts to many volts), data acquisition systems are either application specific, i.e. designed to accept and condition a particular type of signal, i.e.: current, with a range of 4-20 mA for instance, or include separate discrete signal conditioning devices which consume a large amount of power and add considerable size.

Radio frequency (Zigbee) wireless data acquisition systems can convert the input to a conditioned electronic signal which is used to modulate a carrier frequency which is then transmitted as a radio frequency signal to equipment in another location. The conditioned signal is encoded with data corresponding to the status of the input. The radio frequency signal is received, demodulated and decoded and the data is read, displayed, stored, and/or acted upon, i.e. monitored, analyzed, by equipment at the receiving point.

WORKING PRINCIPLE:

Accordingly, the present invention relates to a wireless data acquisition and transmission system comprising a signal processing module containing a module microcontroller having a memory. The signal processing module operation includes inputting, conditioning and processing at least one external input having a certain range, character and type, and transmitting by wireless means a signal encoded with data corresponding to external input. The module microcontroller adapts the signal processing module in response to variation in the range, character and type of the external input such that the adaptation occurs during signal processing module operation.

The input is adjustable either under control of the module microcontroller or by means of individually components based upon the specific external input characteristics and range enabling the input means to accept that specific external input. For example, if the input is a 4-20 mA analog signal, the input is programmed by the module microcontroller and/or populated with the components needed to accept that range and characteristic of signals. If the input characteristics change the programming and/or components change accordingly but the same platform circuit board design is utilized. In other words, the same platform design is utilized notwithstanding the character, range, or quantity (number of external inputs) [up to a predetermined limit] of the input.

The module microcontroller controls the operation of the signal processing module. In the present invention, the module microcontroller is programmed by the external programming through the connector or through radio frequency signal from the base station. The same module microcontroller, therefore, can be utilized for all applications and inputs by programming it for those applications and inputs. If the application or inputs change, the module microcontroller is modified by merely reprogramming. The digital signal is inputted to the module microcontroller. The module microcontroller formats the digital signal into a digital data stream encoded with the data from the digital signal. And sends over the monitored data over the zigbee to the base station application that monitors the data. This Application is connected to the internet and a remote user might login with a password to check the status of the system.

COMPONENTS USED:

- Microcontroller
- Sensors
- Zigbee Module
- Max 232
- RS232 Cable
- Power supply etc,

SOFTWARE USED:

- Keil C Compiler
- Microsoft Visual Studio
- MSQL Database Sever

COMPONENT DESCRIPTION:

Power supply:

The microcontroller and other devices get power supply from AC to Dc adapter through voltage regulator. The adapter output voltage will be 12V DC non-regulated. The 7805 voltage regulators are used to convert 12 V to 5VDC.

Vital role of 7805 voltage regulator in 'Intelligent car monitoring using GSM & GPS' is as follows:

The adapter output voltage will be 12V DC non-regulated. The 7805/7812 voltage regulators are used to convert 12 V to 5V/12V DC.

Micro controller-AT89S52

The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density

Nonvolatile memory technology and is compatible with the industry- standard 80C51 instruction set and pin out.

Features:

- 8K Bytes of In-System Programmable (ISP) Flash Memory
- Endurance: 1000 Write/Erase Cycles
- 4.0V to 5.5V Operating Range
- 256 x 8-bit Internal RAM
- 32 Programmable I/O Lines
- Full Duplex UART Serial Channel
- Fully Static Operation: 0 Hz to 33 MHz

Vital role of Micro controller-AT89S52 in 'Intelligent car monitoring using GSM & GPS' is as follows:

- Sending and Receiving data to Computer
- Interfacing I^2C.
- Displaying results in LCD.

RS 232 CONVERTER (MAX 232N)

RS-232 was created for one purpose, to interface between Data Terminal Equipment (DTE) and Data Communications Equipment (DCE) employing serial binary data interchange. So as stated the DTE is the terminal or computer and the DCE is the modem or other communications device.

RS-232 pin-outs for IBM compatible computers are shown below. There are two configurations that are typically used: one for a 9-pin connector and the other for a 25-pin connector.

9-pin RS-232 Pin-out

PIN	DESIGNATION
1	Data Carrier Detect
2	Receive Data
3	Transmit Data
4	Data Terminal Ready
5	Signal Ground
6	Data Set Ready
7	Request to Send
8	Clear to Send
9	Ring Indicator

Voltage range

The standard voltage range on RS-232 pins is _15V to +15V. This voltage range applies to all RS-232 signal pins. The total voltage swing during signal transmission can be as large as 30V. In many cases, RS-232 ports will operate with voltages as low as _5V to +5V. This wide range of voltages allows for better compatibility between different types of equipment and allows greater noise margin to avoid interference. Because the voltage swing on RS-232 lines is so large, the RS-232 signal lines generate a significant amount of electrical noise. It is important that this signal does not run close to high impedance microphone lines or audio lines in a system. In cases where you must run these types of signals nearby one another, it is important to make sure that all audio wires are properly shielded.

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Vital role of RS232 Converter (Max 232n) in: 'Intelligent car monitoring using GSM & GPS'.

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5 volt logic and from 5 volt logic to 12 volt logic .The serial port is used transfer the data from microcontroller to the peripheral devices.

Zigbee module

- Integrated 2.4 GHz, IEEE 802.15.4-compliant transceiver, PHY and MAC
- 3 dBm nominal TX output power
- -95 dBm (typ) RX sensitivity

- + 5 dBm in boost mode
- Integrated Murata antenna
- 128 kb embedded Flash and 5 kb integrated SRAM for program and data storage
- 17 GPIO with alternate functions: GPIOs, UART, I2C, SPI, ADC
- 2 16-bit general purpose timers: one 16-bitsleep timer
- ADC, sigma-delta converter with 12-bit resolution
- On board 24 MHz stable crystal
- Selectable integrated RC oscillator (typ 10 kHz) or 32.768 kHz crystal for low
- power operation
- < 2 µA (typ) power consumption in deep sleep mode
- Watchdog timer and power on reset
- Pins available for non-intrusive debug interface(SIF)
- Single supply voltage 2.1 to 3.6 Vdc
- CE and FCC compliance. FCC ID:S9NZB250A

ADVANTAGES:

- Full remotely control and access the data from the sensor
- Sensors are connected wirelessly through Zigbee
- Monitor number of sensors from single system using Mesh Network
- No manual work needed

DISADVANTAGES:

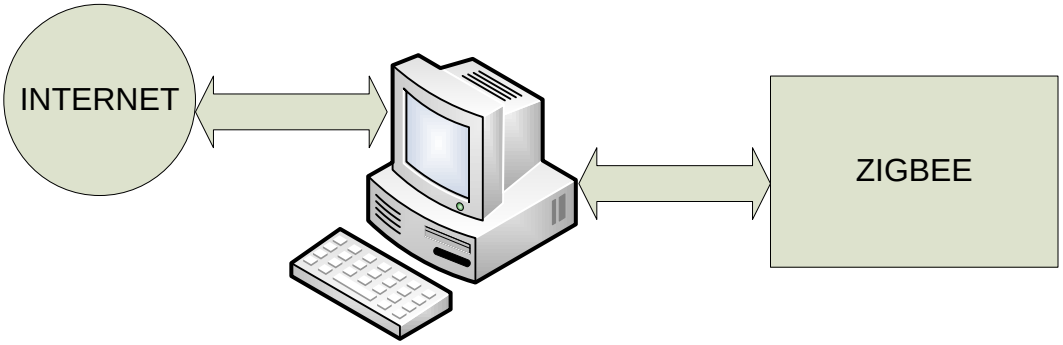
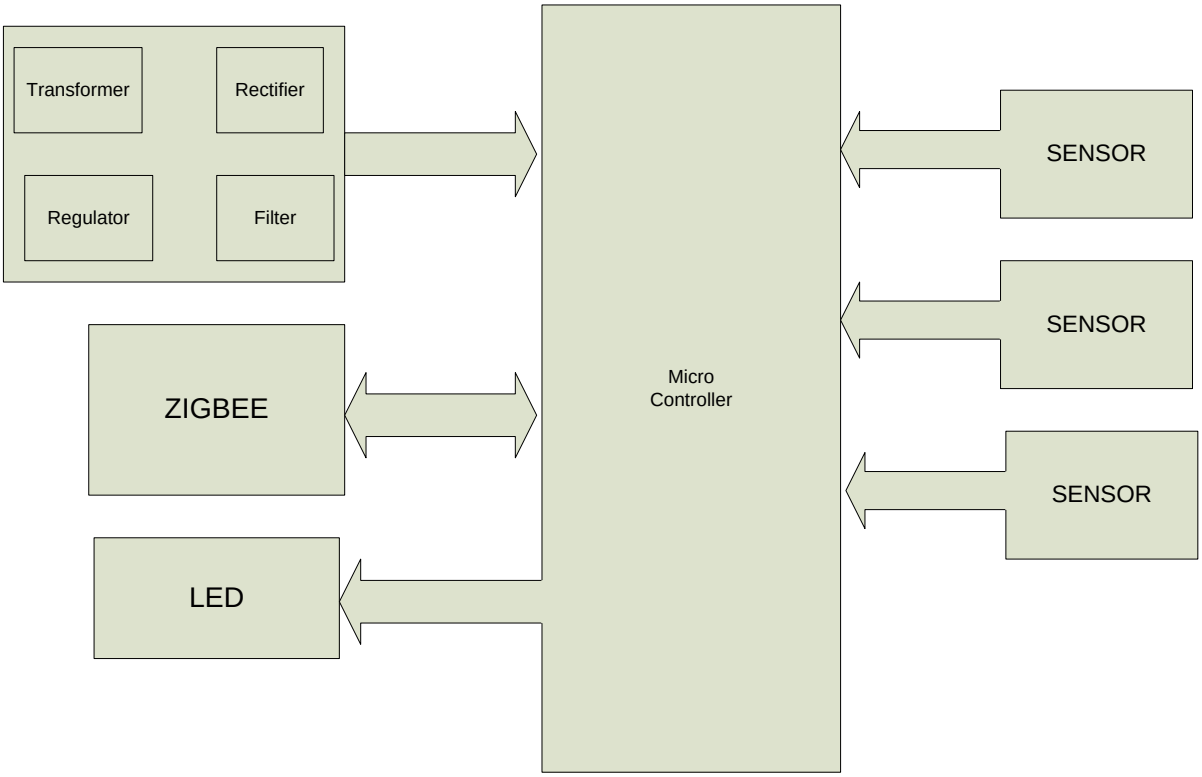
- Number of Zigbee will increases with number of sensors.

APPLICATIONS:

- Applicable in remote data monitoring system.

BLOCK DIAGRAM:

RECEIVING SIDE:



SENDING SIDE: