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Industrial Data Locker Using Android Plat Form

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Abstract:

The advent of new high-speed technology and the growing computer Capacity provided realistic opportunity for new design of an android based data acquisition system using wireless zigbee communication network. The paper presents a new era of an intra load based parameters monitoring and locking the status to display onto the PC using zigbee wireless technology. The acquired sensed data which is received from wireless network can be stored and uploads it to the internet. Using either android program or through a website portal the consumer can check monitored or measured data. Thus the user can know about the status of the system remotely. This system comprises of a PIC microcontroller, Zigbee transceiver module for wireless communication and load control techniques.

Index terms:

PIC microcontroller, Current transformer, Zigbee transceivers, relays, Android.

I.INTRODUCTION:

With the scarcity of power resources and increase in demand for power, the world is going through a power crisis. The world is now looking forward to develop technologies for efficient power generation and utilization at the same time. In some countries high loads at peak hours have lead to blackouts in the past. So power generation efficiency alone is not important to a country but efficient power consumption pattern as well.In this situation it has become a necessity to raise awareness about the importance of giving people access to data surrounding their energy usage. Mobile applications will play a major role inhuman to human and machine to human interaction. Smart plug enables the users to operate a device and monitor its power consumption even from a remote location using an android.

SCADA is an acronym that stands for Supervisory Control and Data Acquisition. SCADA refers to a system that collects data from various sensors at a factory, plant or in other remote locations and then sends this data to a central computer which then manages and controls the data. The monitoring function collects data and sends it back to the central computer. The control function gathers data from monitoring sensors processes it and send control signals back to the equipment according to a prescribed software program.

The user interface is often a large control room where individuals can monitor SCADA input and output responses in real time. SCADA systems are an extremely advantageous way to run and monitor processes. They are great for small applications such as climate control or can be effectively used in large applications such as monitoring and controlling a nuclear power plant or mass transit system.

The literature related to the research topic has been reviewed for last twenty years in order to find out work carried out by various researchers. There are many systems for remote monitoring and control designed as commercial products or experimental research platforms. It is noticed that most of the research carried out belongs to the following categories.

- Uwb channel measurement in an industrial environment.
- Emi disruptive effect on wireless industrial communication system in a paper plant.
- Study and simulation of the ambient noise of an industrial environment for wireless communication application.

In recent years, ultra-wideband (UWB) spread spectrum techniques have gained increasing interest.

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UWB systems are often defined as systems that have a relative bandwidth larger than 20% and/or absolute bandwidth of more than 500 MHz. There are several qualities of an UWB channel that can be of interest in the area of wireless communications.

The large relative bandwidth, as well as the large absolute bandwidth, ensures resistance to frequency-selective fading, which implies more reliable communications. Also, the spreading of the information over a very large frequency range decreases the spectral density. This decreases interference to existing systems and makes interception of communication more difficult. Finally, the concept of impulse radio allows the construction of modems without RF components, which allows simpler and cheaper transceivers. For the planning of any wireless system, channel measurements and modeling are a basic necessity. It has been shown by theoretical as well as practical investigations that the UWB channel has properties that can be fundamentally different than those of narrowband channels

II. RELATED WORK:

The objective of the proposed system is to minimize human casualties of making mistakes based on sensors data monitoring and manual based controlling. The SCADA system can provide the acquisition of data based on the sensors connected with automatic controlling of the load. The data management system comprises of wireless sensor network with zigbee based communication unit.

The proposed system consists of PIC microcontroller interfaced with Current Transformer-Sensor. Since PIC has inbuilt ADC the sensors are directly connected with it and the data retrieved values from sensors are continuously monitored with the set values. The Sensed energy value sends it to the data management system using Zigbee communication. The data management system collects and stores the data and uploads it to the internet.

The consumer can directly monitor the monitored data on to the PC using wireless zigbee network and also onto the smart android mobile phone with Android SDK application development. Thus the locked data can be revealed about the status of the system remotely.

In terms of complexity embedded systems can range from very simple with a single microcontroller chip, to very complex with multiple units, peripherals and networks mounted inside a large chassis or enclosure. The software tools used for the development are PIC C Compiler for programming PIC microcontroller, PIC KIT 2 connects to the PIC microcontroller hardware to upload programs and to communicate with it, Android SDK and Eclipse SDK for android application development and MYSQL/PHP coding is done for setting up the server.

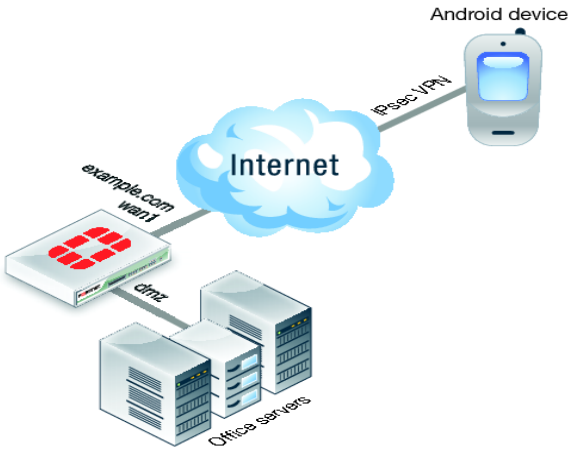

Fig-1: Wireless communication network using Android OS to PC.

III.HARDWARE DESIGN OF PROPOSED SYSTEM:

In this paper we presented a PC based wireless Industrial data locker using Android platform and the monitored data is stored onto the PC using wireless Zigbee network technology. In this work, we propose to develop a smart plug, an energy monitoring system that provides real time update of the energy consumption at the device level. The system uses PIC microcontroller board, an ENC28J60 ethernet module, and a current transformer sensor.

The method of current sensing employed is non- invasive type. The User Interface of the system is to be developed in android and the data will be uploaded onto a server using the ethernet connectivity. The final output results to be a smart plug that can monitor a remote device using ethernet- android platform. The Microcontrollers used in the project are programmed using Embedded C language.

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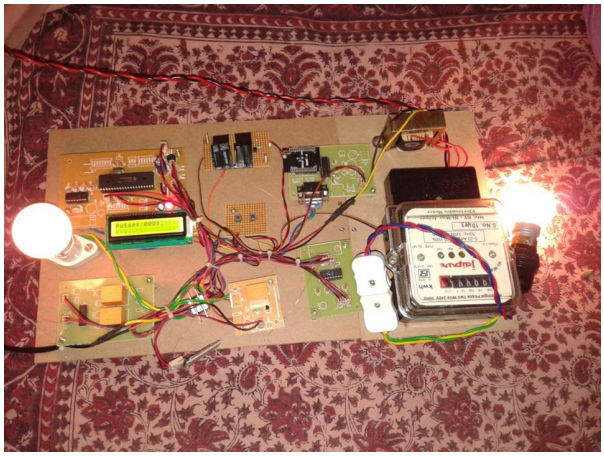

Fig-2: Working model of Industrial data Logger.

The proposed working model consists of two categories mentioned below-

1.Hardware section Category:

The Entire paper work explains the concept of data based management system with wireless network communication using ethernet module and android SDK application. The system requires hardware modules like current sensor; loads connected with a relay switches, Ethernet module, Zigbee transceiver modules, Android mobile phone.

The operating device or the controller we are using is a Samsung Galax Y S5360. It operates on Gingerbread OS (API level 8) with 835MHz single-core processor. The executable application is installed on the device with communicates with the server (PC),which in turn send communicates with the client modules or the house appliances through a relay board designed for parallel interfacing.

The hardware description of the proposed system is explained as below:

a.PIC Microcontroller:

The microcontroller used in the proposed system is PIC which stands for Peripheral Interface Controller given by Microchip Technology to identify its single-chip microcontrollers. PIC microcontrollers are very successful in 8-bit microcontrollers. This project makes use of an onboard mini computer, which is usually termed as micro controller. It acts as heart of the project.

This onboard computer can efficiently communicate with the output and input modules which are being used. The controller contains some internal memory to store the program code.

This memory is also used to dump some set of assembly instructions into the controller and these help for the functioning of the controller.

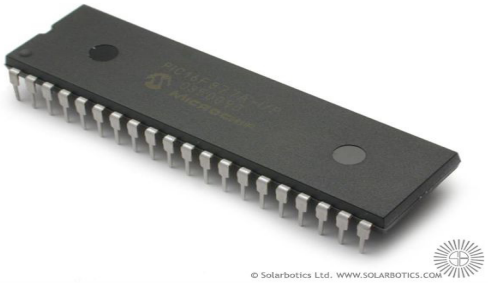

Fig-3: Microcontroller

The crystal oscillator speed that can be connected to the PIC microcontroller ranges from up to 20Mhz. Using the CCS C compiler usually 20Mhz oscillator will be used.

The cost of the microcontroller is also very cheaper. The 20 MHz crystal oscillator should be connected with about 22pF capacitor. There are 5 input/output ports on PIC microcontroller namely port A port B port C port D and port E.

Every single port has different based functionality. Most of them can be used as general I/O ports. The microcontroller uses Harvard architecture which separates both Program and Variable (data) memory interface. This facilitates fetching of an instruction and the operation on data/accessing of variables simultaneously.

b. Relay Interface Circuit:

The relay interface circuit is used to connect the PC with the household electronic or electrical appliances. The circuit comprises of a relay (5v, 5A), a freewheeling diode, a transistor to drive the relay energizing input and connectors to interface parallel port. For testing purpose we are using two fans and two LED's (serving as light bulbs).

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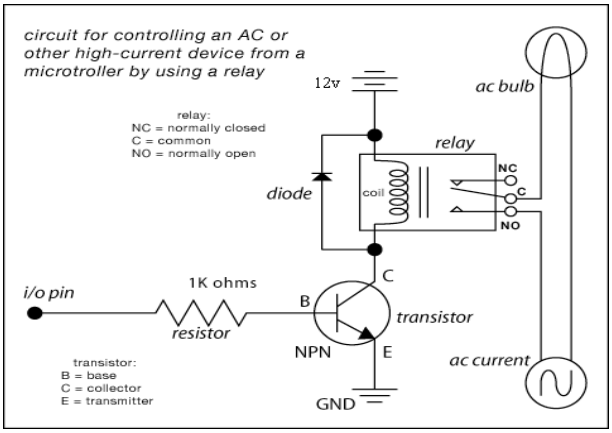

Fig-4: Circuit model of relay unit

c. LCD Display module:

One of the most common devices attached to a micro controller is an LCD display. A liquid crystal display is special thin flat panels that can let light go through it, or can block the light. Some of the most common LCD's connected to the many microcontrollers are 16x2 and 20x2 LCD displays.

It means that 16 characters per line by 2 lines were displayed and 20 characters per line by 2 lines were displayed, respectively. Liquid crystal displays are usually abbreviated as LCD's. These displays are often used in battery-powered devices, such as digital watches, since they require very little amount of electricity consumption.

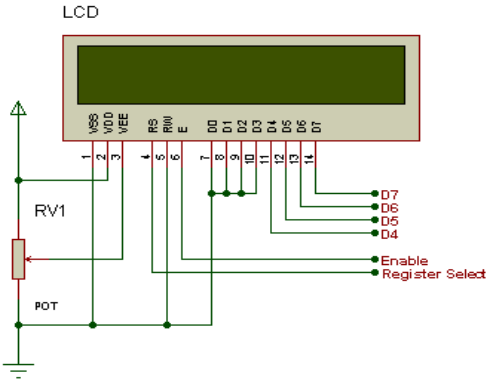

Fig.5. LCD module

d. Zigbee module:

Zigbee is a PAN technology based on the IEEE 802.15.4 standard. Unlike Bluetooth or wireless USB devices, Zigbee devices have the ability to form a mesh network between nodes. Meshing is a type of daisy chaining from one device to another.

This technique allows the short range of an individual node to be expanded and multiplied, covering a much larger area.

Fig.6 Zigbee module

e. Energy meter module:

An electricity meter or energy meter is a device that measures the amount of electric energy consumed by a residence, business, or an electrically powered device. Electricity meters are typically calibrated in billing units, the most common one being the kilowatt hour [kWh]. Periodic readings of electric meters establish billing cycles and energy used during a cycle. The amount of energy represented by one revolution of the disc is denoted by the symbol Kh which is given in units of watt-hours per revolution. The value 7.2 is commonly seen. Using the value of Kh one can determine their power consumption at any given time by timing the disc with a stopwatch.

$$P = \frac{3600 \cdot Kh}{t}$$

Where:
t = time in seconds taken by the disc to complete one revolution,
P = power in watts.
For example, if Kh = 7.2 as above, and one revolution took place in 14.4 seconds, the power is 1800 watts. This method can be used to determine the power consumption of household devices by switching them on one by one.

Fig.7: Energy meter Module

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f. Current Transformer (Sensor) module:

In the proposed system the current transformer works as sensor based unit for sensing the load voltage input, as a current transformer (CT) is used for measurement of electric currents. Current transformers, together with potential transformers (PT), are known as instrument transformers. When current in a circuit is too high to directly apply to measuring instruments, a current transformer produces a reduced current accurately proportional to the current in the circuit, which can be conveniently connected to measuring and recording instruments. A current transformer also isolates the measuring instruments from what may be very high voltage in the monitored circuit. Current transformers are commonly used in metering and protective relays in the electrical power industry.

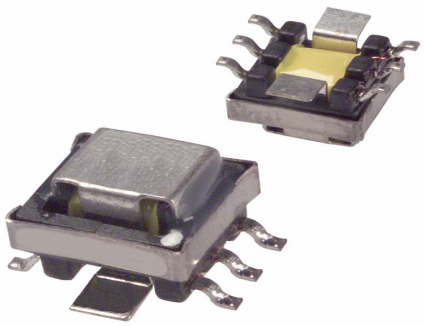

Fig.8 : Current sensor Module

2.Software Section Category:

The data management system which is proposed in the paper makes use of Express SCH or Express PCB software for circuit designing and it also uses a number of different programming tools mentioned as below.

a. Android SDK:

The development kit used to program on Eclipse Indigo IDE is the ANDROID SDK developed by Google, Inc. The Android SDK separates tools, platforms, and other components into packages you can download using the SDK Manager. For example, when the SDK Tools are updated or a new version of the Android platform is released, you can use the SDK Manager to quickly download them to your environment.

b.PIC Microcontroller related software Tools:

PIC compiler is software used where the machine language code is written and compiled. After compilation, the machine source code is converted into hex code which is to be dumped into the microcontroller for further processing. PIC compiler also supports C language code.

The PCB, PCM, and PCH are separate compilers. PCB is for 12-bit opcodes, PCM is for 14-bitopcodes, and PCH is for 16-bit opcode PIC microcontrollers.

Due to many similarities, all three compilers are covered in this reference manual. Features and limitations that apply to only specific microcontrollers are indicated within. These compilers are specifically designed to meet the unique needs of the PIC microcontroller. This allows developers to quickly design applications software in a more readable, high-level language.

c.Proteus Software Tools:

Proteus is software which accepts only hex files. Once the machine code is converted into hex code, that hex code has to be dumped into the microcontroller and this is done by the Proteus.

Proteus is a programmer which itself contains a microcontroller in it other than the one which is to be programmed.

This microcontroller has a program in it written in such a way that it accepts the hex file from the pic compiler and dumps this hex file into the microcontroller which is to be programmed.

As the Proteus programmer requires power supply to be operated, this power supply is given from the power supply circuit designed and connected to the microcontroller in proteus.

The program which is to be dumped in to the microcontroller is edited in proteus and is compiled and executed to check any errors and hence after the successful compilation of the program the program is dumped in to the microcontroller using a dumper.

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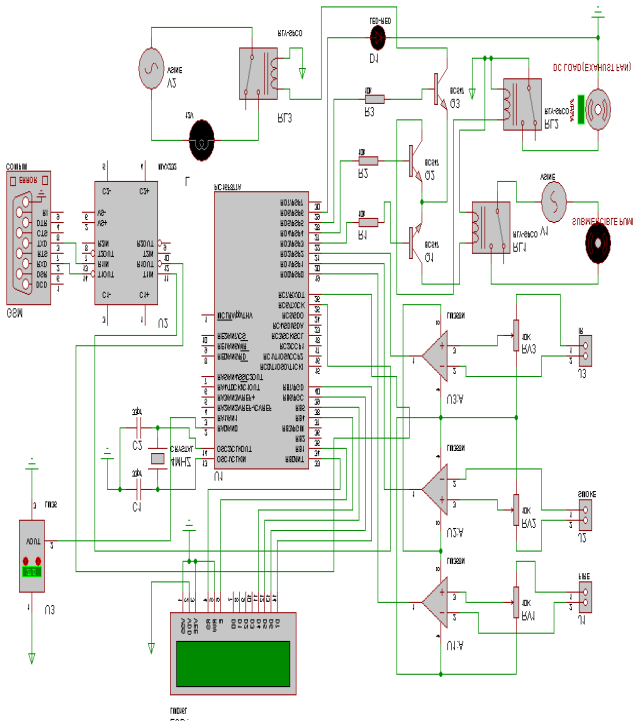

Fig-9: Schematic Diagram of proposed system using Proteus software

IV.CONCLUSION:

An existing Data management system of industrial parameters using Android platform and Ethernet connectivity was designed such that the industrial parameters are sensed using sensors like current sensor and energy meter for reading .

the load parameters and the monitored data was transferred using zigbee and displayed on to the PC monitor using Ethernet connectivity also to smart Android mobile using Bluetooth communication.

The Bluetooth client was successfully tested on a multitude of different mobile phones from different manufacturers, thus proving its portability and wide compatibility.

This project will not only provide convenience to the common man but will be a boon for the elderly and disabled.

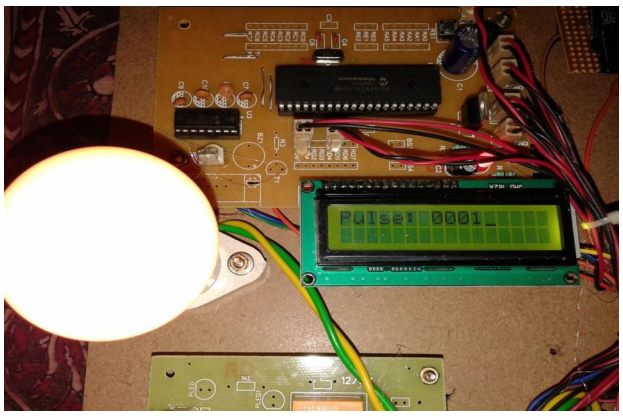

Fig-9: Over load measuring and auto controlling image of proposed system using relay.

This system can be further developed by integrating it with and internet to monitor your home or industry or any firm while sitting in a remote area. The monitoring status was kept as an eye on his or her industry through an internet connected to the user's mobile phone or PC or laptop.

This system not only improves under security concerns in this modern world but also assist in power saving or conservation of energy with automatic sensing of wastage of it. Example like if you left any home appliance switched on by mistake, then you can check the status of the appliance on the graphical interface made on your mobile and can switch it off using the internet connectivity.

It can also be extended by connecting temperature, gas, smoke sensors to the industrial monitoring system so that we can get the temperature, leakage of any gases, smoke of dangerous zones in personal computer itself instead of sending human to there and facing problems at field we can send robot to there and sensor will detect the environmental condition and it gives information to the micro controller and micro controller gives the information to the transceiver from that we can get the data at pc side.

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