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Embedded Based Energy Efficient Handling of Big Data Using Wireless Sensor Network

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Abstract- The wireless sensor networks have each individual node of a network may store and deliver a massive amount of information at once or over time. In the future, massively connected, highly dynamic wireless sensor networks have such vehicle-2-vehicle communication scenarios may hold even greater information potential. This is mostly because of the increase in node complexity and data volumes will be a problem for traditional data aggregation strategies traffic-wise as well as energy efficiency. The existing system is continuously monitors the nodes status and gives information to the user. It does not have any monitoring or data storage system to save the information. This leads to the continuous energy consumption and data is not saved at the monitoring unit. This causes high power consumption and needs manual control over the system in industrial and army applications this leads to continuous waste of time and energy. To avoid this waste of time and energy consumption then we proposed the following system. In the proposed system, the big data is monitored by the server section by using ZIGBEE. The nodes communicate their sensor data to the server section through ZIGBEE which is a high power, effective communication system. This helps the server to receive data and handle large amount of data from different nodes. The collected big data is posted in web by using GPRS section and the big data handled and posted to the server.

Keywords *-wireless sensors ,energy meter, (LPC2148)microcontroller, Zigbee transceiver, gsm, Lcd display, power supply.*

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1. INTRODUCTION

The amount of user data may be stored or processed doubles every two years. This fact raises several problems such as data management because every day data size increases and time-critical data processing tasks. In order to handle these issues, the researchers from all over the world are concentrating their work under the topic “big data”. If we are talk about big data research, we consider new approaches for the processing of large amounts of data from different, heterogeneous sources. There are some Key problems include search strategies, data dissemination, automated analysis as well as the visualization and post processing. Big data environments in a traditional manner deal with massive, centralized computing resources, high performance computing centers and high-speed storage systems. Typical scenarios focus on data mining scenarios, fraud detection and scientific data evaluation as well as pattern recognition. The embedded system is a computer system in which the dedicated function. It is a personal computer, an embedded system performs the one or a few predefined tasks and there are specific requirements. The system is dedicated to a specific tasks and the design engineers can optimize it, reduce size and cost of product. Embedded systems are often mass-produced, benefiting from economies of scale.

The majority of research and development activities in this field focus on to the existing information is in large volumes than the amount of data usually handled with relational database systems. Today, the researchers all over the world are focus actual research changes rapidly. There are Several big data projects deal with large amounts of multi-dimensional data in embedded and distributed systems. Accordingly, the different application context requires different strategies. For example, if we consider that the next generation driver assistance systems, Vehicle-2-Vehicle concepts, the large amount of sensor data is generated and needs to be fused. Additionally, distributed scenarios, the evaluation and classification of data is received by imaging systems these are local preprocessing techniques. The scenarios address sensors and data monitoring systems as well as smart metering which are operating in a highly integrated and connected environment[7].

2. RELATED WORK

The research work for big data in distributed and embedded systems correlates with delay tolerant network strategies (DTN) and adapted concepts of data aggregation or data fusion. In contrast to traditional big data infrastructures, our goal is to shrink the relevant user data directly at the source (or in-network) instead of transmitting the sink entire data for long-term storage. The challenge here is not the amount of the locally measured sensor data, but rather than the large number of distributed nodes and the changing communication infrastructure between these nodes. The energy resources as well as buffer storages are not as strictly limited as in other mobile embedded sensors. The specific data processing approaches have to use the given resources. The key parameters are latency behavior as well as the communication range and the high level of mobility. In visiting different industries such as steel industries, chemical industries are in weather control department we come to know that they use conventional technology and wired communication. And general purpose web server required huge amount of memory and sometimes a special hardware. For making it simple and wireless we studied about different technique which can be used such as RF(radio frequency), GSM, Bluetooth and Zigbee. RF can have interference problem, Bluetooth is very short in range . if we want to sharing of logged data over a large range then it is not flexible. The data will have different values at different times and we have to shared(transfer) them, and finally the Zigbee and GSM

which provides the secure communication with large range and having low power consumption. Similarly, we studied different temperature, humidity and came to know that LM35,MQ4/7,SY-HS 230 used for temperature, humidity respectively. These sensors are having large amount of advantages and required specification over other sensors.

Dr.pascal minet and ridha soua in (2011) has described the concept of energy efficient techniques in wsn.[6] The most challenging issue in WSN is how to save energy of node while maintaining the desirable network behavior. Any WSN can only complete its mission when only it is considered as alive, but not after that. As a consequence, the goal of energy efficient technique is to increase network lifetime. This depends drastically on the lifetime of any single node. The majority of authors use a definition for the context of work. This situation Based on the previous works on WSNs done is in detail. Researchers are invited to design energy efficient protocols while achieving the operations of desired network. This paper focuses on different techniques to reduce the energy consumption of the limited energy budget of sensor node then after having identified the reasons of waste of energy in WSNs, we classify techniques of energy efficient into following classes namely control reduction, energy efficient routing, data reduction, duty cycling and topology control. The big data are identified through the ”3V model”: velocity, variety, volume. These 3v models can also be transferred to future wireless sensor networks, as follows:

A)Volume: The high node density and/or nodes having a high information potential

B) Velocity: Today, there is already a high velocity in information of WSN changes in many application contexts.

C) Variety: There are different variety of sensor data.

X.Wu, X.Zhu and W.Ding (2013) proposed a data mining with big data.[1] the Big Data concern large-volume, complex, growing data sets with autonomous sources. The rapid development of data storage, data collection capacity, networking and Big Data are now expand rapidly in science and engineering domains, including biological and biomedical sciences. This paper characterizes the features of Big Data revolution and proposes a Big Data processing from the data mining. The model of data-driven involves demand-driven aggregation sources of information, security and privacy considerations. We analyze the challenging issues in to the model of data-driven and Big Data revolution.

M. Rezaei, M. Sarshar, and M. M. Sanaatiyan(2010) presented next generation driver assistance that achieving secure vehicles equipped with accident prevention systems greatest passions of researchers in automotive laboratories.[2] This article provides description to the techniques for driver's behavior analysis and road situation monitoring. The focus would be to gain a practical approach in simultaneous analysis of driver's distraction, EEG spectrum has been gathered, potential road hazards to make an emergency intervention in case of dangerous driving situations and then fused with out-vehicle sensors such as RADAR, Ultrasonic and Vision. In order to cope with computational complexities due to multiple sensors. all discussions are based on real sensors. The method applied on various driver assistance systems such as overtaking and lane keeping systems.

3. SYSTEM DESIGN

The energy-consumption system collect all the running parameters in energy saving system such as office, factory community, room, house, or any space.The collected parameters including temperature, people number, light luminance. CO2, power and humidity which influence the dynamic running of the system, and the collected parameters would be sent to computer and embedded system through Bluetooth and ZigBee web-net to decide the feedback control parameters. The sensors of humidity, temperature, luminance, power used in this energy-saving system were design with modules with different situations of air conditioning, power consumption such as power system, official affairs machines and facilities, lights luminance, and the information stream was used large number of technology of Wireless Sensor Network so as to construct an, active & intelligent energy-saving system. All sensor modules were designed with microprocessor as the core of control system, consumers would be combine some certain module to set up the energy-saving system in their own need[8].

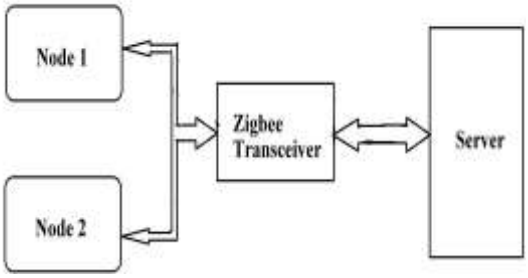


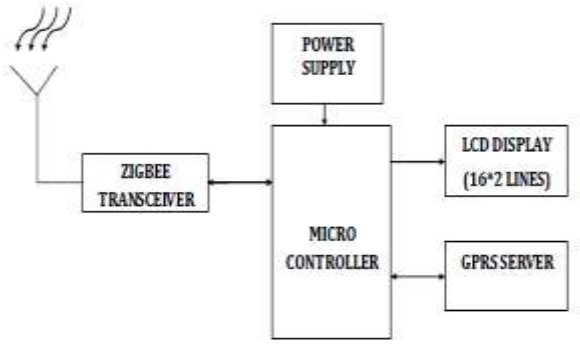
Fig3.1 system block diagram

3.1 ZIGBEEE TRANSCEIVER

The zigbee is wireless networking technology. It is a device which acts as both transmitter and receiver. The zigbee transceiver module have range is 30 to 70m in urban areas and 1 to 1.5km in outdoor (LOS). This operates with 2.8-3.4V. The data transfer in packets and the data transfer rate of 250 kbps. The transceiver has an on-chip RF wipe antenna and it operates at a frequency of 2.4GHz. This organized data is send to the receiver through RF antenna. The data transfer capabilities of Bluetooth is much higher, which is capable of graphics and pictures on to the small networks and also for transmitting audio,file transfers. The zigbee technology used to transmitted smaller packets over large networks,infrequently used devices, mostly static networks with many, like toys, remote controls, home automation.The Bluetooth performance drops when more than 8 devices are present, ZIGBEE networks can handle 65000+ devices. The main feature of ZIGBEE is low power consumption, low cost, low data rate. ZIGBEE is good for the devices where the battery is rarely replaced, zigbee is designed to optimize slave power requirements, and normal battery life is upto 2 years. Bluetooth is a cable replacement for items like headsets, phones, laptop computers. the Bluetooth devices require regular charging and use a power model like a mobile phone.

3.2 SERVER

The server block diagram consists of ARM7 LPC2148 processor, Zigbee transceiver, LCD display, power supply, GPRS Server.



3.2 server block diagram

3.2.1 Arm Microcontroller(Lpc 2148)

This section consists of a Microcontroller with its associated circuitry like Reset circuitry, Pull up resistors, Crystal with capacitors. It the heart of the project because it controls the devices according to the program being written such as communicates and interfaced with the devices. an ARM stands for Advanced RISC Machines. It is a 32 bit processor core and it is used for Advanced Robotic Applications and high end application

Key features:

- 16-bit/32-bit ARM7TDMI-S microcontroller
- on-chip static RAM of 8 kB to 40 kB and 32 kB to 512 kB of on-chip flash memory.
- It enables high-speed 60 MHz operation for 128-bit wide interface/accelerator.
- The In-Application Programming/ In-System Programming via on-chip boot loader software.
- The Embedded Trace interfaces offer real-time debugging and Embedded ICE RT with and high-speed tracing of instruction execution and the on-chip Real Monitor software.
- Endpoint RAM of 2KB in USB 2.0 Full-speed compliant device controller.
- The LPC2146/48 provides 8 kB of on-chip RAM accessible to USB by DMA.
- The One or two (LPC2141/42 vs. LPC2144/46/48) a total of 6/14 analog inputs provides by 10-bit ADCs with conversion times of 2.44 µs per channel is low
- variable analog output (LPC2142/44/46/48 only) provide by Single 10-bit DAC.
- PWM unit (six outputs)Two 32-bit timers/external event counters and watchdog.
- The Real-Time Clock (RTC) is low power with 32 kHz clock input and independent power.
- Multiple serial interfaces including two Fast I2C-bus (400 kbit/s), two UARTs (16C550).
- buffering and variable data length capabilities in SPI and SSP.
- configurable priorities and vector addresses in Vectored Interrupt Controller (VIC).
- The tiny LQFP64 package have Up to 45 of 5 V tolerant fast general purpose I/O pins.
- Up to 21 external interrupt pins available.

3.2.2 LCD Display

Liquid crystal displays (LCDs) have materials which showup the status of project and which combine the properties of both liquids and crystals.The two glass panels in LCD with the liquid crystal material sand witched in between them. The transparent electrodes coated in glass plates which define the symbols or patterns, character of polymeric layers to be displayed which is present in between the electrodes and the liquid crystal, which makes the liquid crystal molecules to maintain a orientation angle.LCD have 16*2 interface in 4 bit mode. When the LCD is in the off state, light rays are the liquid crystal, rotated by the two polarizer such that the light rays come out from the LCD without any orientation. When the electrodes have sufficient voltage, the liquid crystal molecules would be aligned in a specific direction. The polarizer rotated the LCD when light rays passing through LCD which would highlighting the desired characters.

The LCD"s are lightweight with thickness of few millimeters. The LCD"s consume less power, they are compatible with low power electronic circuits. The LCD does not generate the light and so light is 26 needed to read the display. The Backlighting is used for reading then only possible to reading in the dark. LCD"s have long life and a wide operating temperature range.

3.2.3 Temprature Sensor

A thermistor is temperature sensing device. It is a type of resistor whose resistance is dependent on temperature. Thermistors are widely used as self-resetting over current protectors, inrush current limiter, temperature sensors (NTC type typically), and self-regulating heating elements. a digital output temperature sensor in a four-ball wafer chip-scale package (WCSP) as TMP103. It is capable of reading temperatures to a resolution of 1°C.

3.2.4 LDR(Light Dependent Resistor)

The LDR is used to measure the light intensity. LDRs or Light Dependent Resistors are normally used in light/dark sensor circuits. The resistance of an LDR is very high and sometimes it is high as 1000 000 ohms. When resistance of light drops then microcontroller is used to switch on the bulb at node section by sending the command through monitoring side.

3.2.5 Humidity Sensor

Humidity sensor is a device that detect the relative humidity of environment which sensor placed. A humidity sensor used for both the indoors and outdoors. It is also available in both analog and digital forms. They measure moisture present in air and it is express relative humidity. The relative humidity change with change in teprature.The sensor is made out of either glass or ceramics. The insulator material which absorbs the water is made out of a polymer which releases water based on the relative humidity of the given area and which takes in. It will change the level of

charge in the capacitor on board of electrical circuit.the private consumers use humidity sensors when they suffer from allergies and also used in wine cellers for keep air consistant .

3.2.6 DC Motor

The DC motor is output of the project and controlled by the microcontroller with the respective inputs given by us. Motor connected to microcontroller. Its speed will be varied according to the speed set by the switches. A DC motor behave unlike magnetic poles are attract each other and like magnet poles repel. A wire of coil generates an electromagnetic field aligned with coil center only when its current running through it. magnetic field can be switched on or off by switching the current on or off in a coil or by switching the direction of the current in the coil .

3.2.7 GPRS

GPRS is packet based wireless communication service and it is general packet radio service. The GPRS have data rate from 56kbits upto 114kbits.It is based on GSM communication and complement with existing services such as circuit switched cellular phone connection and sms.the GPRS have higher bandwidth and therefore data speed become immediate, continous connection to the internet. It is packet switching technology to CDMA,TDMA and GSM these mobile networks making easier to integrate with other packet based protocols such as X.25 and IP. Today GPRS is being deployed in mobile networks for packet data handling capabilities that 3G will need to provide the core network, whether delivered using EDGE or WCDMA.EDGE is next step towards the 3G for GPRS/GSM networks.

4. CONCLUSION

We tested our approach with a multiple sensor network using ZIGBEE. The main communication device used here is ZIGBEE which offers a speed transfer of data and distance coverage is more compared. The collected big data is posted in web by using GPRS section. The big data handled and is posted to the server. The purpose is to develop intelligent energy-saving system to complete the goal of real energy-saving. The propose an aggregation strategy tied to technological prerequisites which enables the handling of large data volumes and the efficient use of energy. Furthermore, actual sensor platforms demonstrate the energy conservation potential based on experiments.

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