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Industrial Monitoring System Using Zigbee with Multi-Processor Support

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Abstract:

This paper is an ARM based architecture designed for the purpose of data transmission between two controlling units through IWSN without collision. Embedded is a Process which will be done between hardware and application. Here, the data transmitter form source to destination through wireless communication. The project deals with the data transmission between two units in the exact time without any collision. The data transmission time is increased with the protocol standard. One of the section runs with LPC2148 as master node and another as also LPC2148 data acquisition node to which sensors are connected. Data acquisition node uses the ARM. Communications between two nodes (hardware and application) are accomplished through IEEE 802.15.4.

Index-terms:

ARM processor, ZIGBEE module, sensors, LCD,loads.

I. INTRODUCTION:

An enforced Wireless HART stack has well-tried the Feasibility of the projected design is for sensible product style. And future challenges yet as suggestions to plain improvement area unit mentioned. This is essential to reduce the possibility of and to meet the critical requirement of timing determinism of industrial applications. To do this, all the nodes must be synchronized precisely, i.e. the jitter of synchronization should be much smaller than the length of time slot.Also, the stack designer must guarantee that the node can finish everything within the time slot.

Such timing critical requirement has become one of the primary challenges to design the protocol stacks. Firstly, it is challenging to finish the complicated tasks within such a short timeslot by the processor with limited resource (clock frequency, memory, energy supply, etc.). Secondly, the IWSN stacks are often only a part of the timing critical tasks that the At the same time, the rapidly increasing complexity and other specific requirements of industrial systems have made it necessary to adopt the real time operation system in the IWSN stacks. However, the adoption of RTOS and support of multiprocessor have made it more challenging to guarantee the timing integrity. An optimized architecture is needed, but existing study on this topic is insufficient.Nowadays, periodic transmission of accurate and reliable measurements is central to safe, efficient and economic operation of Nuclear Power Plants and large scale industries for specific application. Various sensors are being used for measuring the temperature, IR etc.

These sensor values must be in real time and accurate in order to avoid faults. Hence, processor used which can read data in parallel and in real time with high speed on multiple different sensor date rate. The measured values are sent using Zigbee to the monitoring station and then sent. Then the measured values are compared with the threshold value. In case of mismatch the workers will be informed to take corrective measures. This is a new approach using processor in order to avoid serious disasters in nuclear power plants and large scale industries. Here we are connected two sensors, whenever temperature values exceeds the predefined values automatically fan will ON, buzzer ON and display on LCD. When IR sensor alert is occur immediately receiver side display on LCD.

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II. BLOCK DIAGRAM:

Slave node:

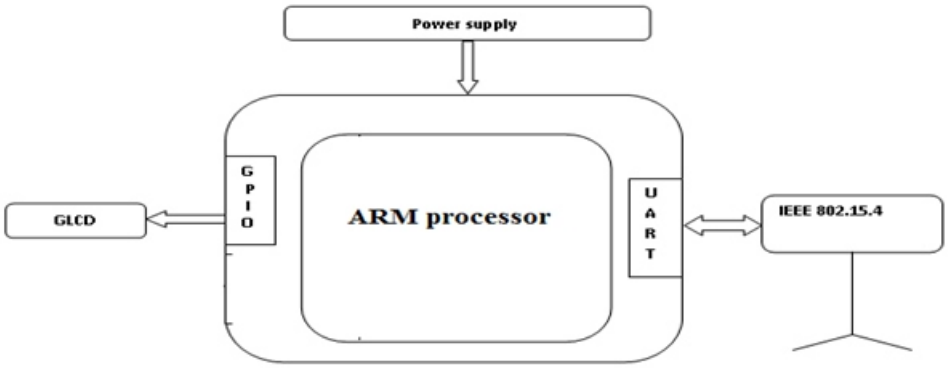

Figure-1: block diagram of slave node

Master node:

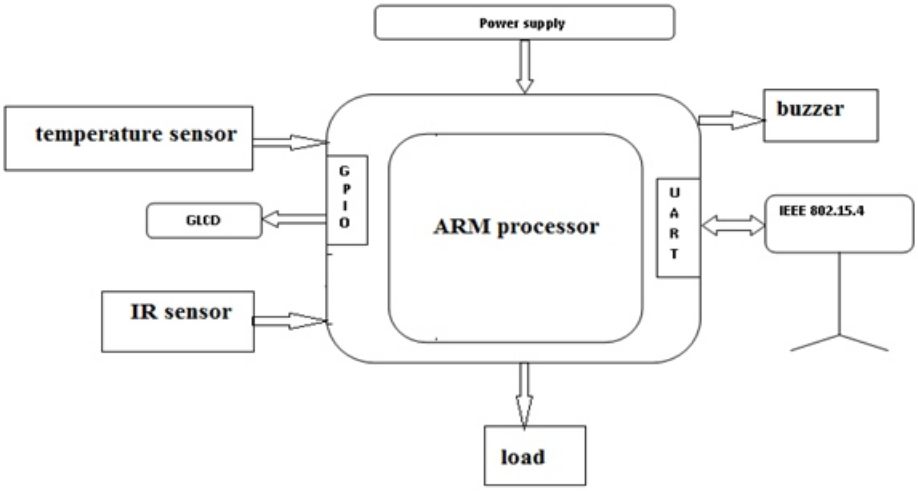

Figure-2: block diagram of master node

III. RELATED WORK:

3.1 ARM processor:

The ARM7TDMI-S is a general purpose 32-bit microprocessor, which offers high performance and very low power consumption. The ARM architecture is based on Reduced Instruction Set Computer (RISC) principles, and the instruction set and related decode mechanism are much simpler than those of micro programmed Complex Instruction Set Computers (CISC). This simplicity results in a high instruction throughput and impressive real-time interrupt response from a small and cost-effective processor core. Pipeline techniques are employed so that all parts of the processing and memory systems can operate continuously. Typically, while one instruction is being executed, its successor is being decoded, and a third instruction is being fetched from memory. The ARM7TDMI-S processor also employs a unique architectural strategy known as Thumb, which makes it ideally suited to high-volume applications with memory restrictions, or applications where code density is an issue. The key idea behind Thumb is that of a super-reduced instruction set.

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3.2 SENSORS:
TEMPERATURE SENSOR (LM35):

LM35 series sensors are precision integrated-circuit temperature sensors whose output voltage is linearly proportional to the Celsius temperature. The LM35 requires no external calibration since it is internally calibrated. . The LM35 does not require any external calibration or trimming to provide typical accuracies of ±¼°C at room temperature and ±¾°C over a full −55 to +150°C temperature range.

The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to read-out or control circuitry especially easy. It can be used with single power supplies, or with plus and minus supplies. As it draws only 60 µA from its supply, it has very low self-heating, less than 0.1°C in still air.

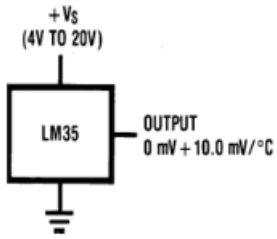

Figure-3: Temperature sensor (LM35)

IR SENSOR:

IR wireless is the use of wireless technology in devices or systems that convey data through infrared (IR) radiation. Infrared is electromagnetic energy at a wavelength or wavelengths somewhat longer than those of red light. The shortest-wavelength IR borders visible red in the spectrum.

The longest-wavelength IR borders radio waves. Infra-Red is interesting, because it is easily generated and doesn't suffer electromagnetic interference, so it is nicely used to communication and control, but it is not perfect, some other light emissions could contains infrared as well, and that can interfere in this communication.The sun is an example, since it emits a wide spectrum or radiation. The adventure of using lots of infra-red in TV/VCR remote controls and other applications, brought infra-red diodes (emitter and receivers) at very low cost at the market.

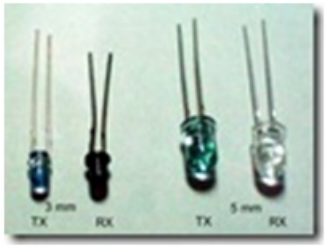

Figure-4: IR sensor

3.3 ZIGBEE MODULE:

ZigBee is a low-cost, low-power, wireless mesh networking proprietary standard. The low cost allows the technology to be widely deployed in wireless control and monitoring applications, the low power-usage allows longer life with smaller batteries, and the mesh networking provides high reliability and larger range. The ZigBee Alliance, the standards body that defines ZigBee, also publishes application profiles that allow multiple OEM vendors to create interoperable products. The protocols build on recent algorithmic research (Ad-hoc On-demand Distance Vector, neuRFon) to automatically construct a low-speed ad-hoc network of nodes. In most large network instances, the network will be a cluster of clusters. It can also form a mesh or a single cluster. The current profiles derived from the ZigBee protocols support beacon and non-beacon enabled networks.

3.4 EXISTING AND PROPOSED SYSTEMS
EXISTING SYSTEM:

In this project the data transmission between two units in the exact time without any collision. The data transmission time is increased with the protocol standard. One of the section runs with LPC2148 as master node and another as normal data acquisition node to which sensors are connected. Data acquisition node uses the Peripheral Interface controller (PIC). Communications between two nodes are accomplished through ZIGBEE.

PROPOSED SYSTEM:

An embedded system based monitoring and control system for scale industries is designed. The programming module is implemented using ARM. The system mainly consists of monitoring unit.

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The monitoring unit is placed near the machines and also monitoring place far away from the place. The monitoring unit consists of sensors, micro controller and Zigbee. The measured sensor values of the plant or industry are sent to the controller and they are transmitted to another side via Zigbee. Here both sides we are using LPC2148 processor only using this is the speed of the processor is high compare to the existing method.

IV. RESULTS:

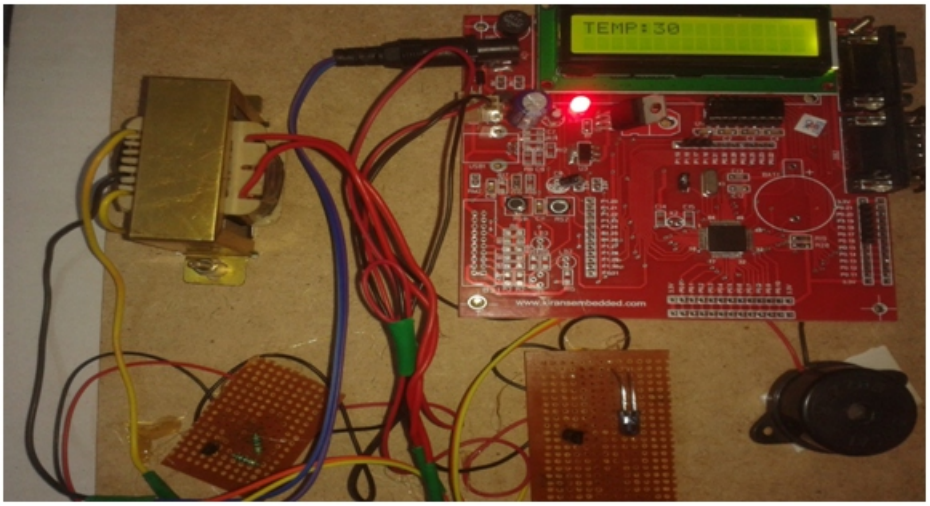

Figure-5: Hardware implementation of master node

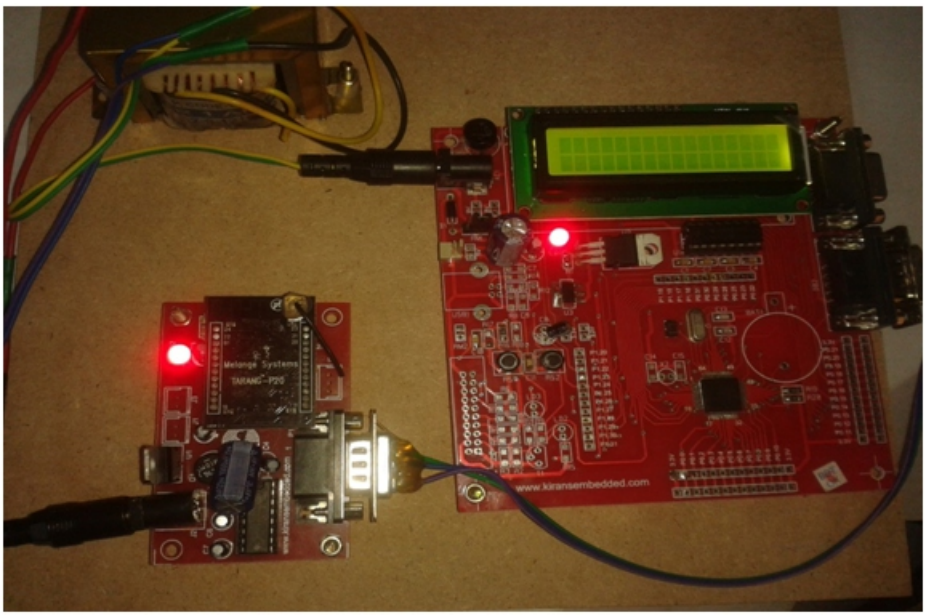

Figure-6: Hardware implementation of slave node

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V. CONCLUSION:

In Future ARM architecture supports the wireless sensor Network architecture. In this advantage of Wireless HART Stack implemented on a lowest cost two processor plat form. In The current Situation, we have analyzed, a huge amount of Messages are transmitted between layers. Reduce the Possibility of collision (and thus increase the communication Reliability), and to meet the critical requirement of timing Determinism of industrial applications. This is essential to Reduce the possibility of collision (and thus increase the Communication reliability), and to meet the critical Requirement of timing determinism of industrial applications.

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