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WIRELESS CAN BUS FOR INDUSTRIAL APPLICATION

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Abstract **-** To perform Industrial power plant monitoring and control using CAN and ZIGBEE by collecting the real time parameters and to control if it exceeds the pre-defined value. Implementation of this project in a power plant is to monitor and control the real time temperature, power (voltage and current), intruder security, water level, and fire along with safe and secure operations. This project is one of the major applications of the power plant. The proposed model has a supervisor (PC) which Communicates with the remote terminal unit, processing the variable parameters and controlling the systems. This project consists of two sections; one is Remote Terminal Unit (RTU), other one is Supervisory Control (SC).The RTU is a local controller in distributed processes environmental which acquires the data from sensors, process the collected data puts the required data together, forming the frame for transmitting to the Supervisory Control (S.C). RTU also receives and processes Control commands from S.C. and executes them accordingly. The communication utilizes a full duplex communication for data transmission between S.C. and RTU. The communication through wireless by using Zigbee.

Keywords- Zigbee technology; CAN BUS; network topology; communication protocol; CAN-Zigbee node; sensor node

I. INTRODUCTION

In recent years, the application research of Zigbee has been paid greatly attention in industry field, since it is a good solution for long range wireless communication and replacement of cable. Zigbee modules operate in the unlicensed ISM (Industrial, Scientific and Medical) frequency band at 2.4MHZ and avoid interferences from industry. On the other hand, CAN bus have been widely used in sensors, data acquisition, industrial control systems, and instrument device with high reliability, reality and flexibility. How to integrate the CAN bus wired technology with the Zigbee wireless technology is a hot research task now.

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This project gives a kind of design of CAN bus network based on zigbee technology, including CAN bus zigbee intelligent nodes, sensors network with zigbee and the whole network architecture. In this project power plant monitoring and control system by using CAN and ZIGBEE by collecting the real time parameters and to control if it exceeds the pre-defined value. Implementation of this project in a power plant is to monitor and control the real time temperature, power (voltage and current), intruder security and fire along with safe and secure operations. This project is one of the major applications of the power plant. The proposed model has a supervisor (PC) which Communicates with the remote terminal unit, processing the variable parameters and controlling the systems. The communication utilizes a full duplex communication for data transmission between S.C. and RTU. The communication through wireless by using Zigbee. The simulated inputs from the sensors and simulated outputs to the relays as controllers. A single chip solution for both acquiring and control process is obtained using an ARM PROCESSOR.

A. EXISTING SYSTEM

In the existing system, remote measurement and control by using wired communication and the distance of the RTU and SC unit is minimum. Because of the cost and complexity each unit have own monitoring section. The existing system is highly expensive and consumes more power also it has less reliability.

B. PROPOSED SYSTEM

In the proposed system, remote measurement and control by using wireless communication and the distance of the RTU and SC unit is maximum. Here wireless communication is used so only one monitoring section is enough to monitor whole unit. It consume less power, low expensive and provide high reliability.

II. BLOCK DIAGRAM

RTU:

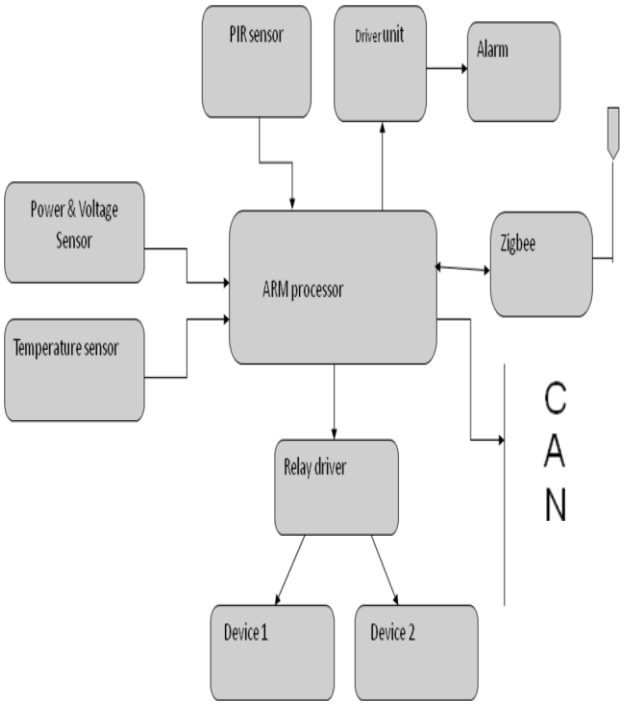

Fig.1 Remote Terminal Unit

S.C:

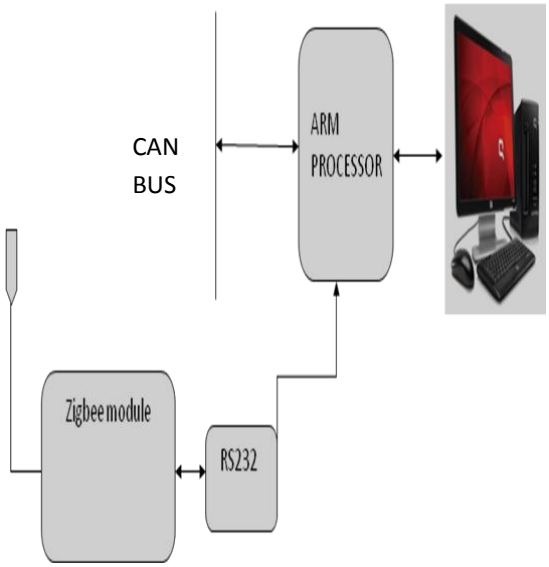

Fig.2 Supervisory control Unit

III. BLOCK DIAGRAM DESCRIPTION

This project consists of two sections; one is Remote Terminal Unit (RTU), other one is supervisory control (SC). In RTU section sensor are used to sense physical parameter like current, voltage, Water level and temperature these are fed to the ARM processor through ADC channel, intruder sensor is used to monitor anybody entering in the restricted area, all variable parameters to be processed in the ARM processor after they are transfer to supervisory control section through CAN and wireless by using zigbee. In the supervisory control section, all remote area data's are collected by using zigbee and they are compared with the actual parameter with that of set point. If it exceed the set point corresponding devices to be on/off in the RTU.

A. HARDWARE COMPONENTS

1. Microcontroller(ARM7)
2. Zigbee Module
3. Temperature, Voltage, Current sensor
4. PIR sensor
5. MAX 232
6. Relay unit

B. SOFTWARE COMPONENTS

1. KEIL IDE
2. FLASH PROGRAMMER
3. EMBEDDED C

IV. HARDWARE DESCRIPTION

A. MICROCONTROLLER

The ARM architecture (Advanced RISC Machine) is a 32-bit RISC processor architecture developed by ARM Limited that is widely used in embedded designs. Because of their power saving features, ARM CPUs are dominant in the mobile electronics market, where low power consumption is a critical design goal. Today, the ARM family accounts for approximately 75% of all embedded 32-bit RISC CPUs, making it one of the most widely used 32-bit architectures. ARM CPUs are found in most corners of consumer electronics, from portable devices (PDAs, mobile phones, media players, handheld gaming units, and calculators) to computer peripherals (hard drives, desktop routers);

however it no longer has significant penetration in the desktop computer market and has never been used in a supercomputer or cluster.

B. ZIGBEE

ZigBee is a specification for a suite of high level communication protocols using small, low-power digital radios based on the IEEE 802.15.4-2003 standard for Low-Rate Wireless Personal Area Networks (LR-WPANs), such as wireless light switches with lamps, electrical meters with in-home-displays, consumer electronics equipment via short-range radio. The technology defined by the ZigBee specification is intended to be simpler and less expensive than other WPANs, such as Bluetooth. ZigBee is targeted at radio-frequency (RF) applications that require a low data rate, long battery life, and secure networking. Zigbee is a low-cost, low-power, wireless mesh networking standard. First, the low cost allows the technology to be widely deployed in wireless control and monitoring applications. Second, the low power-usage allows longer life with smaller batteries. Third, the mesh networking provides high reliability and more extensive range. 802.15.4 is a standard for wireless communication issued by the IEEE (Institute for Electrical and Electronics Engineers. The 802.15.4 standard specifies that communication can occur in the 868-868.8 MHz, the 902-928 MHz or the 2.400-2.4835 GHz Industrial Scientific and Medical (ISM) bands. The 802.15.4 standard specifies that communication should occur in 5 MHz channels ranging from 2.405 to 2.480 GHz. In the 2.4 GHz band, a maximum over-the-air data rate of 250 kbps is specified, but due to the overhead of the protocol the actual theoretical maximum data rate is approximately half of that. While the standard specifies 5 MHz channels, only approximately 2 MHz of the channel is consumed with the occupied bandwidth. At 2.4 GHz, 802.15.4 specifies the use of Direct Sequence Spread Spectrum and uses an Offset Quadrature Phase Shift Keying (O-QPSK) with half-sine pulse shaping to modulate the RF carrier.

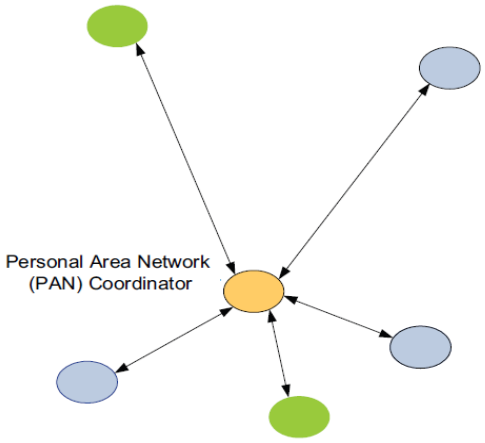

Fig.3 Zigbee Network

C. NULL MODEM

Serial communications with RS232. One of the oldest and most widely spread communication methods in computer world. The way this type of communication can be performed is pretty well defined in standards. The standards show the use of **DTE**/**DCE** communication, the way a computer should communicate with a peripheral device like a modem. **DTE** means Data Terminal Equipment (computers etc.) where **DCE** is the abbreviation of Data Communication Equipment (modems). One of the main uses of serial communication today where no modem is involved—a serial null modem configuration with **DTE**/**DTE** communication—is not so well defined, especially when it comes to flow control. The terminology null modem for the situation where two computers communicate directly is so often used nowadays, that most people don't realize anymore the origin of the phrase and that a null modem connection is an exception, not the rule. RS232: When we look at the connector pin out of the RS232 port, we see two pins which are certainly used for flow control. These two pins are **RTS**, request to send and **CTS**, clear to send. With **DTE**/**DCE** communication (i.e. a computer communicating with a modem device) **RTS** is an output on the **DTE** and input on the **DCE**. **CTS** are the answering signal coming from the **DCE**.

D. CIRCUIT DIAGRAM

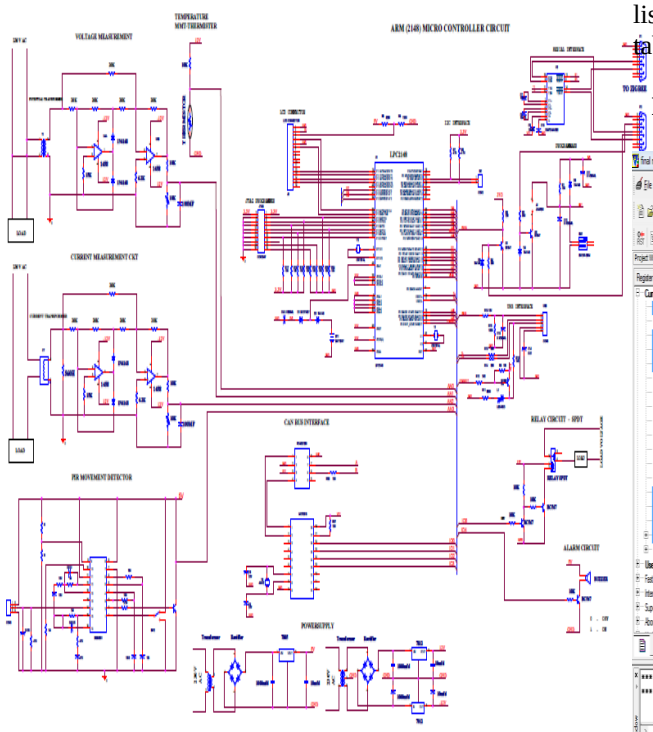

Fig.4 Circuit Diagram

V. SOFTWARE DESCRIPTION

A. KEIL C:

Keil software is the leading vendor for 8/16-bit development tools (ranked at first position in the 2004 embedded market study of the embedded system and EE times magazine). Keil software is represented world wide in more than 40 countries, since the market introduction in 1988; the keil C51 compiler is the de facto industry standard and supports more than 500 current 8051 device variants. Now, keil software offers development tools for ARM. Keil software makes C compilers, macro assemblers, real-time kernels, debuggers, simulators, integrated environments, and evaluation boards for 8051, 251, ARM and XC16x/C16x/ST10 microcontroller families. The Keil C51 C Compiler for the 8051 microcontroller is the most popular 8051 C compiler in the world. It provides more features than any other 8051 C compiler available today. The C51 Compiler allows you to write 8051 microcontroller applications in C that, once compiled, have the efficiency and speed of assembly language. Language extensions in the C51 Compiler give you full access to all resources of the 8051. The C51 Compiler translates C source files into reloadable object modules which contain full symbolic information for debugging with the µVision Debugger or an in-circuit emulator. In addition to the object file, the compiler generates a listing file which may optionally include symbol table and cross reference

B. SIMULATION RESULT

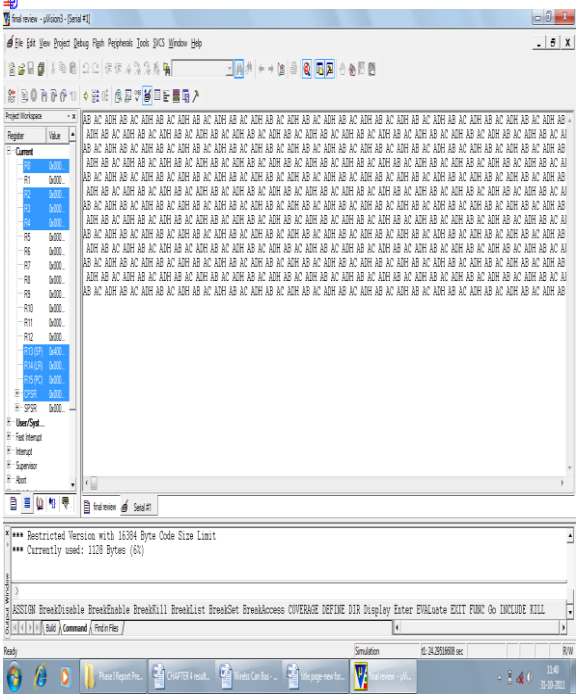

Fig.5 Serial Communication Output

VI. CONCLUSION

The research of the fusion of long distance wireless communication technology and the CAN bus extends the application of field bus in the special industry environment, which makes effectively extend the field bus network towards the low layer. Meanwhile, the field bus supplies the access for the long distance wireless network topology to connect to higher network (such as Ethernet network). It will be an important communication network technology in the automation field and must have a good prospect of application. The proposed system will provide the secured environment to the user. The system can still accurately, fast and steadily transmit data in the strong interference environment.

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REFERENCES

[1] Xiaohong Ren, Chenghua Fu, Tianwen Wang, Shuxiang Jia(2010). 'CAN Bus Network Design based on Bluetooth Technology'. IEEE 2010 International Conference on Electrical and Control Engineering

[2] Soo-Hwan Choi, Byung-Kugkim, Jinwoopark, Chul-Heekang, Doo-Seop Eom(2008). 'An Implementation of Wireless Sensor Network for Security System Using Bluetooth'. IEEE Transaction on Consumer Electronics,1{50},February 2008.

[3] Zdenek Bradac, Petr Fiedler, Pertr Cach, Radimir Vrba(2009). 'Wireless Communication in Automation'. Electronics,Circuits and System,2{2}:659-662,2003.

[4] Shangfeng DU,Xiaozhong Cao,Jin Xiong(2010). 'CAN BUS measurement and control technology with its application'. Beijing Electron Industry Press, January.

[5] Dacfey Dzung, Mario Crevatin(2005), 'Security for Industrial Communication Systems', 2005 Proceedings of the IEEE.

[6] Ping Chen,Yan Chen(2010). 'Temperature Data Aquisition System based on
Bluetooth Technology'. Instrument Technique and Sensor, 11:40-42, 2005.

WEB REFERENCES

- www.microchip.com
- www.dallas.com
- www.gsmfavorites.com
- http://www.shepherdcentre.com.au/
- www.arm.com
- www.myprojects.com