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EMBEDDED SYSTEM FOR MONITORING AND CONTROLLING OF INDUSTRY USING ARDUINO

Jothi sivasubramaniyan J[1], Rajan [2]

[1]PG Scholar, Dept. of EEE., V.R.S College of Engineering & Technology, Villupuram, India

[2]Assistant Professor, Dept. of EEE., V.R.S College of Engineering &Technology, Villupuram, India.

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ABSTRACT

To design a system to meet the real time constraints of large scale industry. In large industrial establishment many process take place so it is essential to monitor and control the process for efficient operation. This automation process reduces the man power required and thus hazardous area can be controlled with more accuracy and better safety. This remote monitoring embedded system is developed using the Lab VIEW and the wireless communication. It is used to communicate between the process and the remote user. Mostly the control system is automated and it can also be controlled by using supervisory controller .A person can able to monitor and control it from remote location also. Data s are collected from the sensors are constantly sent to the microcontroller which is in turn connected to a system .If the value of a sensor goes beyond set point, the microcontroller controls the speed of the machining operation. The front end is designed by Lab VIEW. The ATMEGA328 microcontroller is used to monitor and control the temperature sensor and motor.

1. INTRODUCTION

In much industry the tool drill bit is used for machinery process in case of crossing the extreme heat and tool drill bit is spoiled in that process temperature sensors are placed, in contact with the base of tool bits, so as to measure temperature of tool bits for achieving this real- time constrain in large scale industry. A temperature logging system for a remote machining process is taken. This automation process reduces the man power required.

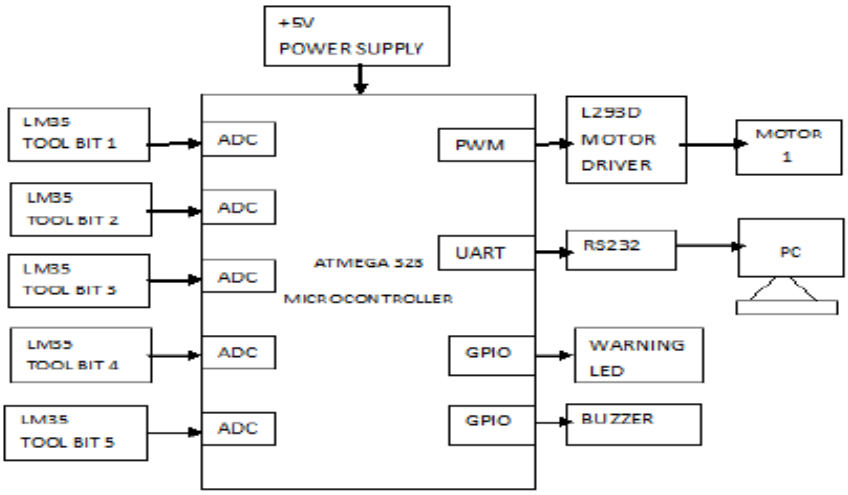

Fig.1. Block diagram

This remote monitoring embedded system is developed using the Lab VIEW and the wireless communication. It is used to communicate between the process and the remote user. Mostly the control system is automated and it can also be controlled by using supervisory controller .A person can able to monitor and control it from remote location also. The output pin is connected to temperature sensor analog read pin of arduino. Arduino in turn is connected with PC through USB. During machining process, the temperature of tool bit rises as high as 400 degrees. Temperature is measured and ATmega 328 microcontroller sends temperature reading to the system. Lab VIEW running in system receives the temperature sensor data and process it.

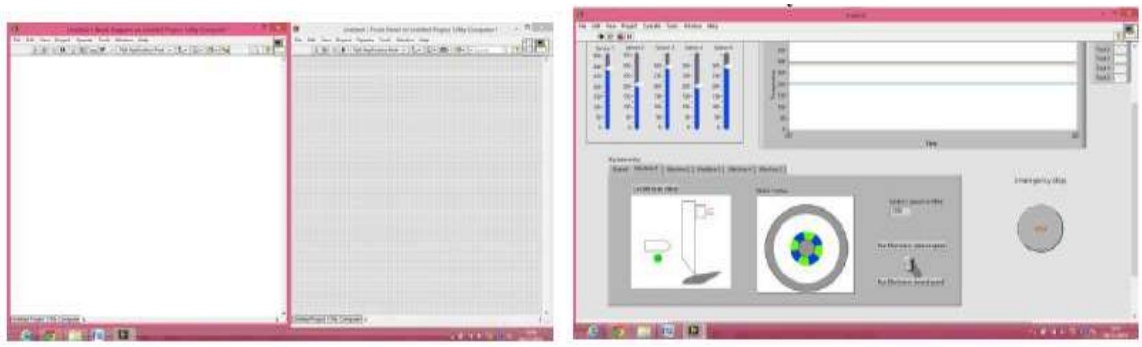

Fig.2. Basic view of the system

The temperature is checked for set point limit. If the temperature is less than set point, the process goes on continuously. If the temperature is greater than set point, coolant spray is switched on. And also a warning buzzer is there to notify the user about the high temperature. Generally, for ordinary metal cutting process, supply of coolant reduces the temperature but in some special cases the temperature of the tool goes on increasing. When temperature is greater than critical point, Lab VIEW reduces the speed of the machining operation by controlling the speed of the motor. A buzzer is used to provide an audible alert, indicating the requirement of immediate attention. The machine continues to run in reduced speed as long as the temperature is greater than the critical point. Once the temperature reduces, normal operation continues.

2. HARDWARE COMPONENTS ARDUINO BOARD

Arduino is an open-source electronics prototyping platform designed to provide inexpensive devices that interact with their environment using sensors and actuators.

Fig 3.Arduino board Interfacing support provided by lab view

Arduino hardware is a single-board computer based on an 8-bit microcontroller. The standardized I/O interface consists of 6 analog input pins, and 14 digital pins which also support serial and PWM features Arduino is a tool for making computers that can sense and control more of the physical world than your desktop computer. It's an open-source physical computing platform based on a simple microcontroller board, and a development environment for writing software for the board. A key benefit of LabVIEW over other development environments is the extensive support for accessing instrumentation hardware. Drivers and abstraction layers for many different types of instruments and buses are included or are available for inclusion. These present themselves as graphical nodes. The abstraction layers offer standard software interfaces to communicate with hardware devices. The provided driver interfaces save program development time. Even people 12 with limited coding experience can write programs and deploy test solutions in reduced time frame when compared to more conventional or competing systems.

3. LABVIEW INTERFACE FOR ARDUINO (LIFA)

A sketch for the Arduino microcontroller acts as an I/O engine that interfaces with the LabVIEW Vis through a serial connection. This helps to move information from Arduino to LabVIEW without adjusting the communication, synchronization or even a single line of code. The Arduino microcontroller must be connected to the computer with the LabVIEW through a USB, Serial, or Bluetooth .

A. DC MOTOR CONTROL

XBee Wireless Modules Series 2 Quick Overview These XBee series 2 modules are perfect for wireless communication between two robots or a pc and a robot details. This is the very popular2.4GHz XBee module from Digi (formally Maxstream). These modules take the 802.15.4 stack (the basis for Zigbee) and wrap it into a simple to use serial command set. These modules are used for simple communication between microcontrollers and computers. Features: 3.3V@ 50mA 250kbps Max data rate 1mW output (+0dBm) 300ft (100m) range Wire antenna Fully FCC certified 6 10-bit ADC input pins 8 digital IO pins 128-bit encryption Local or over-air configuration AT or API command set Mounting Considerations The XBee®/XBee-PRO® RF Module was designed to mount into a receptacle (socket) and there-fore does not require any soldering when mounting it to a board. The XBee Development Kits con-tain RS- 232 and USB interface boards which use two 20-pin receptacles to receive modules.

The receptacles used on Digi development boards are manufactured by Century. Digi currently uses the following receptacles:

Through -hole single-row receptacles - Samtec P/N: MMS-110-01-L-SV (or equivalent) and Surface -mount double-row receptacles - Century Interconnect P/N: CPRMSL20-D-0-1 (or equivalent) • Surface-mount single-row receptacles - Samtec P/N: SMM-110-02-SM-S

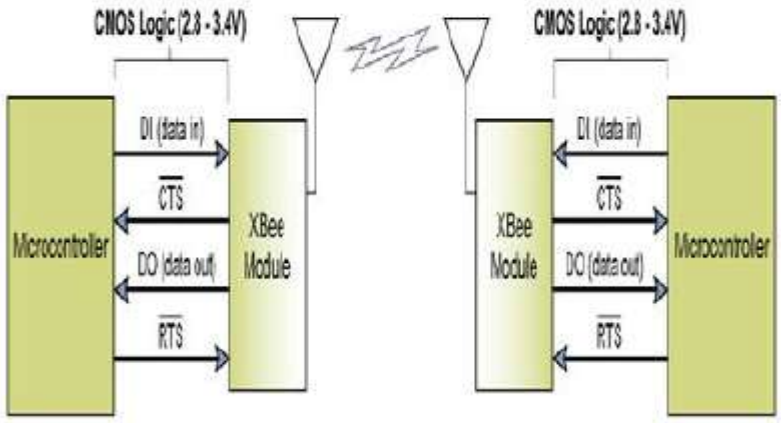

Fig 5 .Mounting XBee to RS-232 and USB

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4. SERIAL COMMUNICATIONS UART DATA FLOW

Devices that have a UART interface can connect directly to the pins of the RF module as shown in the figure below.

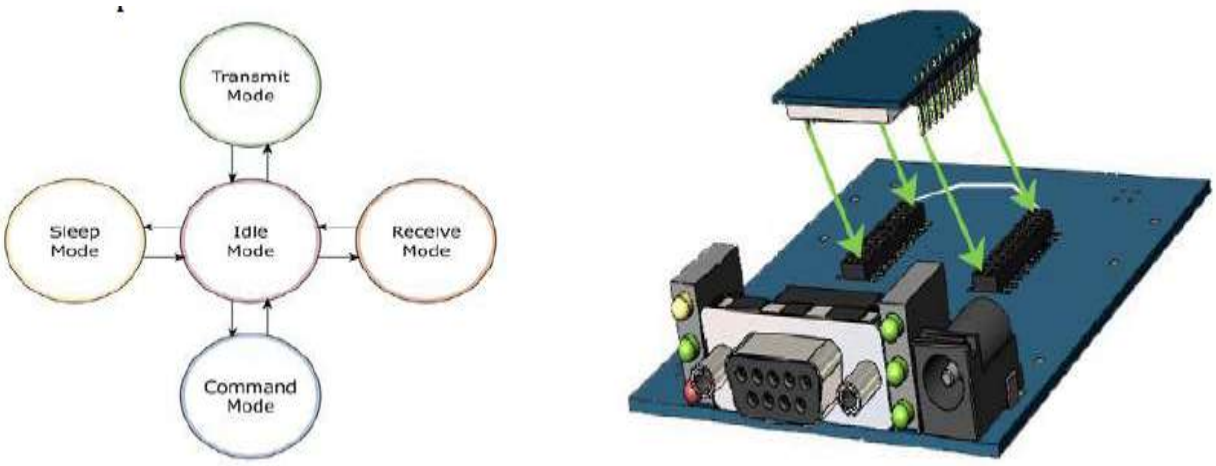

Fig.6. Mode of operation model and System Data Flow Diagram in a UARTinterfaced environment

When not receiving or transmitting data, the RF module is in Idle Mode. The module shifts into the other modes of operation under the following conditions: Transmit Mode (Serial data is received in the DI Buffer) • Receive Mode (Valid RF data is received through the antenna) . Sleep Mode (Sleep Mode condition is met) .Command Mode (Command Mode Sequence is issued) .In this front panel window 5 temperature sensor is placed for 5 individual machine controls. According to the different temperature level the graph varies accordingly, then machine has two level indicators in this front panel window first one is operating normally which indicates in white color, it shows that motor runs in normal speed without any damage, second one is attention required which indicates in red color, it indicates in case of any problem in the machine process .Five machine status indicated separately in the front panel. Emergency stop is also available in case of immediate stop for process.

In above figure, there are 5 monitoring and controlling machine status is available, in which the motor runs in normal speed 1200rpm.Red color round dot is present in machine status which has coolant spray control, it represents the spray is in off condition due to the level of motor runs below the speed 260. So the coolant spray is in off state. Green color round dot in coolant spray status which represents the spray is in on condition due to the level of motor runs above at the speed 260. So the

coolant spray is in on state. And also one switch in available which has two condition 1).Run machine in reduced speed 2). Run machine in normal speed. And also emergency stop is available for each machine control.

5. CONCLUSION

By Arduino platform the embedded board is used for its advantages on simplified I/O programming and cost. Then LabIEW platform has been selected for the development of GUI part for its advantages on data acquisition, signal processing features, and user interface development.

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