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Monitoring Of FMS Machine Coolant Motors Using Microcontroller and Bluetooth Module for Easy Troubleshooting

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ABSTRACT

In this paper the FMS machine cooling motor status is monitored using contactors, and Arduino Uno. Further the status of the cooling motors will be displayed on a LCD screen and also on an Android mobile via Bluetooth application. In Conventional method, some system equipments or processes are monitored by visual inspection and manual maintenance which has many disadvantages. To avoid the human artifacts we have designed an automatic monitoring of the processes, equipment and installations and the development of human-machine communication.

Keywords: Coolant motors, Contactors, LCD screen, Bluetooth module

I. INTRODUCTION

The use of FMS Machines is still growing in many industry processes where it is required to do different tasks. Every day there are more industries implementing these machines to produce their own products with low cost, high quality and less environmental impact. Connection through parallel port is still the most used connection port in these machines, because of allowing control devices to divine continuous tasks in parallel process controlling. Extinguishing of Parallel port in nowadays computers, has caused the need to emulate it by using some adaptors to operate those machines. This allow developers to make new designs using USB technology for FMS machines' communication, leading us to develop embedded applications using microcontrollers that allows do parallel processes, but connecting with emergent connection such as Bluetooth, Wi-Fi.

For developing an algorithm which its structures work simultaneously, is necessary to consider that traditional MCUs (Microcontrollers) operation is by using serial connection, limiting to execute just one instruction at a time. MCUs (Microcontrollers) are more than a CPU (central process unit) which execute code sequences.

These are equipped with modules like: comparators, input and outputs ports, analog-digital convertor, timers and memories. Each module works individually doing specific tasks waiting for CPU instructions, letting programmers to use interrupts to attend a subroutine and then return to the function that was in execution. To make parallel processes using MCUs, is need to build a star network

configuration where different MCUs make various tasks (slaves).

A person far away from the process area can also monitor the system via Bluetooth device using smart phones. The results of monitoring system can be displayed on a LCD display screen which can be personally monitored by observer.

II. LITERATURE SURVEY

The paper[1] gives overall idea how to design a system to control and monitor a flexible manufacturing system.It also uses intelligent algorithm's for controlling and monitoring of FMS. Since it uses Intelligent algorithm for monitoring it becomes a rigid phenomenon.

This paper[2] deals with the reconfiguration of flexible manufacturing systems. It presents a methodology which deals with the failure regarding the reaction loop. Methodology deals only with the failure regarding the reaction loop.

The primary objective of this paper[3] is to achieve a capability for dynamic reconfiguration to the change of FMS configuration, scheduling and control logic and communication platform, for the control of FMS. Entire control of FMS configuration cannot be studied.

This paper[4] presents the first results of an ongoing research activity towards an inter disciplinary modeling approach to validate the quality of multi agent system (MAS) architectures for the implementation of flexible control systems. Latest research in the field of MAS architecture cannot be obtained.

The author of this paper[5] addresses the optimal deadlock control problem of FMS's. Based on their Petrinet models, it introduces the concept of K-resources and proves that an FMS containing no K resources has only two types of reachable states: Safe ones and dead locks. Depends only on the concept of K-resources.

This paper[6] deals with the design and implementation of the Bluetooth protocol stack. It also describe a functional overview and applications of Bluetooth. We have explained Industrial automation via Bluetooth using IISS (Intelligent Informative Switching System). Industrial automation only through Bluetooth can be studied.

This paper[7] presents an experimental setup was created to emulate the Industrial environment and evaluate the performance of the communication infrastructure for successful deployment of intelligent condition monitoring. Intelligent condition monitoring has only been stressed.

III. METHODS AND MATERIAL

Arduino microcontroller serves as the brain of the whole series. The microcontroller can be linked with the other circuits to perform certain functions. Microcontroller is the central data in processing system. Microcontroller arduino has been equipped with as internal EEPROM, flash memory, etc. Bluetooth module consist of pins which transmits or receives the data from the microcontroller.

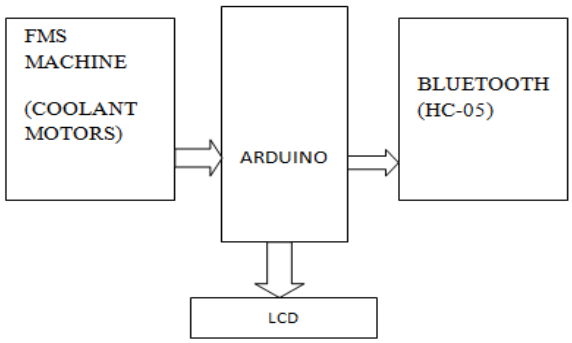

Figure 1(a). Block Diagram of Arduino Interfacing with Bluetooth

The resultant output will be displayed on the Liquid Crystal Display and if connected with a Bluetooth device(HC05) through the application it displays the output. Therefore the FMS motor status can

efficiently monitored for easy troubleshooting. FMS machine will be continuously filtering the dirty coolant using filters at different stages using coolant motors. The motor status needs to be monitored continuously which is very difficult for a human observer. Hence in our project we will be easily monitoring the status of coolant motors by accepting the digital data. This data will be fed as an input to the Arduino microcontroller where it will check for the motor ON or OFF status.

A. Hardware and Software Components

i) Microcontroller:

This project will make use of an arduino microcontroller as shown in figure(b).Arduino Uno is a microcontroller board based on the ATmega 328. It has 14 digital input-output pins(of which can be used as PWM outputs), 6 analog inputs. It has flash memory of 32KB. It contains everything needed to support the microcontroller.

Figure 2. Arduino Microcontroller

ii) Bluetooth Module HC-05

HC-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup as shown in figure(c). The HC-05 Bluetooth module can be used in Master or Slave configuration, making it a great solution for wireless communication.

Figure 3. Bluetooth module

iii) Contactors

A Contactors is an electrically controlled switch used for switching an electrical power circuit as shown in figure(d). A Contactor is typically controlled by a circuit which has a much lower power level than the switch circuit, such as a 24v coil electromagnet controlling a 230-volt motor switch.

Figure 4. Contactors

iv) LCD Display

A liquid crystal display is a flat panel display as shown in figure(e).Liquid crystals donot emit light,they use a reflector to produce images in color.LCD screen is energy efficient and consumes very less power.

Figure 5. Liquid crystal display

v) Bluetooth Electronics Application

This application can be used to control the electronic project with an android device. This app communicates using Bluetooth HC-05 module. Large selection of control to Bluetooth includes buttons, switches, graphs that can be dragged and droped to design a new panel. This panel can be designed as per the requirement.

IV. RESULTS AND CONCLUSION

Arduino is a open source platform which allows the beginners code using embedded C. The interfacing process of the software and hardware is carried out for monitoring motor status on the FMS. The areas which are prohibited due to security reasons for the human observers can monitor the motor status using Bluetooth in the range of 10 to 100 meters.

The FMS machine coolant motors will be monitored using arduino microcontroller for its on/off status and the result will be displayed on the LCD screen as well as the human observer can keep track of the process by the observing the variations indicated in the smartphone which has an in-built Bluetooth .Hence,appropriate control procedures and suppliers management are crucial to the effectiveness of the ongoing process.

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