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Interfacing Arduino Controller and SCADA Software Using Modbus

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***Abstract*— This paper proposes a novel strategy to Interface Arduino controller and SCADA programming utilizing Modbus serial communication protocol. Due to increment of motor vibration, the motor will be harmed. In this proposed system control the motor speed has been controlled to build the life time of the motor. In past technique had utilized as a part of visa serial strategy to control the motor vibration. In visa serial technique has more complementation of the program and sets aside greater opportunity to execution. The motor vibration causes unnecessary damage to the motor. The vibration of motor is to reduce the speed of the motor. To reduce the vibration the motor speed to be in control automatically to avoid the unnecessary damage. This project describes the SCADA based automation of motor which widely used for industrial purpose. The control action transfer to the motor by communicating Arduino controller and SCADA software by using the Modbus serial communication protocol. Automatic controlling of motor, reduces the labor cost and also human effort. The vibration sensor senses the continuous monitoring of the motor beyond threshold value it will automatically change the motor condition indicates that motor in off state. The continuous vibration monitoring system senses the presence of vibration level of the motor which can be controlled the speed of motor by using SCADA software over long distance. This project proposed for the purpose of maintaining and increasing the lifetime of the motor in industries. The motor vibration level monitored continuously and visualized the picturized view on LabVIEW front panel.**

Keywords— SCADA, Modbus Protocol, Arduino IDE, RTU

I.INTRODUCTION

Arduino is an open source stage which comprises of both a physical programmable circuit board and programming IDE [14]. SCADA is utilized as a part of energy plants, media transmission, and oil and gas refining. Modbus used to transmit data over a serial line between electronic devices. The Arduino and LabVIEW interfaces through Modbus serial in RTU mode. The registers are just gotten to by the master and slave amid communication. For a successful communication first we transform the Arduino into a Modbus device. The extra libraries are to empower in the Arduino which goes about as either master or slave. In this LabVIEW is set as a master and after that Arduino kept as a slave with legitimate settings. To clarify the utilization of the Arduino controller and LabVIEW in mechanical, a unit is intended to screen the motor vibration with a specific end goal to expand the life time of the motor.

When they energized a specific vibration level implies that past the edge the motor will transforms into off condition consequently. The Modbus registers, slave Id and baud rates are made in the Arduino IDE for Modbus communication. Arduino IDE a control program for motor vibration observing is created and transferred in to the Arduino controller. In the LabVIEW front panel is made with driven, changes, and graph to send and get information to the Arduino. Modbus I/O server, shared factors, communication settings are made and after that common factors labeled with front panel segments. These parts are utilized to send and get computerized and simple signs to the LabVIEW through Arduino controller. The vibration sensor yield is simple flag, which is appeared in diagram design in the front panel. Arduino is an open source stage which comprises of both a physical programmable circuit board and programming IDE. SCADA is utilized as a part of energy plants, media transmission, and oil and gas refining. Modbus used to transmit data over a serial line between electronic devices. The Arduino and LabVIEW interfaces through Modbus serial in RTU mode. The registers are just gotten to by the master and slave amid communication. For a successful communication first we transform the Arduino into a Modbus device. The extra libraries are to empower in the Arduino which goes about as either master or slave. In this LabVIEW is set as a master and after that Arduino kept as a slave with legitimate settings. To clarify the utilization of the Arduino controller and LabVIEW in automatic, a unit is intended to screen the motor vibration with a specific end goal to expand the life time of the motor. When they energized a specific vibration level implies that past the edge the motor will transforms into off condition consequently.

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protocol is mostly used for the SCADA application.[3] The serial communication protocol is based on the function code table. The Function Code characterizes the order that the slave device is to execute, for example, read information, acknowledge information, and report status, and so on. The function codes are 1 to 255.

Function code table [15]

Command	Function Code
01	Read Coils
02	Read Discrete Inputs
03	Read Holding Register
04	Read Input Registers
05	Write single coil
06	Write Single Registers
07	Read Exception Status
08	Diagnostics
.	.
.	.
XX	Upto 255 function codes depending on the device

application program for process control, the social occasion of information continuously from remote areas keeping in mind the end goal to control hardware and conditions. SCADA innovation enhances which the more sensors can be set to enhance proficiency. SCADA can see the activity of substantial power process continuously through programming. The SCADA is an arrangement of programming and equipment components that enables mechanical associations to control modern procedures locally or at remote areas, Monitor, accumulate, and process constant information, straightforwardly connect with devices, for example, sensors, valves, pumps, motors, and more through human-machine interface (HMI) programming Record occasions into a log document. The SCADA comprises of three components, for example, Remote Terminal Unit, Human Machine Interface and Communication component. The communication occurs because of information link.

II.ESTABLISHMENT AND CONNECTION DIAGRAM

The Uno board is basically fueled with 12v dc source through the outer power plug. Information sources and yields are fueled with dc 5v which is taken from the Ground and 5v stick of Arduino as demonstrated the association outline. The yields are not associated with the Arduino specifically and are associated through the Relay board. The opto coupler in the transfer board offers security to the Uno board from the outside flaws the sign drove in the hand-off board demonstrates the status of the specific hand-off. To detect the motor vibration a plate compose vibration sensor is utilized, which gives simple information and is associated in the simple stick a0.The vibration sensor is a two lead sensor in which the positive lead is associated with the a0 stick. A 12 v dc motor is utilized as a part of the pack and gets On/Off through transfers. Alternate transfers can be utilized for facilitate advancement. The front panel hues are getting change amid change of status of the framework.

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SOFTWARE

SCADA acronymed as Supervisory Control And Data Acquisition which in view of class of software application program for process control, the gathering of information continuously from remote areas keeping in mind the end goal to control hardware and conditions. SCADA innovation enhances which the more sensors can be set to enhance proficiency. SCADA can see the activity of substantial power process continuously through programming .The SCADA comprises of three components, for example, Remote terminal Unit, Human Machine Interface and Communication component. The communication occurs because of information link. The capacity of a RTU is to gather the on location data which the vibration level of the motor and this data is sent to a focal area with the assistance of the

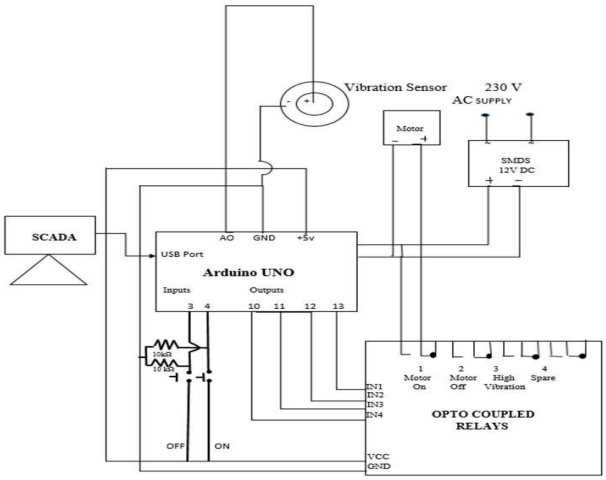

Figure. Block Diagram of Interfacing Arduino and SCADA

LABVIEW FRONT PANEL

SCADA screen, the control and working segments of motor vibration checking framework is indicated is pictorial shape. These parts and controls read and compose information on microcontroller to demonstrate the status of framework switches in front panel is utilized to control the activity through PC.LabVIEW Front panel based on,All options are user interface.Used to display Controls or Indicators.Highly customizable

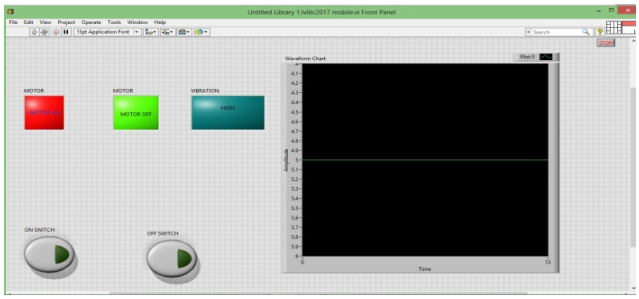

Figure. LabVIEW Front panel

III.RESULTS AND DISCUSSION

HARDWARE IMPLEMENTATION

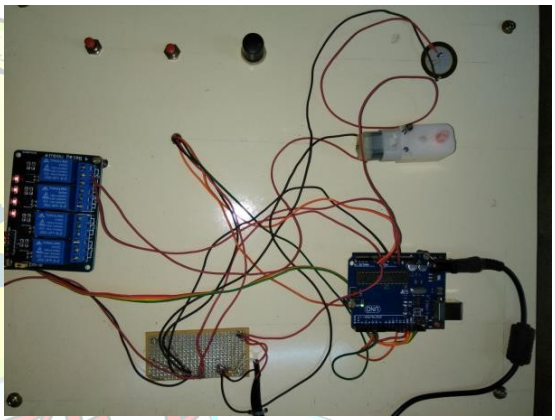

Figure. Hardware implementation of Arduino interface

The Arduino controller and SCADA software interfacing by using serial communication protocol to monitor the vibration level of the motor. A piezoelectric sensor is used for sensing the presence of motor vibration**.** The piezoelectric sensor may be a gadget that utilization those piezoelectric effect, to assess transforms On weight, Extending speed, temperature, strain, alternately force by evolving over them should a electrical charge. In the purpose At the sensor gets a thump, the Arduino load up will turn on the headed for changed wanted and subsequently murders. A piezo electric sensor may be a entranced part with certain Furthermore negative terminals. Those certain terminal will be connected with those straightforward stick A0 of the Arduino board same time the negative terminal may be grounded In those GND terminal for Arduino. Circuits that fill in at high voltage or during high voltage streams can't be regulated particularly Toward a Arduino. Rather, use a low-voltage control movement from those Arduino should control a transfer, which may be fit for dealing with and trading high-voltage alternately high-control circuits. Transfers provide for complete electrical isolation

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between the control circuit and the circlet continuously regulated.

LABVIEW DIAGRAM FOR CREATING SHARED VARIABLE

It demonstrates the made imparted variable and labeling of variable to the front panel segments. The green shading and blue shading demonstrates the kind of information utilized as a part of this task. Green shading signifies bit and blue shading indicates 16 bit information.

OUTCOMES

Two pointers are given on the screen one is for MOTOR ON sign and another is to demonstrate the MOTOR OFF condition. A diagram is plotted to picture the vibration amongst time and sufficiency, in which time is spoken to in x pivot and adequacy is spoken to in y axis. The waveform shows the vibration of the motor high. The front panel is the user interface, which demonstrates the controls and pointers utilized as a part of the task. Every part has office to change its properties like its measurement, shading, switch activity, kind of chart and so on. This choice empowers the client to make front panel as user interface.

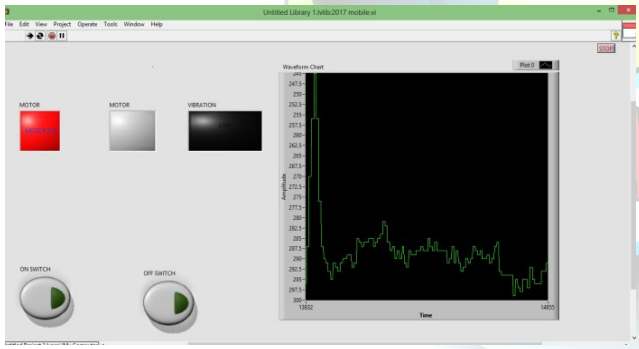

Figure: Picturized view of vibration level on LabVIEW Front panel

IV.CONCLUSION

Through this paper, the Arduino Uno and LabVIEW was interfaced by Modbus serial communication. The appropriate libraries were in recognized and incorporated into the Ide to make the Arduino as Modbus device. At that point Modbus enlist bank and communication settings like slave id, baud rate are made in IDE programming. After transform on the Arduino into a Modbus device, the control program for motor vibration observing framework was produced and transferred into controller. The LabVIEW, Modbus I/O server was made and communications setting were accommodated Modbus communication. A front panel was created with all fundamental control and framework segments to demonstrate the framework status adequately. At that point shared factors are made and labeled with the front panel objects. The Arduino was associated with the PC introduced LabVIEW through USB port. Then Successful communication observed by sending and receiving data between the LabVIEW and Arduino. By this project, outlined and created venture according to our want by receiving the most recent innovation. The communication was effectively settled among Arduino and SCADA by Modbus. The framework functioned according to the program composed by us to control and screen motor vibration toolbar.The future research is focused on the monitoring the water level of the boiler and controlling the automation of boiler in thermal power plant by using the SCADA software. The coal conveyor belt fault detection are monitored and controlled which displayed picturized view with help of Arduino and SCADA software.

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