



Production of Motor using Zigbee Transceiver

P.Priyadharshini¹, R.Santhiyarani², N.Sangeetha³, S.Saranya⁴

UG student, Department of EEE, Saranathan College of Engineering, trichy, India^{1,2,3,4}

Abstract: In this paper, a wireless monitoring system is designed to monitor and acquire the remote electrical parameters like voltage, current, speed, temperature and send real values over wireless network. To implement this, a zigbee module is connected to the controller which would transmit the data to zigbee coordinator which is connected to pc through RS232 serial communication. The monitored values are displayed in pc and as SMS in mobile through GSM technology.

Keywords: Monitoring, Three phase induction motor, Arduino Mega2560, Zigbee, GSM.

I. INTRODUCTION

In modern industrial field, the requirement for monitoring and controlling system is one of the most important criteria for minimizing the power consumption. In our project, a wireless monitoring system for three phase induction motor is realized using zigbee protocol, where wired communication is either more expensive or impossible due to physical conditions and human hazards for safe and economic data communication in industrial fields.

During continuous process of production it became dangerous and risky operation to control the machines. In such cases, remote control and monitoring techniques became a considerable solution to eliminate the hazards. Hence wireless data communication is used in various industries. The institute of electrical and electronics engineering(IEEE) developed 802.15.4 standards and health production of Zigbee protocol and devices that support this protocol. As a result, Zigbee supported device have low cost, intelligent network topologies. A lot of devices and machines can be controlled, and data can be received and send at same time by Zigbee wireless technology. All measurements related to induction motor such as voltage, current, speed and temperature were protected against the failure of induction motor. Control of three phase induction motor has been achieved via the pc over the zigbee protocol.

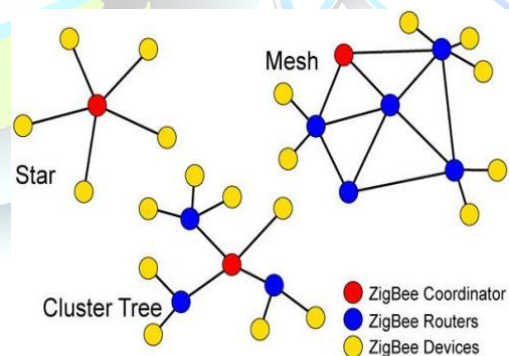
II. TECHNOLOGY

The parameters of the motor collected from the system transferred to the Zigbee coordinator via the Zigbee router;

and then, they have been transferred to the computer over the RS232 protocol.

A. Zigbee Communication

Zigbee communication is specially built for control and sensor network on IEEE 802.15.4 std for wireless personal area network (WPANs). Zigbee WPAN operates at 868 MHz, 902-928 MHz and 2.4 GHz frequencies. Data rate of 250 kbps is best suited for periodic as well as two way transmission of data between sensors and controllers. It is low cost and low powered mesh network deployed for controlling and monitoring applications. It covers 10 to 100m within the range. It is simpler than other sensor networks such as Bluetooth and Wifi.



B. Zigbee Architecture

It consists of three different types of devices, Zigbee coordinator:

Zigbee must contain atleast one coordinator which act as root and bridge of network. It is responsible for



handling and storing information while performing receiving and transmitting data operation.

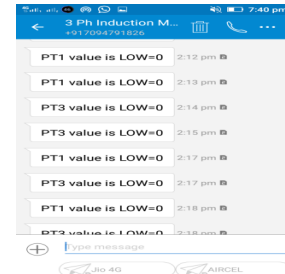
Zigbee router:

It act as intermediary devices that permit data to pass to and fro through them to other devices.

End device:

It have limited functionality to communicate with parent nodes such that battery power is saved.

The number of coordinator, router and end device depends on type of network such as star, tree, mesh network.



The modem sends back a result after it receives a command
D. ARDUINO MEGA2560

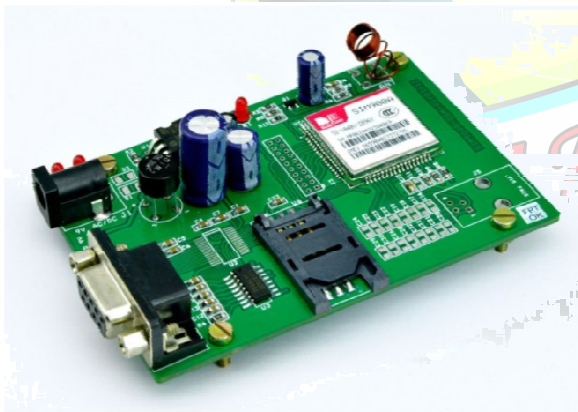
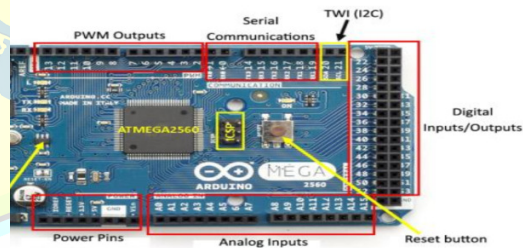
C. GSM

Global system for mobile communication (GSM) is used for mobile communication. GSM module consists of GSM modem assemble together with power supply circuit and communication interfaces. It requires a SIM card just like mobile phones to activate communication with the network.

GSM modem can perform the following operations,

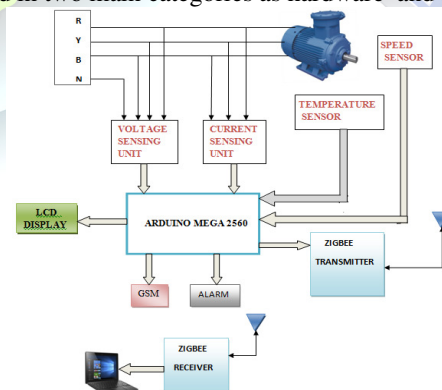
- Receive, send or delete SMS messages in a SIM.
- Read, add, search phone book entries of the SIM.
- Make, receive or reject a voice call.

It has 54 digital Input / output pins out of which 15 can be used as PWM outputs, 16 analog inputs, 4 UARTs, 16MHz crystal oscillators, USB connection, power jack, ICSP header and reset button. It's operating voltage is 5volts.



III. PROPOSED SYSTEM

The general block diagram for the proposed system as shown in figure. The proposed system can be examined in two main categories as hardware and software.

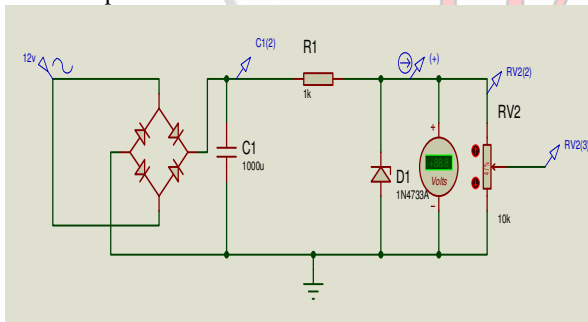


The modem needs AT commands, for interacting with controller which are communicated through serial communication. These commands are sent by controller.

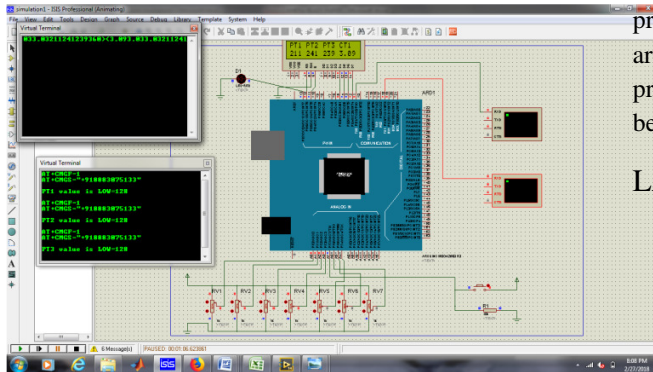
The diagram shows a current sensor module. A 5V supply is connected to the top of the sensor. The sensor has two input/output terminals labeled I_{in} and I_{out} . The sensor is connected to a resistor R . The other end of R is connected to a capacitor C and a 4.7V Zener diode. The output of the Zener diode is connected to an ADC Channel.

These sensed values are given to the Arduino Mega2560 which sends the monitored value to lcd display and to database which is created in pc.If overload conditions occurs , an alert message is given to mobile using GSM module

AC voltage measurement can be carried out by converting AC voltage into proportional DC Voltage using rectifier and filter circuits. Similar to DC voltage measurement Voltage divider is constructed using 47K Ohm variable resistor R1. 5V zener diode is used to protect Arduino from accidental excess voltages. Adjust the resistor R1 (47K) to calibrate the voltage. Here the AC voltage that we can give to transformer is from 50V to 230V depending on its ratings. Rectified DC is fed to the voltage divider circuit. We design this circuit in proteus simulation software before implementation.

[illegible]

Current sensor is a device that detects the electric current and generates a signal proportional to that current. The generated signal could be analog voltage or current. The



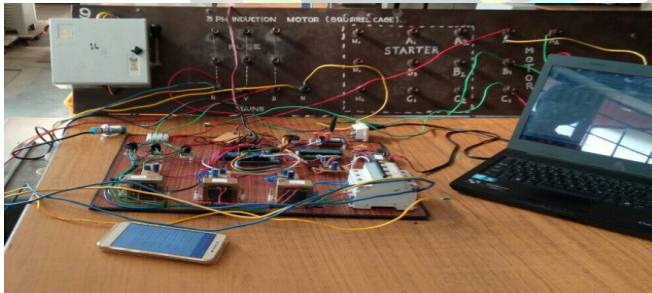
For simulation, we used proteus software. The version of the software is proteus7.7.

In the simulation, we used arduino mega2560, a lcd display, push button, variable pot and a virtual terminal.

For using arduino mega2560, we first download the arduino library. Then the library was added in the software. The lcd display, push button and the variable pots are connected to arduino pins. Variable pot range is from (0-1023). The pot is used to vary the voltage, current, temperature and speed values. The values are get displayed in LCD.

After connecting all the blocks, the arduino program is to be added to the arduino block.

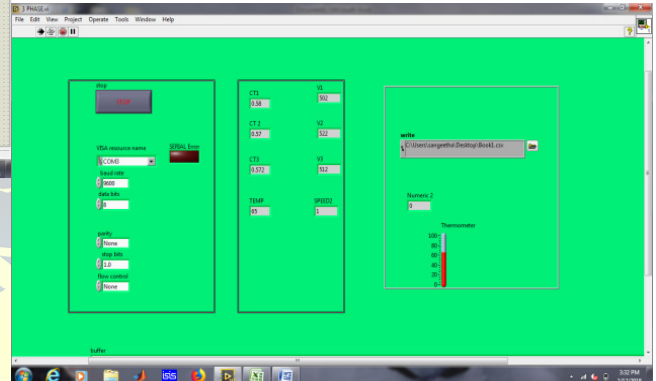
RESULTS DISCUSSION:



The temperature of the motor is measured using LM35 temperature sensor. The current and voltage of the three induction motor, speed of the induction motor are measured using appropriate measuring unit and it can be displayed on LCD display. This paper is based on ongoing project whose testing is yet to be done. Thus actual results have not been presented. The system is expected to monitor the parameters of induction motor and send message on mobile phone when the values of those parameters crosses the limitations prescribed in

programming of microcontroller. And also monitor values are stored in database which is stored in pc. Hence, preventive action can be taken for protection of motor before actual fault occurs in the system.

LABVIEW:



Serial data from arduino is stored in the excel sheet using LABVIEW VISA tool. The Virtual Instrument Software Architecture (VISA) is a standard for configuring, programming, and troubleshooting instrumentation systems comprising GPIB, VXI, PXI, Serial, Ethernet, and/or USB interfaces.

TIME	DATE	IKN	IYN	IKN	VKN	VYN	TEMP	SPEED
3:31 PM	2/12/2018	0	0	0	0	0	26	0
3:31 PM	2/12/2018	2.21	2.23	2.24	249	251	250	27
3:32 PM	2/12/2018	2.22	2.25	2.22	249	251	250	27
3:32 PM	2/12/2018	2.23	2.26	2.23	248	251	250	27
3:32 PM	2/12/2018	2.23	2.26	2.23	249	252	251	27
3:32 PM	2/12/2018	2.23	2.26	2.22	250	252	251	27
3:32 PM	2/12/2018	2.23	2.26	2.22	250	252	251	27
3:32 PM	2/12/2018	2.22	2.25	2.22	250	252	251	27

APPLICATIONS:

- Industrial automation.
- Home automation.
- Smart metering.
- Smart grid monitoring.



IV. CONCLUSION

The monitoring of induction motor through wire communication is not only expensive but also the data communication may apply due to physical conditions like human hazards. Hence wireless communication becomes a praiseworthy substitute for not only monitoring but also the control of induction motor. It enhances the performance of the motor. The proposed system can measure, monitor and control the most important parameters like voltage, current, temperature and speed of the induction motor.

REFERENCES

- [1] Mohit Kumar¹, Mohnish Sharma¹, Rishabh Narayan¹, Sumit Joshi¹, Sanjay Kumar² - "zigbee based parameter monitoring and controlling system for induction machine"- Conference on Advances in Communication and Control Systems 2013 (CAC2S 2013)
- [2] Mohini Reddy, Vidya Sawant- "remote monitoring and control system for dc motor using zigbee protocol"- International Journal of Application or Innovation in Engineering & Management (IIAEM) Web Site: www.ijaiem.org Email: editor@ijaiem.org Volume 3, Issue 4, April 2014 ISSN 2319 – 4847
- [3] Annie.P.Oommen , Athira.K , Farsana.P.S , Merry Maria Abraham , Mithuna Anuraj- "zigbee based parameter monitoring system for induction motor" International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering (An ISO 3297: 2007 Certified Organization) Vol. 4, Issue 4, April 2015 Copyright to IJAREEIE 10.15662/ijareeie.2015.0404043 2336
- [4] P.E. Elavenil¹, Dr. R. Kalaivani²- "speed monitoring and protection of motor using zigbee communication" -International Journal of Scientific Research Engineering & Technology (IJSRET) Volume 2 Issue 11 pp 760-766 February 2014 .
- [5] Daniel Alexandru Vişan, Ioan Liţa, Mariana Jurian and Ion Bogdan Cioc -"wireless measurement system based on zigbee transmission technology"-978-1-4244-7850-7/2010/\$26.00 ©2010 IEEE
- [6] Sneha P. Maske , Dhanashri P. Kandalkar , Punam S. Raut , Prof. A. B. Nagdewate- "zigbee based parameters monitoring and controlling system for induction motor"- International Research Journal of Engineering and Technology (IRJET) Volume: 05 Issue: 01 | Jan-2018
- [7] M. P. Bodkhe, K. N. Pawar-"monitoring and control system for three phase induction motor using poly phase multifunction energy metering ic ade7758 and zigbee protocol"- International Journal of Science and Research (IJSR) ISSN (Online): 2319-7064
- [8] Harsha Jain, Surbhi Shrivastava- "Modern method for protection of induction motor using microcontroller and wi-fi technology" International Journal of Innovative Research in Computer and Communication Engineering, Vol. 4, Issue 6, June 2016
- [9] VongsagonBoonsawat,JuraratEkchamanonta,KulwadeeBumrunghket ,andSomsakKittipiyakul-Xbee "wireless sensor networks for temperature monitoring"- Industrial Applications Conference, 661-667, Sept 2007.
- [10] R. R. Patil, T. N. Date, B. E. Kushare- "zigbee based parameters monitoring system for inductionmotor"-2014 IEEE Students' Conference on Electrical Electronics and Computer Science 978-1-4799-2526-1/14/\$31.00 ©2014 IEEE.