

Wireless Control of AC Motor using Mesh Network Standard

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Abstract: - Nowadays it's very common to use automation in industries. AC motors are the nerve of many industries. Hence, the automation is much needed for accuracy and reliable operation. This project proposes a system on wireless control and monitoring different parameters of induction motors based on zigbee technology. Due to this, there will be safe data transfer communication in industrial field where the other mode of data transfer communication is more expensive than zigbee or impossible due to some physical conditions. On this design, there will be a set of transducer and sensor monitors the parameters of Induction motor and transmit its data through zigbee. An Arduino based system is used for collecting and storing data and accordingly generating control signal to stop or start the AC machine wireless through computer interface developed with Zigbee. This Techniques has different sensors to monitor and measure different parameters of induction motor and the data is transmitted to control room i.e., drive using zigbee wireless protocol. The overall control like starting and stopping of motor can be done with zigbee that is already interfaced with computer. It also protects motor against some faults such as over current, over heating in winding, under lower voltage, data acquisition system saves all received parameters data of motor in the database.

Keywords: Induction motor (IM), Zigbee, Arduino, Current Sensor, Temperature Sensor, voltage sensor, Pc.

I) INTRODUCTION

Induction motors are mostly preferred in all Industries. The reason for using industrial motor is because, they are self-starting, economical and reliable. Although they have sufficient features, and simple structure they undergoes several stresses which creates faults which finally ends in failure. To treat these conditions several controlling in motors are needed.

For a reliable operation of motors, they are several data's which plays a major role to control its operation. The data's like current, voltage, temperature and speed decides the performance of Induction motors and drive systems. These parameters directly affects these Motors efficiency and reliability. However, while using Induction motor in Industries, there will be continuous process of motor for these production. On that time if any faults occurs it becomes risky and also very operation to control the motors. The only way for controlling these hazards was to monitor these parameters. It's impossible to monitor these parameters for 24x7 by humans. So, wireless communication technique for transforming data's from machine to drive is needed, which is used in most of industries.

There are different ways in monitoring Induction motor which was been discovered by many reviewers and researchers. Although, we have different methods in monitoring and controlling Induction motors, still we faces critical problem in Industries, this is because the problem in Induction motors should be found at initial stages. So, that we can rectify it before it creates a large fault. For detection of fault we need fast emerging technology. It should withstand its monitoring and control for all initial faults and also unexpected faults.

Still in most of industries and automation applications, the traditional methods are used i.e., wired technology. Although wired technology operations are designed to meet several hard situations sometimes it creates failures at last. But wired technology was also designed in same way the only difference is that it doesn't have any physical connections. So, that the data communications in wireless manner will be fast as it's compared to wired technology.

In some existing system, there are different methods has been introduced for monitoring, detecting mechanical stresses, controlling temperature in Induction motor. But they didn't fulfill all the controlling and also has some disadvantages, the methodology used will be costlier.

Our proposed system will overcome these defects as we used different protocols like voltage sensors, current sensors, temperature sensors for automatic controlling and interfacing we have used Arduino. In Desktop computer the C programming were done to design the interface and finally communication. We have used Zigbee methodology which was more efficient than other methods and also cost efficient.

This paper was organized as Section II Wireless Methodology, Section III Proposed. There are different ways in monitoring Induction motor which was been discovered by many reviewers and researchers. Although, we have different methods, this is because the problem in Induction motors should be found at initial stages. So, that we can rectify it before it creates a large fault. For detection of fault we need fast emerging technology. It should withstand its monitoring and control for all initial faults and also unexpected faults.

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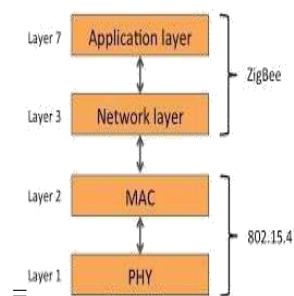
II) WIRELESS METHODOLOGY

For remote philosophy the zigbee convention was utilized. Zigbee plays as a transmitter between beneficiary among Drive and Enlistment engine. On IEEE 802.15.4 norm for remote individual territory organizations (WPANs), it is utilized for correspondence of zigbee among control and sensor organization and it is the item from Zigbee partnership. This IEEE standard principally characterizes the correspondence among physical and Media Access Control (Macintosh) layers to deal with the various gadgets with low-information rates.

The WPANs of these sort of zigbee's work at 868 MHz, 902-928MHz and 2.4 GHz frequencies. It is most appropriate for intermittent just as middle two path transmission of information among sensors and regulators at the date pace of 250 kbps is. It has three sorts of organization lattice, tree, and star network for these geography associations. The quantity of switches, organizers, and end gadgets relies upon the sort of organization utilized.

Features of Zigbee module:

- ❖ Cost efficient.
- ❖ The maximum data rate for a Zigbee device is 250Kbps because it has low data rate. □ Reliable.
- ❖ It can ends upto 65000 nodes in a network.
- ❖ It automatically establish it desired network.
- ❖ It uses very small packets when has compared to Bluetooth and WIFI.



Zigbee specifies itself with three different devices. They are Zigbee Coordinator (ZC), Zigbee Router (RC), Zigbee End devices (ZED).

ZIGBEE COORDINATOR (ZC):

Zigbee coordinator is one of the devices in Zigbee. It was used for channel selection. It assign an ID for the network. It allocates unique address to each devices and also it initiates and transfer messages to network.

ZIGBEE ROUTER (ZR):

Zigbee Router act as intermediate nodes between the coordinator and the end devices. It router traffic between different nodes. It receives and stores messages intended for their children.

ZIGBEE END DEVICE (ZED):

Zigbee End devices contains just enough information to talk to the parent node. They may sleep which make end devices more suitable choices for battery operated devices. All traffic to an end devices is first routed to its parent. Examined in two main categories as hardware and software. The functions of the each part of the system are described in the following sections in detail.

Hardware

The system consists of a 3 hp/1440 rpm, T.E.F.C. type three-phase induction motor, and two voltage transformers w

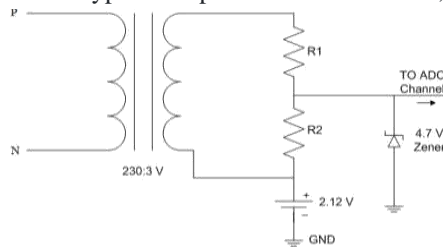


Fig.2: Current Measuring Circuit.

Two signs for voltages, two signs for flows are utilized as contribution to the A/D module of the DSC and one sign for temperature is utilized as advanced contribution to DSC. Fig. 5 and fig. 6 shows the current estimating and voltage estimating circuit individually whose yield is given to the ADC channels of the advanced sign regulator.

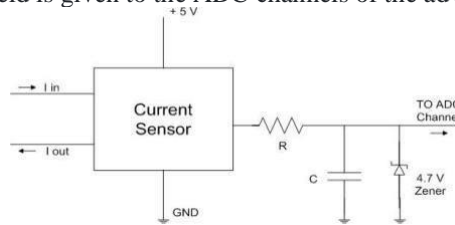


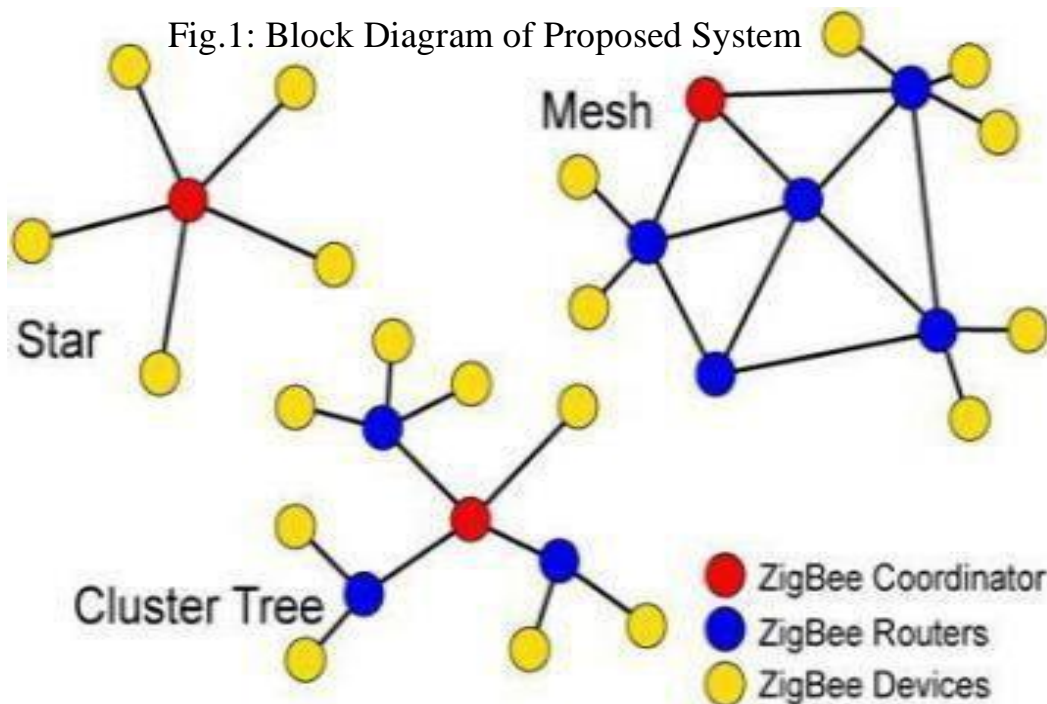
Fig.3: Voltage Measuring Circuit.

The framework programming created in C Programming that works under Windows working framework and has a profoundly adaptable programming structure with information base help. The boundaries of the engine gathered from

III) PROPOSED SYSTEM

A square graph of proposed is demonstrated as follows. The proposed framework can be sensors dependent on Lobby Impact having Greatest Essential current: 25 A, Auxiliary Voltage (VO): 2.5 ± 0.625 , recurrence: DC-25 kHz, exactness: 0.1%. Third stage voltage and current is determined by the computerized signal regulator calculation An advanced temperature sensor for engine winding temperature estimating, a 16bit advanced sign regulator dsPIC30F4013 by Central processor. The framework comprises of a 3hp/1440 rpm, T.E.F.C. type three-stage acceptance engine, and two voltage transformers with change proportion of 230/3 V, two current.

Fig.1: Block Diagram of Proposed System



The system transferred to the Zigbee coordinator via the Zigbee router; and then, they have been transferred to the computer over the RS232 protocol. Graphical User Interface used to display received data on the screen to perform controlling commands and to storage data receive throughout the Zigbee system.

IV) TEST&RESULTS

Five usage photos of the proposed framework are portrayed in fig. 9 to fig. 13. The fig. 9 shows the outline of the proposed framework demonstrating the force supply, starter, observing unit and acceptance engine. Fig. 10 delineates the voltage, current detecting sheets, Force supply for advanced sign regulator and Zigbee Transmitter. Fig. 11 represents the association of Zigbee Beneficiary with PC through RS232. Fig. 12 and fig. 13 are demonstrating the outcome on LCD show under burden condition. At long last fig. 13 shows the boundaries on the graphical interface demonstrating a similar outcome got as on the LCD show. All the information are put away in the neighborhood plate of PC as a dominate record as on table 1.

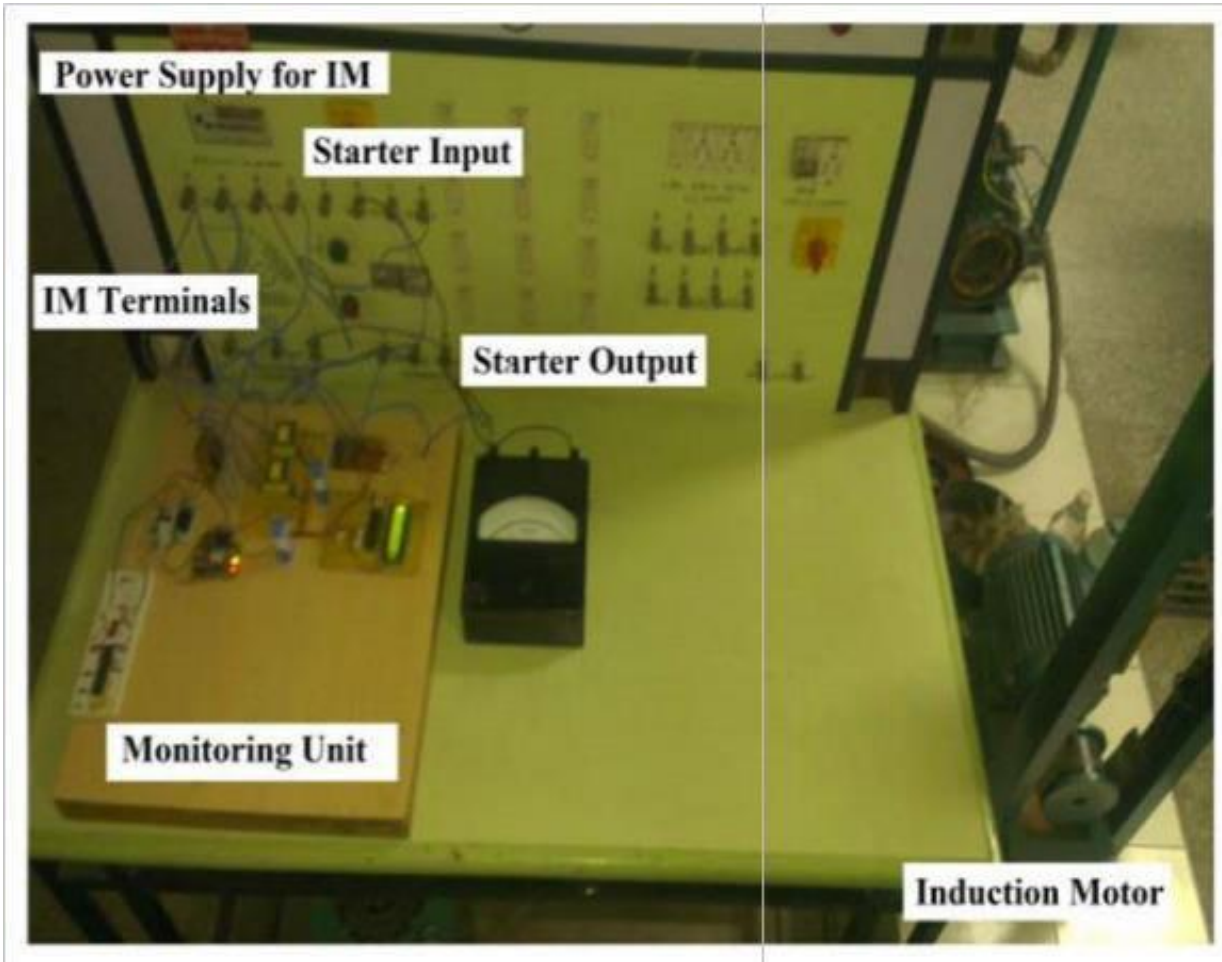


Fig. 4: overview of the proposed system

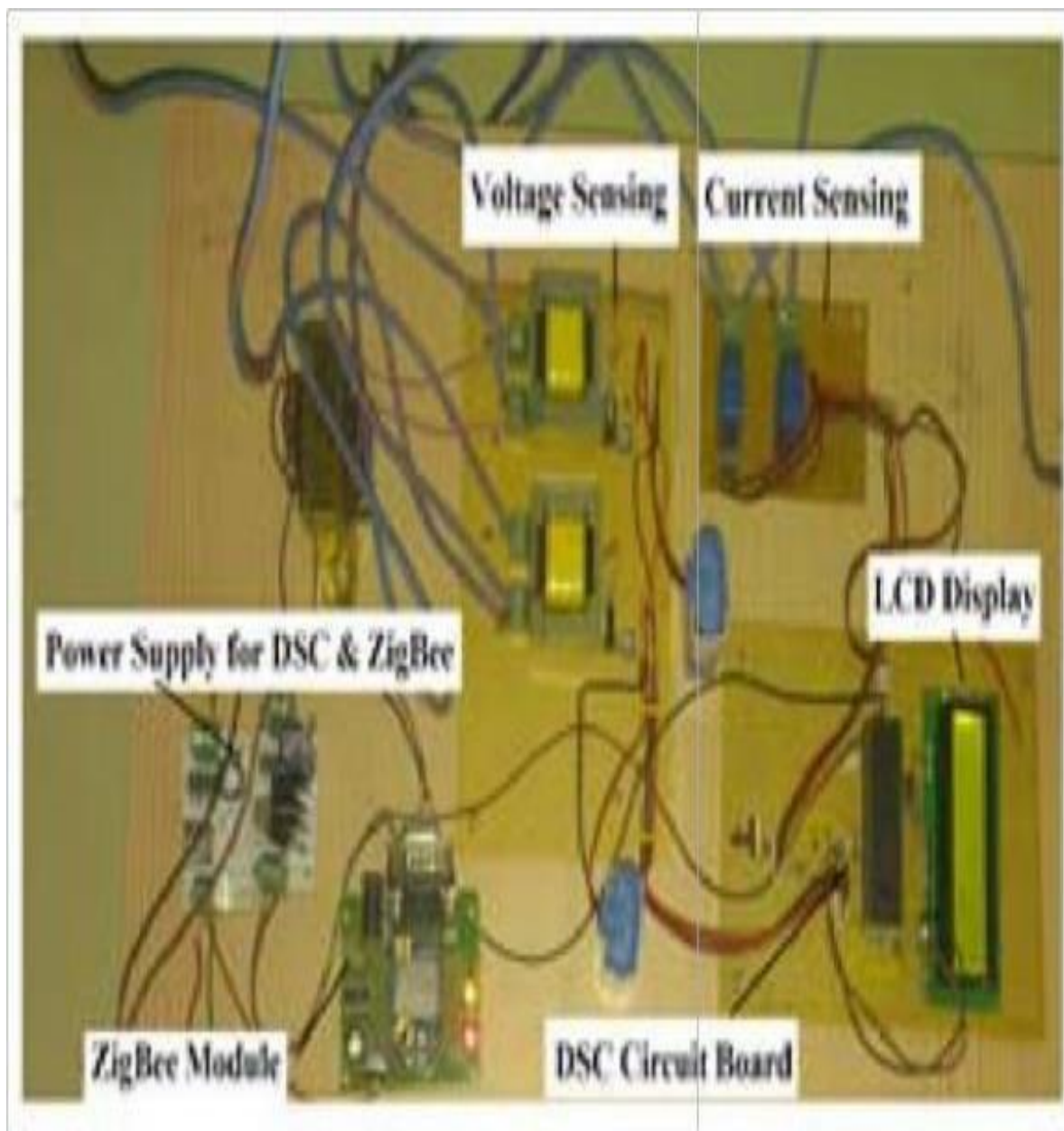


Fig. 5: Components Used

V) CONCLUSION

This proposed research work is planned and actualized in Electrical Machine Lab of Electrical Designing Division at KKWIE&R; Nasik (India).The framework created has been tried tentatively and discovered fruitful in checking the boundaries.



Fig.6: A view of the Results on Home Page.

	A	B	C	D	E	F	G	H
1	Vrn	Vyn	Vbn	Ir	Iy	Ib	W	Var
2	227.3V	233.6V	237.8V	3.003A	3.163A	4.689A	0169W	0661VAR
3	224.4V	232.7V	234.3V	2.960A	3.203A	4.666A	0159W	0645VAR
4	226.8V	234.9V	236.6V	3.050A	3.153A	4.670A	0168W	0671VAR
5	224.2V	234.4V	238.9V	3.047A	3.173A	4.738A	0176W	0660VAR
6	225.5V	234.1V	233.4V	2.977A	3.232A	4.683A	0168W	0650VAR
7	224.4V	233.9V	236.1V	2.951A	3.198A	4.639A	0173W	0639VAR
8	225.0V	235.1V	236.1V	2.953A	3.190A	4.565A	0175W	0641VAR
9	225.5V	233.0V	234.9V	3.042A	3.174A	4.694A	0181W	0661VAR
10	224.3V	235.2V	238.2V	2.965A	3.165A	4.617A	0165W	0644VAR
11	226.7V	234.2V	236.9V	3.033A	3.229A	4.670A	0194W	0659VAR

Table 1: Data stored in excel format.

During the observational tests, no issue has been noticed either imparting the ZigBee to the PC, or coordinating the equipment units utilized for observing the acceptance engine. The framework created can be utilized for modern applications as well as for instructive purposes; it implies, the framework might be valuable to schools that have professional, specialized, and mechanical training. Educators can utilize the framework introduced as a supporting showing instrument, and it very well may be adjusted in exploratory investigates effectively. Additionally, the exhibition of the enlistment engine can be recorded and if there should be an occurrence of terrible condition the assurance is likewise given by starter. At long last the proposed framework is savvy when contrasted with different ones.

The proposed framework is tried uniquely for voltage, current, powers, temperature with the assistance of ZigBee and work are a pc/PC, however this framework can be adjusted for speed, vibration, moistness, compound boundaries checking by adding a few sensors to framework and rolling out little improvements in the program structure.

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