Zigbee Based Remote Monitering Of Parameters of Trasformer Using Wireless Interface

[1]Saurabh Kathale,[2]Saurabh Nimje,[3]Sanket Mahajan,[4]Pratik Mahalle,[5]Apoorva Kulkarni,[6]NehaSambartode
Students, Department of Electronics and Communication Engineering, DBACER, Nagpur, Maharashtra, India.
[1]kathalesaurabhjb@gmail.com,[2]saurabhnimje4@gmail.com,[3]sanketmahajan161@gmail.com,
[4]pratik.mahalle16@gmail.com,[5]apoorvak2705@gmail.com,[6]neha.sambartode1302@gmail.com

Abstract: : Day by day our needs are increasing and everything is turning effort free. In today's world automation has become a basic need for the society. Transformers are the nerves of many industries and residential area. Hence industrial automation is required for perfect and accurate operations. This paper proposes a wireless control and monitoring system for a transformer based on Zigbee communication protocol for safe and economic data communication in industrial fields where the wired communication is more expensive or impossible due to physical conditions. A set of transducers and sensors checks the parameters of transformer and transmit the data through Zigbee Protocol at a range of 2.4 GHz. An AVR system is used to collect and store data and accordingly is used to generate control signal to stop or start the transformer wireless through computer interface developed with Zigbee.

Keyword — Atmega16, Transformer, Zigbee.

INTRODUCTION

Transformer is a key parameter and are very popular in industries because of it large applications. Hence it is necessary to protect them against faults so as to ensure smooth operations and process. Various parameter controlling and monitoring systems are there for other types of machine. but in case of the maintaining transformer monitoring systems are not widely used due to high cost of setup and physical constraints. So as to overcome the drawbacks in monitoring and controlling, Zigbee Based System with an AVR is used which makes it cost-effective and simple.

I. TRADITIONAL SYSTEM

In the existing system the parameters of the transformer were monitored and the modules of the embedded system were connected and communicated through the CAN bus which is wired communication. Wired communication has some drawbacks when they carry data such as loss of data and lack of effective communication. Another thing in this system is the parameters of the transformer such as voltage current temperature and power factor were measured but active power and the reactive power was not measured. Since the communication is wired there will be considerable power loss and also data loss. Efficient data transmission is so much important in transformer monitoring. But there will be loss of data in the CAN bus.

### II. PROPOSED SYSTEM
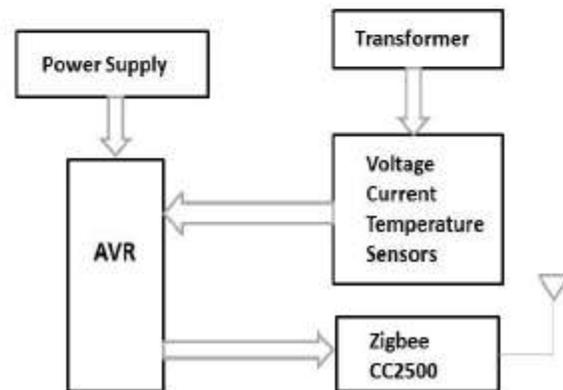
Fig 1: Transmitter
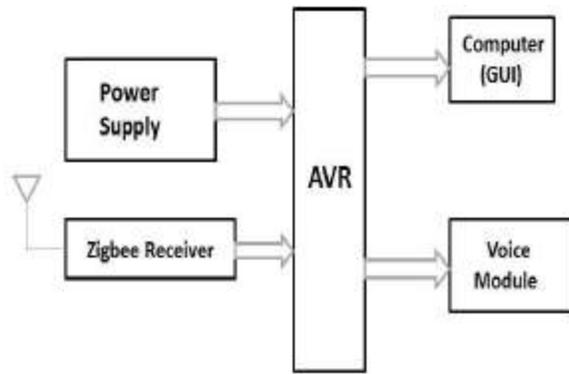
Fig 2: Receiver

A) POWER SUPPLY:

In most of our electronic products or projects we need a power supply for converting mains AC voltage to a monitored DC voltage. For building a power supply, plotting of each and every component is essential.

CONTROL UNIT(AVR ATMEGA 16):

The AVR is a more advanced Harvard architecture unit, where program and data are stored in separate physical memory systems that appear in different address spaces, but having the ability to read data items from program memory using special instructions.

ZIGBEE:

Wireless sensor network system are autonomous and operate unattended also adaptive to the atmosphere. The wireless system for controlling purpose will not only reduce the overall monitoring system cost in term of facilities setup and labor pay, but it provides adjustability in system in term of transportation. Hence these systems are mostly used in military, hospitals, residence and other commercial areas. According to these factors the ZigBee becomes the new standard intended for low cost devices in automation field, computer applications and residence controls.

A. PROJECT METHODOLOGY:

To design this monitoring system, we have combined Zigbee with all the sensors on transmitter to send the data on the other side that is receiver The AVR will keep updating the data with the help of sensors and will keep it transmitting. This output data is then visible on the receiver side on a GUI.

SYSTEM OVERVIEW:

General description of the system

The System is divided into two sections:
1. Section A (Transmitter).
2. Section B (Reciever).

The section A contains different types of sensors. The sensors are used to sense the different parameters and send it to microcontroller. The section B receives this data and displays it on the GUI. This whole process is real time monitoring parameters of the transformer. It is installed at the distribution transformer site and the parameters are recorded using the built-in 10-channel analog to digital converter (ADC) of the microcontroller. Sensors are used to sense the different parameters and send it to microcontroller. The acquired parameters are forwarded and saved in the system memory and transmitted to coordinator unit. On the other hand, the coordinator receives this data and displays it on the GUI.

HARDWARE SPECIFICATION:

1. AVR ATMEGA 16:
2. The AVR is an advanced Harvard architecture 8-bit RISC single chip microcontroller which was built by Atmel company in the year 1996. The AVR was one of the first microcontroller families to use on-chip flash memory for storage of the program, as a dispute to only single Time Programmable ROM, EPROM, or EEPROM which are used by the other microcontrollers at that time.

- High Performance, Low Power AVR 8-Bit Microcontroller
- Modified RISC Architecture
- 130 Powerful Instructions
- Up to 16 MIPS Throughput at 16 MHz
- High capacity Non-volatile Memory segments
- 16K Bytes of In-System Self-programmable Flash program memory
- 512 Bytes EEPROM
- 1K Byte Internal SRAM
- Write/Erase Cycles: 10,000 Flash/100,000 EEPROM

2. TEMPERATURE SENSOR (LM35):
We can measure temperature more accurately by using LM35 than using a thermistor. It has an output voltagethatis proportional to the Centigrade temperature. The scale factor is of $0.01V/^oC$. The sensor LM35 does not require any external calibration or trimming and maintains an accuracy of $+/-0.4^oC$ at room temperature and $+/- 0.8^oC$ over a range of 0^oC to $+100^oC$.Another important characteristic of the LM35DZ is that it draws only 60 micro amps from its supply and

possesses a low self-heating capability. The sensor self-heating causes less than0.1C temperature rise in still air.

3. CURRENT SENSOR (ACS712):

ACS712 current sensor operates from 5V and outputs analog voltage proportional to current measured on the sensor terminals. We can simply use a microcontroller ADC to note the values. The Sensing terminal can also measure current for loads operating at high voltages like 230V AC mains while output sensed voltage is isolated from measuring part.

4. ZIGBEE (CC2500):

The CC2500 is a low-cost 2.4 GHz transceiver designed for very low-power wireless applications. The circuit is made for the 2400- 2483.5 MHz ISM (Industrial, Scientific and Medical) and SRD (Short Range Device) in frequency band. The RF transmitter receiver is combined with a highly configurable base-band modem. The modem also supports many modulation formats.

SOFTWARE SPECIFICATION:

DESIGN ASPECT OF SOFTWARE DEVELOPMENT
- ❖ The general aspect of the software design consists of the following procedure
- ❖ Problem definition and software specification
- ❖ Software structure design
- ❖ Program coding
- ❖ Testing and debugging

VISUAL STUDIO:

Microsoft Visual Studio is an integrated development environment (IDE) from the Microsoft. It is used to develop computer programs for Microsoft Windows.
Visual Studio supports different programming languages and allows the code editor and debugger to support (to varying degrees) nearly any of the programming language, only if a language specific service exists. Built in languages include C, C++and C++/CLI (via Visual C++), VB.NET (via Visual Basic .NET), C# (via Visual C#), and F# (as of Visual Studio 2010).
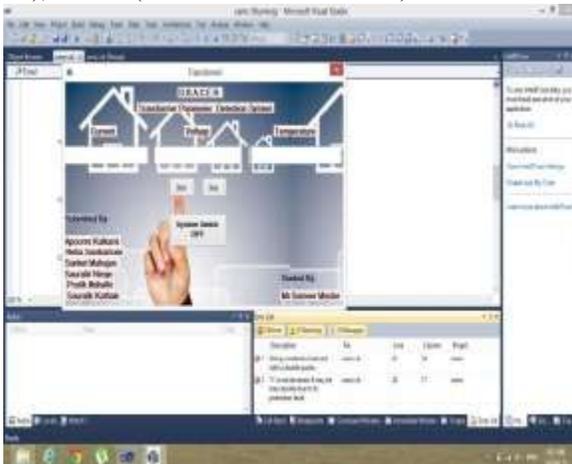
Fig 3: GUI (Graphic User Interface)

SYSTEM TESTING :

Prior to deployment on actual condition, it is necessary to test the circuit module by module, to make sure that the complete circuit is working properly. So first the ZigBee module, then the microcontroller circuit and then Sensors were tested and finally the compete circuit were tested.
This whole project is tested by the following steps:
First of all the temperature sensor is set and tested
.The temperature sensor RTD is placed in a controlled-temperature environment, and calibrated for the different temperature by taking the voltage reading of the sensor at the transmitter end.

CONCLUSION

All the objectives outlined in this paper are achieved. The study of ZigBee modules available in market was done and the best ZigBee module was chosen. The chosen modules were studied and were implemented as end device and co-ordinator. Successful communication system was built between co-ordinator and end device. There are two most important feature of this product. First one is the use of ZigBee technique to transfer data from one point to other; this method increases the life of battery and the product. Using this technology it's possible to cover large fields of about 1 km square area. With modern technology it is possible to monitor a large number of parameters of distributed transformer at a comparatively high cost. The difficulty is to balance the functions of the monitoring system and its cost and reliability. In order to get effective transformer monitoring system to a medium cost, it is important to focus on a few key parameters. System is able to record and send abnormal parameters of a transformer to concerned office. It works on Zigbee technology that supports multiple network topologies such as the point to point, the point to multipoint and the mesh networks. It has low duty cycle – provides long battery life.

FUTURE SCOPE
- ▪ GSM modules can be used instead of Zigbee.
- ▪ The sensors used can be used of higher ratings for actual application

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