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Arduino based Smart Grid Power Monitoring and Control by using IoT

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Abstract –In power transmission line fault occurs which causes interruption in power supply. Time required to find fault is more, hence we design a model which is to be detect the fault in transmission line by comparing the voltage signal between the transmission line and a reference value. Reference value is determined first and set into program. In this system Arduino is installed with a inbuilt server which is connected to the transformers whenever there any problem is occur this can be easily monitor and control by the IOT. Also the measurement of voltage current and temperature of 3 phase system is take place and displayed on the webpage. Alarm is on when fault condition is determined. Also protect the other component from damage by using relay. Wi-Fi module ESP8266 is used to connect system with webpage. Arduino software is used for the programming and Arduino uno is ATMEGA328P microcontroller board based.

Key Words: 1. Voltage Sensor, 2. Current Sensor, 3. IOT, 4. Atmega 328

1. INTRODUCTION:

In power transmission systems, the majority of voltage and current signal distortions are caused by faults. Faults that occur in power transmission lines can cause an interruption of power supply. The time required to locate a fault is drastically reduced, as the system automatically and accurately provides accurate fault information. This will ensure a shorter response time for technical crew to rectify these faults and thus help save transformers from damage and disasters. A smart fault detection system was used to adequately and accurately indicate what fault had occurred. The system uses a current transformer, a voltage transformer, ATMega328 Microcontroller, and a Wi-Fi model. The system automatically detects faults, analyses and classifies these faults the control room using an impedance-based algorithm method. Finally the fault information is transmitted to the control room. The project presents design and implementation of a distributed monitoring and centralized control system. Also with the help of Wi-Fi model control the system by using IOT The fault occurred in transmission line is very much dangerous for the locality. In HV and EHV transmission line there are less fault occurrence but in locality the fault occurrence is more as compared to outer transmission line. In our prototype we design a model which is to be detect the fault in transmission line by comparing the voltage signal between the transmission line and a reference value, the reference value is predetermined and if the transmission line voltage is more than or less than reference value then fault is to be shown in display. The information regarding fault occurrence in particular phase is send to web page via IOT device and also shown in LCD display. The sensor is used to sense the voltage and send output to microcontroller. Here microcontroller IC ATMEGA 328 is used in this IC programming is done which compare the voltage signal and send output to IOT module and display. The power supply is provided to supply 5V dc power to all component this supply is separate from the supply which is used to check the fault occurrence. Development of sophisticated and user friendly IOT webpage

2. NEED-

Fault introduces serious danger on both electrical apparatus and people. Therefore we have to protect ourselves as well as the equipment from these faults. Without it power system will fail in no time.

Various issues need to be protected are:

- Safety for People.
- Equipment safety: Keeping equipment safe from various electrical abnormal and faulty conditions.
- Power system stability: Maintaining a continuous and reliable power supply.

Out of the many things, there are major reasons for development of this project. Which are:

3. DESCRIPTION OF THE PROJECT

In this design the hardware components that we use are:

- Microcontroller ATMEGA328
- Wi-Fi Module
- LCD 16x2
- Relay
- LM35 Temperature Sensor
- Current Sensor
- Voltage Sensor
- Lamp load
- Buzzer
- Arduino Compiler

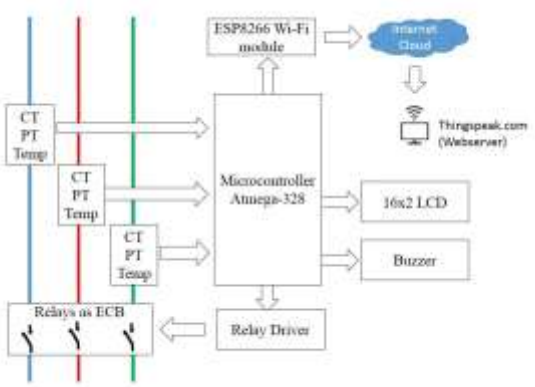


Fig: system block diagram

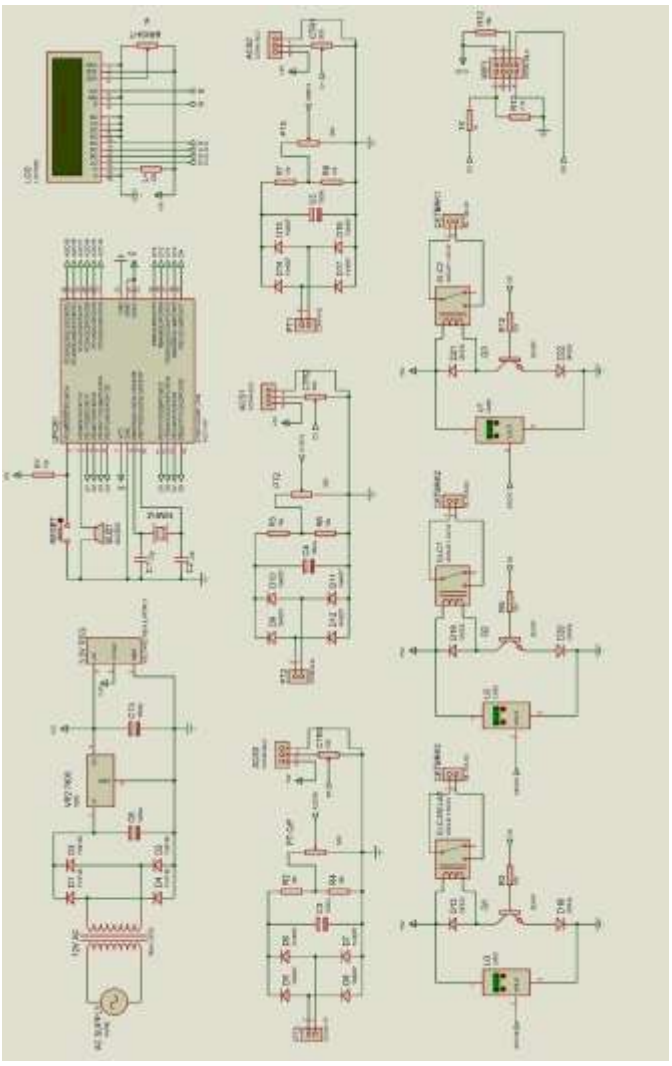
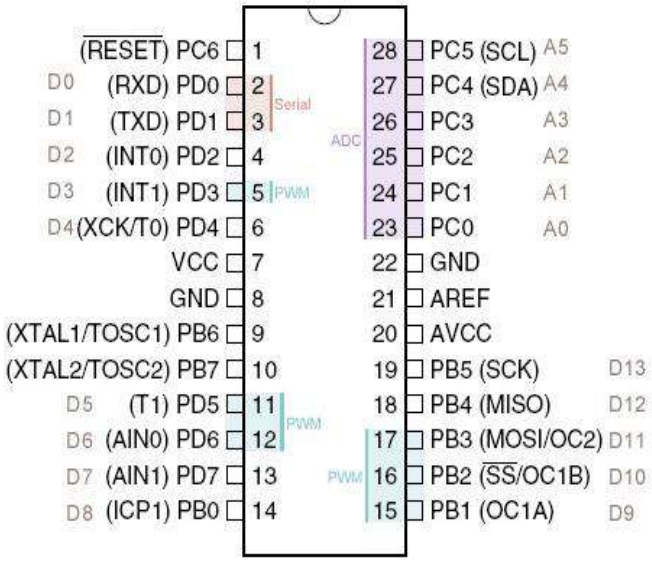


Figure : Circuit Diagram of System

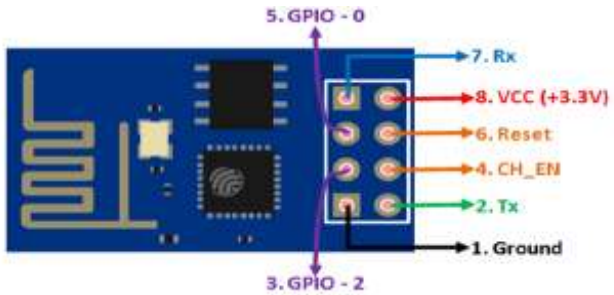
3.1 Microcontroller ATMEGA328



Features:

- 28 pin IC with 20 GPIO pins
- Inbuilt 6 channel ADC
- 2kb SRAM, 1kb EEPROM
- 32 General purpose registers
- Works on 5V
- Low power Sleep mode
- Multiple software tool support

3.2 WI-FI Module



Features:

- Power Supply: +3.3V
- Current Consumption: 100mA
- Built-in low power 32-bit MCU
- Supports Deep sleep (<10uA)
- Works on serial communication protocol

• Can be used as Station or Access Point or both combined

• Programmed using AT-commands

3.3 LCD 16x2

Features:

This is a high quality 16 character by 2 line intelligent display module, with back lighting, Works with almost any microcontroller. This is a popular 16x2 LCD display. It is based on the hd44870 display controller hence it is easy to interface with most micro controllers. It works of 5v and has a green back light.

3.4 Current Sensor:

Features:

▪ Low-noise analog signal path

▪ Device bandwidth is set via the new FILTER pin

▪ 5 μs output rise time in response to step input current

▪ 80 kHz bandwidth

▪ Total output error 1.5% at TA = 25℃

▪ Small footprint, low-profile SOIC8 package

▪ 1.2 mΩ internal conductor resistance

▪ 2.1 kVRMS minimum isolation voltage from pins 1-4 to pins 5-8

▪ 5.0 V, single supply operation

▪ 66 to 185 mV/A output sensitivity

▪ Output voltage proportional to AC or DC currents

▪ Factory-trimmed for accuracy

▪ Extremely stable output offset voltage

▪ Nearly zero magnetic hysteresis

4. Conclusion:

The model design in such a way to solve the problems faced by consumer. By using such method, we can easily detect the fault and resolve it. It is highly reliable and locates the fault in three phase transmission line and also supposed to data storage. It works on real time so we maintain all data sheet and avoid the future problem in transmission line. Here we can monitor any time through IOT webpage. The system provides good flexibility. IoT based proposed system can also be used to detect fault in real time from any location, any device connected to Internet. According to this proposed system, accuracy and automatic system for the transmission line is used using the IOT technology from where if there is any shot circuit automatically the system the change in voltage and current will be detected and automatically the system will indicate the problem.

In this semester we had done all the paperwork regarding proposed system. Deciding the system specification and selection of development tools was complex task due to availability of multiple tools in market. Design of PCB layout and circuit was easy in Protius software. Selection of Arduino IDE and Arduino-uno board was a perfect choice for development board. Simple user interface of Arduino IDE made task so easy. Though the hardware implementation will begin in next semester.

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