

Voltage and Other Parameters Monitoring System Using Android Mobile Application

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Abstract- In this paper, we have proposed an android mobile display to easily monitor voltage, current, and temperature in a transformer. When testing and troubleshooting the electrical works/PCB, the person faces issues while placing probes on 2 points on the electric lines and simultaneously noting the value in multi-meter. As the conventional model consumes more time as well as it also leads to faulty/improper measurements and also causes accidents when in contact with live wire. To overcome the issue, we have proposed to integrate voltage display through the user application for a virtual voltage display while trouble shooting/testing the system. An arduino is used in the circuit for processing and displaying output. The Arduino Nano V3.0 controller and Bluetooth HC-05 are a cheap microcontroller and wireless device, respectively. The new Android smartphone application that monitors the voltage and current measurements uses the open source MIT App Inventor 2 software. The voltage and current measured, system is designed smartly.

Keywords- Voltage Monitoring, Trouble Shooting/Testing, Virtual Organic Display, Augmented Reality Technology.

I. INTRODUCTION

Today's world requires safety and smart technology. This project is to overcome the accidents in the live wire and the transformer line burns. For the past years, there have been nearly 200 people reported as victims. This has been increasing day-by-day. These systems allow supervisors, technicians, and managers to control and monitor the performance of power line or transmission line over the long distance. The monitoring system is very important when working in the field of three phase systems like transformers, some companies use smart monitoring software programs. The employers install the program or company install program to check for error.

The main objective of this paper is to create a smart monitoring system using smart technology. The proposed system is a smart e-glass to monitor voltage and current measuring. The system design consists of two parts namely: the first is the control system uses arduino to calculate and read current and voltage from sensors.

The WeMos D1 is an ESP8266 operated with voltage of 3.6 V, also a Wi-fi based board that uses the arduino layout, this is an open source platform that is a low cost, very flexible, and has data processing capabilities in the cloud. This paper helps the electric workers to monitor the faults in the transformer without the direct contact with the electric lines. (Fig 1[a]) The workers can monitor and view the values from the ground without taking effort of climbing the transformer and having the direct contact with the electrical transmission lines through the mobile.

The ZMPT101B current transformer is used as a voltage sensor unit (Inter-plus Industry Co. Ltd., Shenzhen, China) and the amplification of signal using a LM358 IC (Texas Instruments, Dallas, TX, USA). The current sensor unit is based on ACS712 chip (Allegro Microsystems, Worcester, MA, USA). Temperature unit, voltage and current units are isolated, low cost and flexible to use. The cloud computing is the final part of the unit placed between the control system and the end user (monitoring system) [1].



Fig 1. Workers find faults in the transmission lines by climbing the transformer.

WeMos is programmable via Arduino IDE. This is an ESP8266 based WiFi enabled microprocessor unit on an Arduino-UNO footprint. That means the board looks and works (in most cases) like an UNO. Several shields,

sensors and output devices that are manufactured for the Arduino platform will work on the WeMos-D1R2 with the added advantage of builtinWiFi

II. LITERATURE REVIEW

This paper is divided into two parts, the first part is for the Arduino microcontroller[1][2] to read the data from the voltage and current sensors [18] and send the data are shared by advanced cloud computing technology over Bluetooth to the end user[3][4]. The second part of the system is monitoring using organic display, where the received data using the microcontroller i.e. arduino Nano. [11][16].

Table 1. Literature review related to monitoring system.

Related Work [Reference] Year	Application	Communication System	Type of Sensors	Microcontroller	Monitoring System
Gill et al. [5], 2012	Smart Power Monitoring	ZigBee	Voltage and Current	PC	PC
Aurilio et al. [1], 2014	Smart Meters	---	Voltage and Current	Arduino Shield	Ordinary
Tamkittikhun et al. [20], 2015	Power Meter Design	Ethernet Shield	Voltage and Current	Arduino Mega 2560	PC
Salamone et al. [2], 2016	Smart Lamp	Bluetooth	Temperature and Humidity	Arduino Mega 2560	Smartphone
Sung et al. [25], 2013	Smart LED	Wi-Fi + ZigBee	Light Sensor	XP-8000	Smartphone
Di Gennaro et al. [26], 2014	Monitoring System	ZigBee	pH Probe	Raspberry Pi	PC
Calderón et al. [7], 2016	Monitoring System	Cable	Temperature	Arduino Mega and PC	PC
Kim et al. [27], 2015	Monitoring System	Wi-Fi	Webcam	Embedded Linux Board and Arduino	Smartphone

Many methods of controlling and monitoring a three phase system circuit[12] used either for controlling or displaying the values. Smart phone application where used in paper instead of traditional methods[5].

The control unit includes voltage sensor, current sensor, WeMos Arduino and cloud [20] [6] [13], while the monitoring of voltage and current done by virtual organic display,[7] Google has provided with android project application. (Fig 2[a])

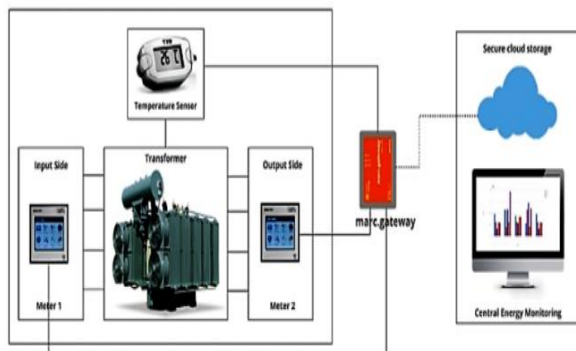


Fig 2. Process of receiving data from the sensors.

The existing system has tedious way of measuring and risk associated with live wire [18] [21]. This allows only a few distance to be operated for monitoring the electric lines by direct intact with the electric lines [6] [7] [8].

III. PROPOSED SYSTEM

Two types of program are used in this work, the first one is for the Arduino microcontroller to read the data from the voltage and current sensors and send the results by Bluetooth to the end user. The second one is for monitoring the received data from the microcontroller.



Fig 3. Structural view of the Transmission lines of the transformer.

The voltage and current for three phases are monitored by the android smartphone application. This application developed by the MIT App Inventor 2, as open source platform available from Google as online software for Android project applications

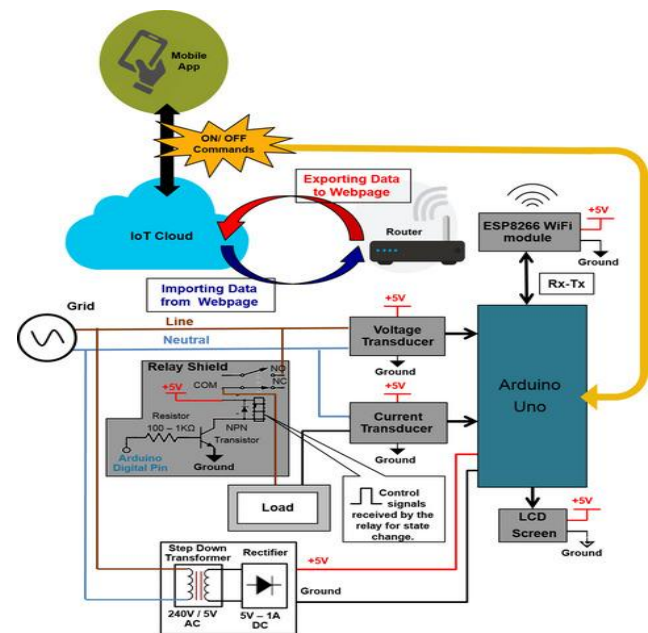


Fig 4. Block diagram of smart mobile voltage and other parameters monitoring system.

It uses a graphical user interface (GUI) very similar to the programming languages Scratch (programming language) and the StarLogo, which allows users to drag and drop visual objects to create an application that can run on android devices

A key feature of MIT App Inventor is its live development environment for mobile applications. App Inventor provides this by means of a companion app installed on the user's mobile device. The App Inventor web interface sends code to the companion app, which interprets the code and displays the app in real time to the developer.



Fig 5. WeMos ESP8266 Wi-Fi module.

The WeMos ESP8266 Wi-fiModule [15] [16] is an advanced technology and is equipped with self contained SOC which supports TCP/IP protocol stack that can support any type of microcontroller access to WiFi network system. The ESP8266 can host any application or offload all Wifi networking functions from another application. (Fig3 [d]).

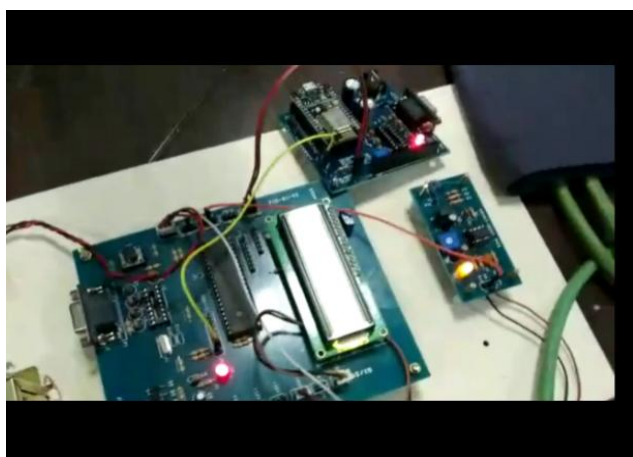


Fig 6. Smart System Architectural Design.

Voltages over approximately 50 volts can be usually very dangerous for the human health. The transformer is framed to step-down at the range of 12V. The current and voltage sensors and temperature sensors and also the ground connectivity is placed over the transformer [16] [17].

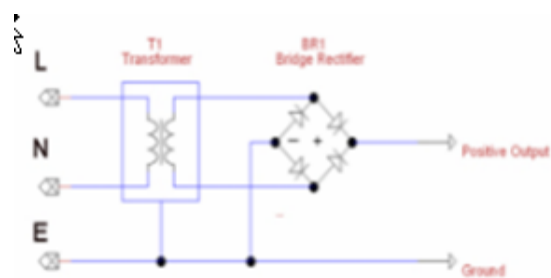


Fig 7. Design of Transformer.

IV. DESIGN METHODOLOGIES

The WeMos D1 have 4Mb of flash in it and uses 3 Mb for file data as the size of the File system depends on the flash chip size. The ESP8266 is low of cost Wi-Fi microchip with full of microcontroller and also TCP/IP stack in it. It is manufactured by the Espressif Systems. This is the 32-bit microcontroller with 80 MHz to 160 MHz and it has nearly 80 Kb user data and 16GPIO pins. (Fig 4[a]).

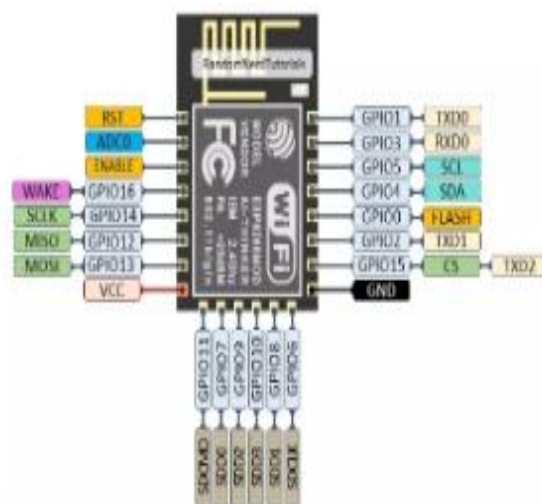


Fig 8. Pin configuration of ESP8266 WiFi module.



Fig 9. MIT Inventor 2.

The basics of the OLED structure is simple – an organic emitter placed between the electrodes as to create efficiency. This OLED uses several intermediate layers like the electron transport and blocking layers in it. The whole structure is deposited on the substrate and the display is driver electronics. This uses the principle of the augmented reality. (Fig 4[b]).

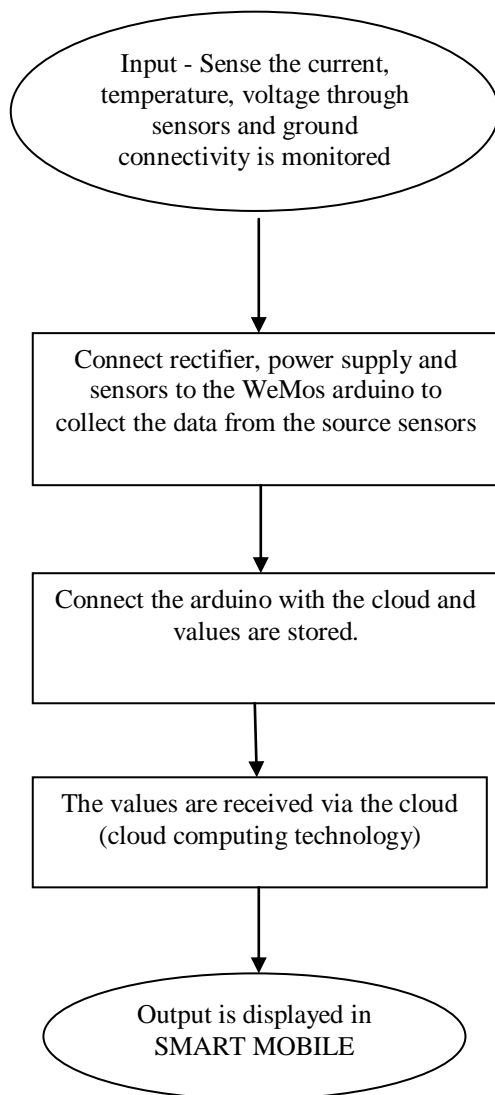


Fig 10. Flowchart of the process in the smart voltage and other parameters monitoring system.

V. RESULT

The output sensed from the ACS712 is used as current sensor, ZMPT101B is used as voltage sensors, and flame sensor .MQ-2 is the Gas sensor is used to detect CO from the transformer.WeMos Arduino node MCUcollects the data from the sensors.The Wifi module is a connected to router. Router module communicate with smart mobile phone (fig 5[a]) from the range of nearly 50 metres or up to 160 feet range. The monitoring of the transmission is

very safe for the workers without direct intact with the electric lines.

The display is viewed from the ground to monitor the temperature, current and voltage data from the transmission lines with the ground connectivity.

Table 2. Analysis of smart monitoring system for transformer of 12 V.

Sensors	Values
Voltage	11.09 V
Current	820mA
Temperature	25 C
Gas	Normal

Table 3. Analysis of smart monitoring system for transformer of 12 V abnormal.

Sensors	Values
Voltage	4.259 V
Current	520mA
Temperature	25 C
Gas	Normal

Table 4. Analysis of smart monitoring system for transformer of 12 V abnormal

Sensors	Values
Voltage	11.09 V
Current	820mA
Temperature	45 C
Gas	Abnormal

VI. FUTURESCOPE

In future the system can be modeled to find the fault from their current location through the wireless communication system by machine language. This technology can be used to find the faults and troubleshoots of the transmission lines.

VII. CONCLUSION

In this paper, how the voltage and other parameters can be monitored through the smart mobile phone has been discussed.The unique property can be used for safety purpose of the electric workers. Looking at the result of different methodologies this proposal will be useful for the monitoring of the parameters over the range of distance without the direct contact with the electric wires. This work can be further extended by using better alternative technique.

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