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THE PARAMETERS MONITORING OF UNMAN RECEIVING STATION BY USING GSM MODULE

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ABSTRACT
As the complexity of distribution network has grown, automation of substation has become a requirement of each utility company to extend its efficiency and to boost the quality of power being delivered. The measured parameters will send as SMS messages. The microcontroller will cooperate with the sensors introduced at the nearby substation and perform a task as commanded. Electrical parameters like current, voltage are going to be compared continuously to its rated value will help protect the distribution and power transformer from burning because of overload, short fault, and overvoltage's, and surges. Under such conditions, the entire unit is closed down through the control area including transfers detecting it, and instantly killing the electric switch. SMS cautions can likewise be produced to demonstrate this. The utilization of GSM makes the substation astute within the sense that it can transmit signals and data and receive commands. This enables to cut back labor cost at the substation and spares time. During this manner, the observing and dealing effectiveness of the sub-station will certainly increment.

Keywords:
Automation, Microcontroller, Substation, Electrical parameters, GSM Module.

I. INTRODUCTION

We know that in India the electricity is distributed by many companies. Organizations such as MSEB – Maharashtra State Electricity Board, Reliance Energy Ltd. BEST – Bombay Electric Supply and Transport. All this distribution has their own receiving station and distribution substations in large number. For e.g. MSEB have 2680 substations approximately. All these require continuous monitoring of parameters to prevent the power system components and power system. For this continuous monitoring the company appoints a supervisor who visits the substation and checks the parameters. But if the substation is far away from the town then it takes time for supervisor to go there and check the parameters and only the waste of time and money. So what's the solution? Solution is nothing but our project name, "Parameters Monitoring of Unman Receiving Substation." The aim of this project is to reduce human efforts and wastage of time and side by side to collect the parameters efficiently and through one place. With the help of this device we can check parameters of every substation sitting at one place on our database. For manufacturing of this device the GSM Module is required and Arduino (AT Mega 328) and P.T., C.T. and relays etc.

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II. METHODOLOGY

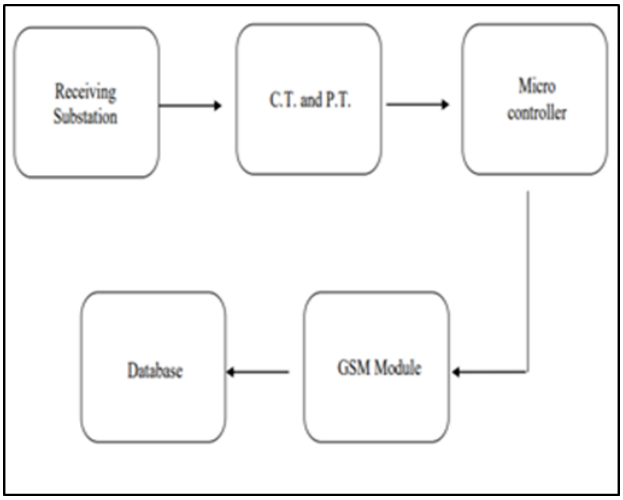

Fig. 1:- Block diagram

Working of block diagram

The device should installed in the substation and the parameters such as voltage and current value be collected using P.T. and C.T. This analog value from P.T. and C.T. is given to microcontroller and after receiving this signal the microcontroller starts working as per the program. The microcontroller transmits and receives the data with the help of GSM Module and finally the microcontroller sends final command to GSM Module. Then the GSM Module starts functioning and communicates with the computer and microcontroller and process the data required. The full of GSM is Global System for Mobile communication. The main function of GSM is to establish communication between a computer and a GSM system.Then afterwards using internet the GSM module uploads the data to the database which is created using the AT command by creating string.

III. CIRCUIT DIAGRAM

Virtual circuit diagram

Circuit diagram of parameters monitoring (Voltage and Current) by using unman receiving station as per the simulation software “Proteus”. The circuit diagram (fig. 2) is divided into three parts i.e. aurdinouno, GSM module and PCB circuit. Here in this circuit diagram two AC supply has been given. There are three bridge rectifier are used, bridge rectifiers are the circuits which converts alternating current into direct current using the diodes arranged in the bridge circuit configuration. Here two variable resistor are used which is denoted as a RV. In which electric resistance value can be adjusted. Above half circuit points is connected to aurdino in analog in points. The digital pin of aurdino is connected to two RL circuit. The digital pin on an aurdino board can be used for general purpose input and output via the commands. Each pin has an internal pull up resistor which can be turned on and off using commands when the pin is configured as an input. Applying command in the GSM module icon the circuit will show actual and accurate parameter. This is a virtual platform of our project. The total circuit is made up on PCB. Which is a small prototype of substation. In the circuit a C.T., P.T., resistor, capacitor, crystal oscillator, voltage regulator are connected. The detailed working of this component see in working part.

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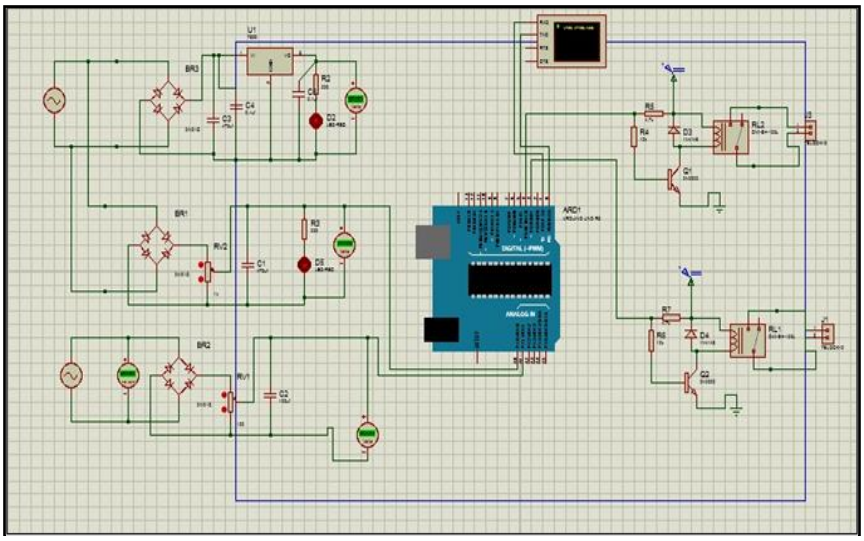

Fig. 2:- Circuit diagram made on proteus

Aurdino UNO

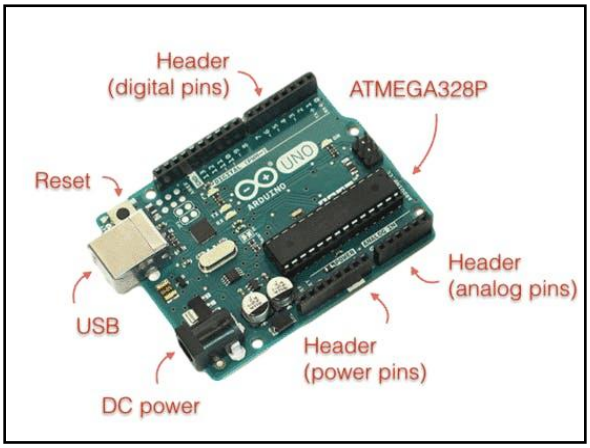

Fig. 3:- Aurdino

For aurdino (fig.3) we need 5V/1A adapter. Aurdino UNO is a microcontroller board based on the AT mega 328. The device operates between 1.8-5.5 V. the no. 328 is for 32KB code space, and the last digit 8 for 8 bit architecture. ATmega 328 is commonly used in many projects and autonomous systems where a simple, low-powered, low-cost microcontroller is needed. Perhaps the most common implementation of this chip is on the popular aurdino development platform. For uploading the program in microcontroller we are using aurdino IDE software IDE (Integrated Development Environment).

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Sim 900 A GSM module

A GSM GPRS module (fig.4) is used to enable communication between a microcontroller and the GSM/GPSR network. As we used GSM module in our project the operator will receive all the parameters on his laptop or mobile via internet so the reading which the operator have received will be accurate.

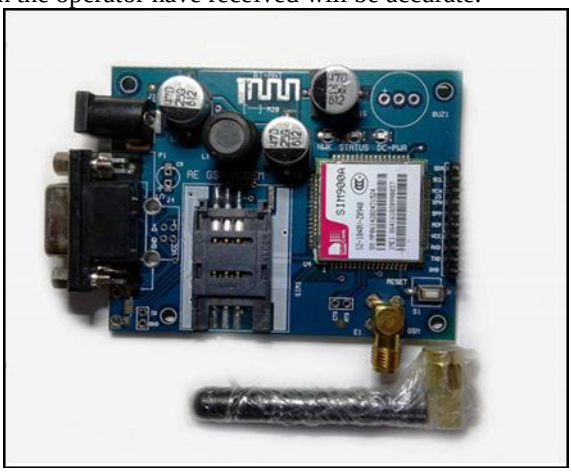

Fig. 4:- Sim 900 A GSM module

A GSM module is basically a GSM modem connected to a PCB with different types of output taken from the board a TTL output for aurdino and RS232 output to interface directly to our computer and mobile. In our project we send message for turning on the load GSM module receive it microcontroller compile it and send us back a proper accurate reading of parameters on our databus. With the help of internet data will upload on databus. The aurdino GSM shield connects our aurdino to the internet using the GPRS wireless network. Just connect this module into our aurdino board put a sim card from operator. Offering GPRS coverage and by following some instructions to start receiving sensor data. GSM module required 12V input so we feed it using a 12V /2A DC power supply. For this supply we are using 12V adapter. Insert the SIM card to GSM module and turn it on. Now wait for some time and see the blinking rate of 'status LED' or 'network LED' (GSM module will take some time to establish connection with mobile network). Once the connection is established successfully the status network LED will blink continuously every 3 seconds. You may try making a call to the mobile number of the sim card inside GSM module. If you hear a ring back the GSM module has successfully established network connection.

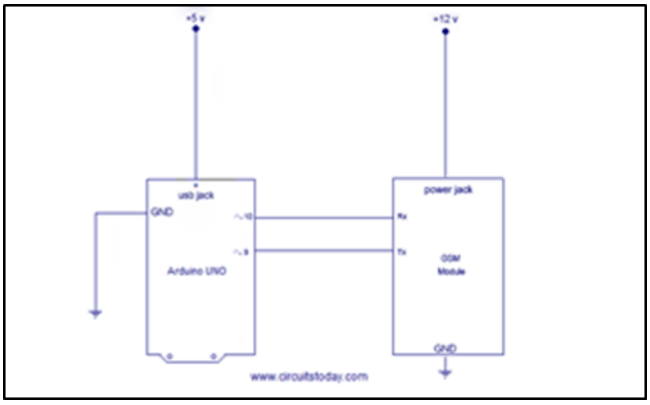

Fig. 5:- Interfacing of Aurdino and GSM module

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Let's see how to connect a GSM module to aurdino (fig.5). In any case the communication between aurdino and GSM module is serial. So we are supposed to use serial pins of aurdino (RX and TX). You may connect the TX pin of GSM module to RX pin of aurdino and RX pin of GSM module to TX pin of aurdino. Now connect the ground pin of aurdino to ground pin of GSM module. We made three connection and the wiring is over now we can load different programs to communicate with GSM module and make it work.

IV. WORKING PRINCIPLE

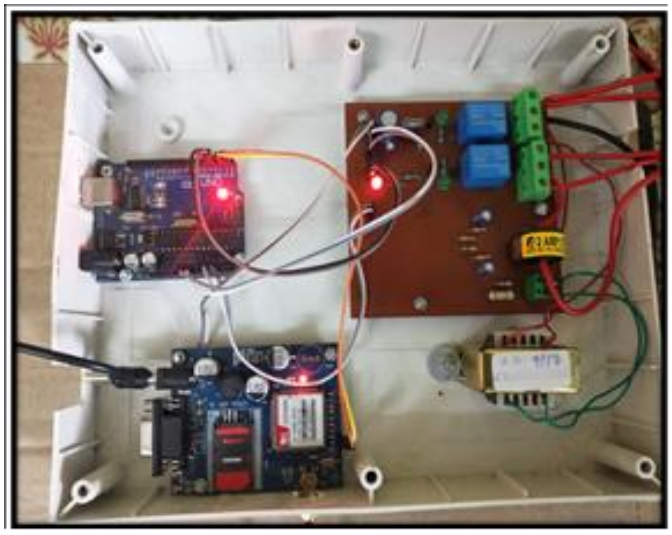

Fig. 6:- Working Circuit

Let's see the working of circuit (fig 6). This circuit is prototype of substation. First we take supply of 12V from the GSM module which is parallel connected to the PCB and aurdino. Means GSM module giving supply to aurdino as well as to the relay. Let's see the input voltage of relay. An input voltage of 12V came from GSM module with the help of voltage regulator we regulate the voltage upto 5V there is a capacitor which is used for filter purpose. Let's check the connection of CT and PT a supply voltage of 230V is given. Parameters or Readings of Substation to be measured is Real power, apparent power, Power factor, Voltage, Current. There is one website called as emonlib where in emonlib library there is already some function are there to measure parameter mentioned in above sentence so we add the emonlib library in our coding. As well as they suggest the component what they required for calculating.

V. RESULTS

This is a complete set up of our project (fig 7). First we have to switch on both 230V supply and adapter. Two light bulbs of 60W are used as a load. Wait for 15 seconds for starting the complete functioning of aurdino.

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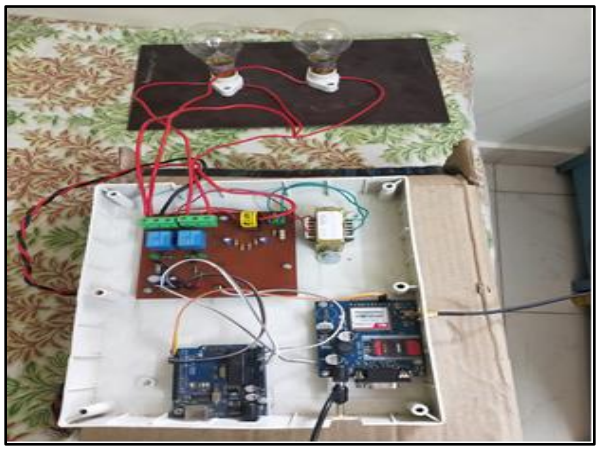

Fig. 7:- Working setup

Input

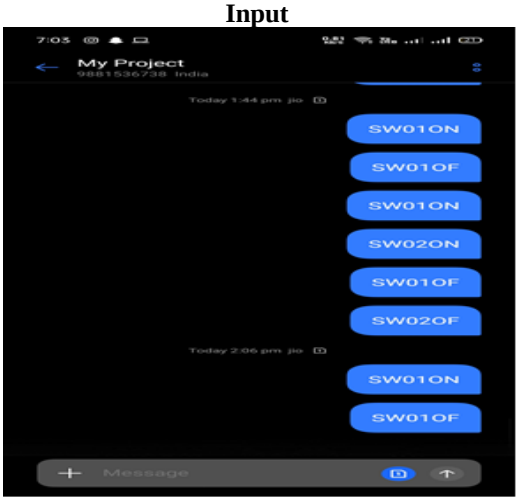

Fig. 8:- Screenshot of text input message

Now open your mobile phone (fig 8). Open text message first save the mobile no. of sim card which is used in GSM module. Now text message SW01ON by applying this message wait for few second.

Output

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Fig. 9:- Operating relay

Here our first relay is operated (fig 9). It turn on the load. Now check the datasheet.

Datasheet

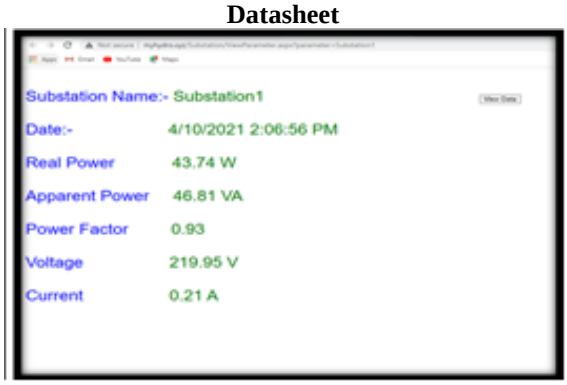

Fig. 10:- Screenshot of datasheet

Let's check this datasheet (fig 10). This data sheet we specially made for this project. We make a website the website name and IP address we add in our coding. Then the readings get uploaded on this datasheet. We gave 20sec delay time for updating the data so we can get accurate data on datasheet. When load increases parameters get changed. Here we are using only one substation we can also add numbers of substation.

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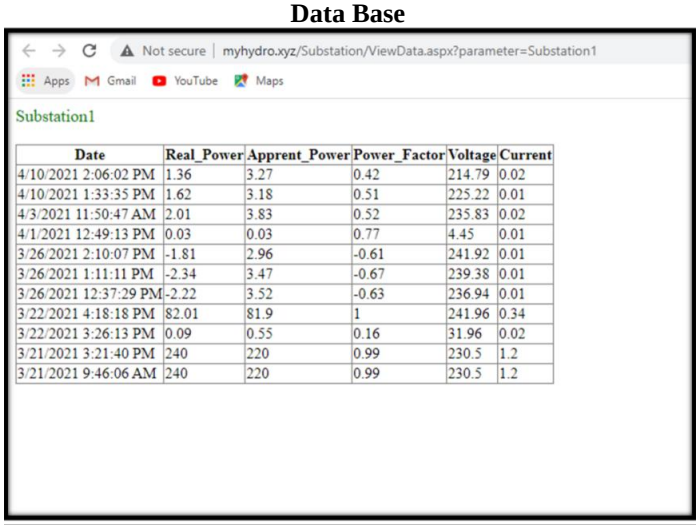
Data Base



Date	Real_Power	Apprent_Power	Power_Factor	Voltage	Current
4/10/2021 2:06:02 PM	1.36	3.27	0.42	214.79	0.02
4/10/2021 1:33:35 PM	1.62	3.18	0.51	225.22	0.01
4/3/2021 11:50:47 AM	2.01	3.83	0.52	235.83	0.02
4/1/2021 12:49:13 PM	0.03	0.03	0.77	4.45	0.01
3/26/2021 2:10:07 PM	-1.81	2.96	-0.61	241.92	0.01
3/26/2021 1:11:11 PM	-2.34	3.47	-0.67	239.38	0.01
3/26/2021 12:37:29 PM	-2.22	3.52	-0.63	236.94	0.01
3/22/2021 4:18:18 PM	82.01	81.9	1	241.96	0.34
3/22/2021 3:26:13 PM	0.09	0.55	0.16	31.96	0.02
3/21/2021 3:21:40 PM	240	220	0.99	230.5	1.2
3/21/2021 9:46:06 AM	240	220	0.99	230.5	1.2

Fig. 11:- Screenshot of previous data

This a previous history of readings we can check this by clicking on view data tab (fig 11). For switch on another load we text message SWO2ON so second load will turn on and readings get updated on datasheet. Now for removing load we text SWO1OFF, SWO2OFF respectively.

VI. CONCLUSION

From the above report we conclude our project by following points mentioned below. This project will really prove to be useful for the operator while operating it. As we have used GSM Module in our project the operator will receive all the parameters on his laptop or mobile via internet so the readings which operator have received will be accurate. Also this project will help to reduce human efforts, save time, save money and the most important thing is this the operator will get all reading anytime and anywhere.

VII. FUTURE SCOPE

We can implement alarm system in this existing project so that we can get indication of fault in the form of sound. No. of parameters can be increased. Instead of aurdino we can use Raspberry pi. We can also use IoT.

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