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LINE FAULT DETECTION, CLASSIFICATION & LOCATION IDENTIFICATION

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ABSTRACT

The electricity demand is increasing day by day as a result, there is a need to transmit more power from one place to another. This paper presents detection, classification and location of the fault in the power system. The measurement of bus voltage and RMS current values are used in this scheme. Detection of fault is done by continuous measurement of voltage and currents before and after the occurrence of the fault. Fault classification is done by using the Wavelet transform technique using the MathLab and the Magnetoresistance sensor based method is used for the location of the fault. When there is a fault detected, the information about the fault is sent to the service provider as well as to the consumers. This process has to be more accurate so that system reliability can be improved, the maintenance and the restoration of the fault condition can be accelerated.

KEYWORDS : Three phase fault, gsm module, fault classification, wavelet transform, line unit, the master unit, Magnetoresistance,

I. INTRODUCTION :

The abnormal condition in a power system is called faults. It can be short-circuited or open circuited. The various faults that expressed by the power system are the single phase to ground fault (LG), phase to phase (LL), double line to ground fault (LLG) and three phase fault (LLL) the main cause of faults are lighting, heavy winds, the tree falling across lines, etc...

The proposed system is a device that is used to detect and locate the fault in the power system by determination of the bus voltage and line RMS current, the identification of the fault can be done. In the proposed system a message is sent to service providers and end users about the information regarding the fault. It consists of two devices one is master and the other is the slave. The slave is placed on the line for measuring continues variations in the voltage and current and master is used for analysing measured reading and the pre-set values or the inflated condition values.

II. EXISTING SYSTEM :

The majority of the faults occurring in the transmission line are minor faults and most of the minor faults were left unseen. And these faults slowly become heavier and cause damage to the transformer, initiate fire and even can turn havoc to human life.

Presently we don't have a proper automatic system to overcome this scenario. For proper fault classification and location identification, the existing systems were not grown up to the mark. Current systems working is mainly carried out in the help of manpower requirement with maintenance or checking of the transmission lines generally carried out on a frequent basis. And it's also costlier. The fault can occur due to the topping of trees, natural phenomena like lightning strikes, heavy rains heavy winds, and snow and ice accumulation on transmission lines. But with the current manpower based systems were not proper for finding those faults quicker and making a faster response.

Fault location identification is also a vital part in transmission line fault detection and correction. Traditionally traveling wave based and impedance-based measurement techniques. The traveling-wave- based approach requires detection devices to connect to the high voltage transmission line, and it makes the system costlier. And the impedance-measurement- based techniques extremelyrelyon the standard ofthe signal and plagued by fault resistance, ground resistance, and non-homogeneity in-line configuration. So, these approaches can cause a location error that is unacceptable in certain.
operation cases. So it's necessary to introduce a magnetoresistance method with MathLab based fault detection and classification.

III. PROPOSED SYSTEM :

The proposed system consists of two devices one is the master and another one is the slave or line unit. Line Unit continuously determines the bus voltage and RMS value of the current and master unit, analysing the data for determination of fault..

Components required

- Arduino
- GSM module
- CT & PT
- Relay
- RF data modem
- Driver
- PC with MathLab software
- Magnetoresistance sensor The slave unit placed on the power line detects the bus voltage and RMS value of current continuously. A current transformer and potential transformer is used to measuring the current and voltage respectively. The main function of the line unit is to detect the bus voltage and current and send the readings to the master station throw the RF data modem.

A. Line unit

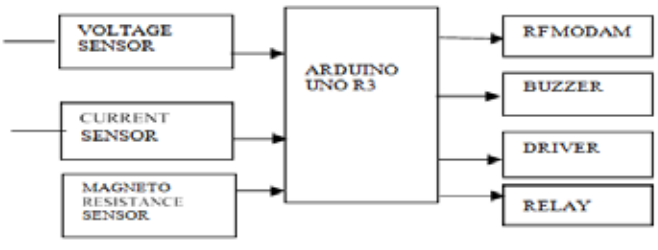


Fig 1. Line unit

Master unit

The data from the line unit is composed of the pre- set data in the master unit. The controller detects the variation from the measured values from the appreciated value. If there is a deviation occurs,then checks for open circuit and short circuits Faults. If anyone of the above-mentioned faults is present, the controller gives information to cut the relay.

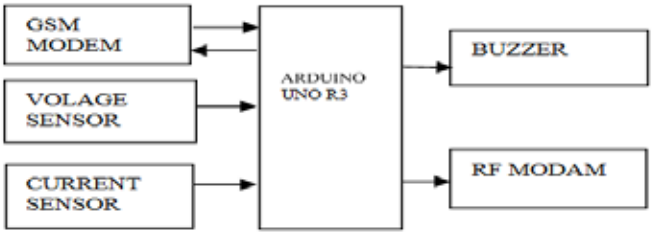


Fig 2. Master unit

IV. FLOWCHARTS :

1. Line unit

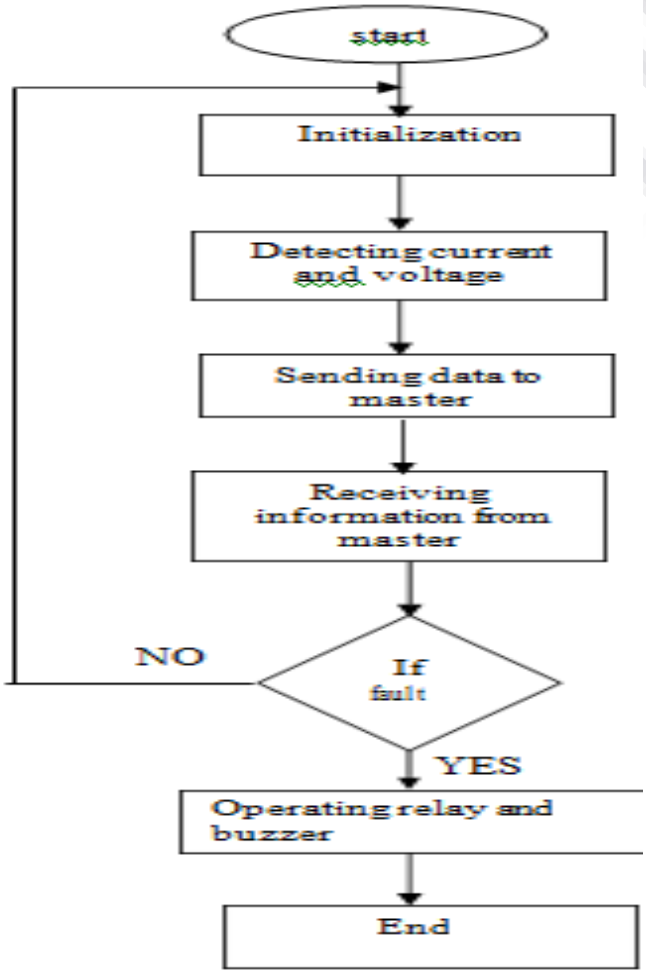


Fig 3. (a)

MASTER UNIT

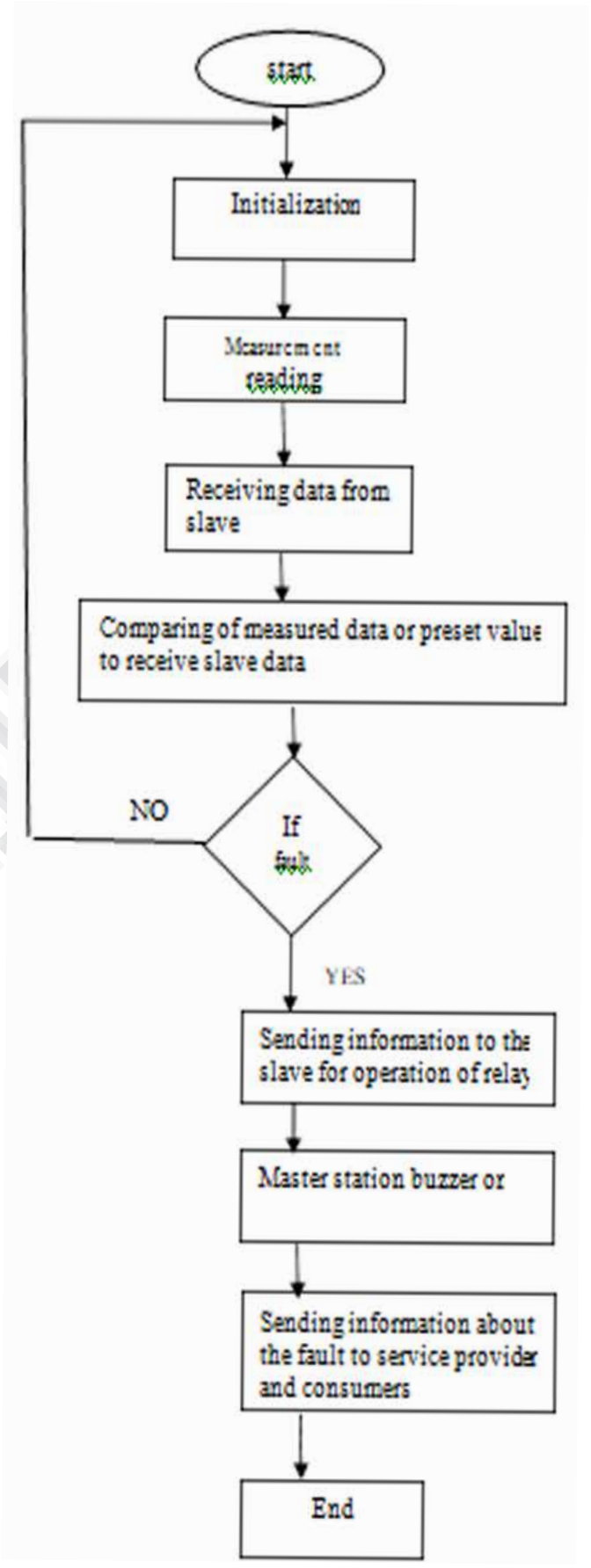


Fig 3. (b)

V. METHODOLOGY :

FAULT DETECTION

Fault detection can be done by comparing of measured values and the pre-set values. When there is a fault occurrence there is a deviation of the measured value of the pre-set value. There are mainly two types of faults series and shunt faults. in series fault, there is an open circuit in the phase. Then there is a rise in voltage and frequency and the current is decreased. Shunt faults, that mainly occur in between line or between line and neutral. in every fault the measured values of current and voltages are different. By analysing the data classification can be done. The line unit detects the voltage and current continuously and sends the data to the master unit through an RF modem. The master unit analyses each datum with the pre-set values and detects the fault.

Fault classification

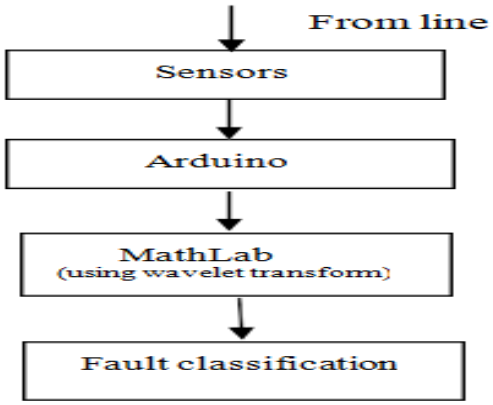


Fig 4.

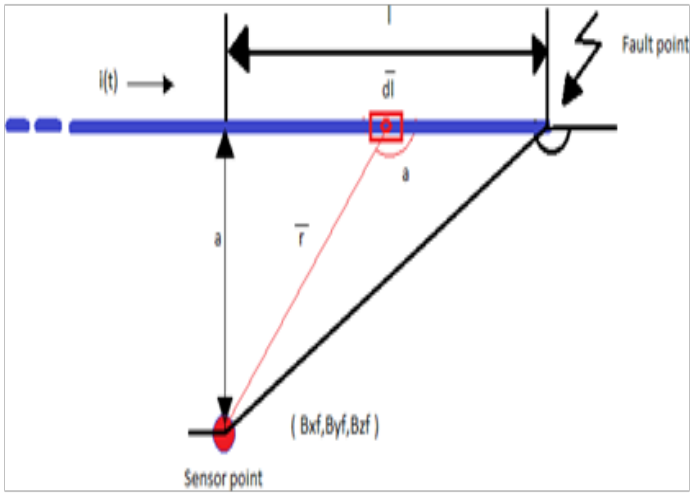
The classification of fault can be done by wavelet transform using MathLab. The output from the Arduino is given to the MathLab and these signals continuously monitor and analyzed.

Wavelets area unit functions that satisfy the wantsof each time and frequency localization. And can be used for analysing non-stationary signals, i.e. Wavelets will give multiple resolutions in each time and frequency. The signal is accurately reproduced with the ripple analysis employing a comparatively tiny variety of parts. Moreover, several categories of functions are portrayed by wavelets during an additional compact approach.

In the proposed method during fault condition amplitude and frequency of the test signal will be changed also the wavelet transform will change in accordance with the system changes from a normal state to a fault state. This system deals with an algorithm for the classification of different faults like single line to ground (SLG) fault, line to line (L–L) fault, double line to ground (DLG) fault and three lines to ground (3LG) fault.

Fault location

Fault location can be identified using a magnetoresistance method. Magnetoresistance is the property of a material in which the resistance of the material is changed by applying an external magnetic field. The main advantage of these sensors is the large temperature range, wide frequency bandwidth. In our proposed system the magnetoresistance sensor is placed in-line unit. The magnetic fields of each phase are measured. And the data sent to the master unit from the line unit. When a fault occurs the measured magnetic field increased. The ratio of the magnetic field when a fault occurs and the normal condition is the same as the ratio of short circuit current during fault conditions to normal condition. Identification of the fault location based on the signal sent back from installing terminal. Based on the previous location and identification results the fault location within the spam is identified.



The sensing element is put in beneath a faulted conductor on that a current I (t) is flowing through at a distance of ‘a’. According to Biot-Savart law, if ‘a’ is far less than the length of span, the ratio of the measured magnetic field beside the fault point to the

other measured magnetic field is.

Bx,By –> Measured magnetic field components far away from the faulty span.

VI. COMMUNICATION :

In the proposed topology there are several communication networks. The data from the line unit is transferred to the master unit through RF modem

and further analyzing and calculations were done in the master unit, if there is any fault in the line is noticed then the relay is triggered. The information about the fault is sent to the consumers and service providers through GSM modem.

VII. FUTURE SCOPE :

In current methods when there is a fault occurs there is no way to identify the type and location of the fault. This device can be able to notify the information. There is a quick replacement of the faulted system. The power quality can be improved. The protection equipment that is connected to service and the protection of the consumer can be improved.

- Fault detection of a Generator and motor
- Improvements in computer-based protection of Industry automation.
- By using this system, we can reduce the maintenance time and easily restore the power service, and reduce outage time as well as possible

VIII. CONCLUSION :

The proposed system is used for fault identification, classification and fault location identification. The Line unit is used for the detection of bus voltage and current and sends these data to the processing unit, and by using MathLab software classification will be done. it also consists of magnetoresistance sensors for the measurement fault location. The analysis of the data takes place in the master station. if there is a fault the information is sent to the consumer as well as to the service provider. Although there are several methods available for finding the fault location, the

magnetoresistance method is a non-contact method. this is more accurate and less time-consuming.
When there is a fault occurs the information is sent immediately to a service provider for quick replacement and also for the consumers for the information about the condition for the security of them and for the connected devices.

IX. RESULT :

The proposed system will detect, classify and locate the fault on a line. The device will give information about the fault for both consumer and service provider. There for the fault can be cleared in short period of time.

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