IoT Based Three Phase Power Lines Monitoring with SMS Alert Integration for Real Time Failure Detection

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Abstract - The Electric Power System is divided into multitudinous factors. Transmission lines are used to move power from generating stations and substations to guests. Is the medium of transmission. still, faults in the system can disrupt operations and lead to undesirable incidents. To address this, a smart GSM- grounded fault discovery system has been developed, which directly detects and locates faults in the power system. This system utilizes Power Lines, crystal clear oscillator, RS 232, GSM modem and a GPS to automatically descry, assay, and classify faults. Both approaches have the eventuality to face a variety of issues like slice of power lines. By automating fault position and furnishing real- time information, this system significantly reduces the time needed to detect faults, thereby enhancing the trust ability and effectiveness of the power transmission network. In this system we can fluently descry the particular power line which is disconnected.

Index Terms - Electric Power System, Transmission lines, Fault discovery, GSM- grounded, Crystal oscillator, RS 232, GSM modem, GPS, Automatic discovery, Real- time information, trust ability, effectiveness.

I. INTRODUCTION

The three-phase system consists of a three-phase voltage source connected to a three-phase weight by means of manufactories and transmission lines. Normally the power system is operated in balanced three-phase condition. ultimate of the bulk loads analogous as artificial loads are three-phase balanced loads in nature. still, when there is a mix of single-phase and three-phase loads analogous as domestic loads, the weight will be unstable. It's essential to maintain an uninterrupted power force due to the growing population and advancements in technology. If a fault develops in the transmission or distribution side. It must be corrected as soon as possible to ensure that consumers admit an uninterrupted force. The three power lines is given to attack, in case any disposition of power line, also through GSM the motorist will get alert. So, that alert motorist will know the disposition of power line along with position. Hence, this system can easily cover the failure of the power line.

II. LITERATURE SURVEY

A.S. Mane et.al. [1] we can learn about the failure beforehand and take the necessary steps to resolve the problem. An Arduino system is used to identify power outages, notify the appropriate authorities via SMS, and display voltage and current values on an LCD screen via a microcontroller. This can be done using sensors for failure detection and an IoT-based alert system.

C. Antoun, et.al [2] aims to explore the various failure modes associated with High Voltage Circuit Breakers and Power Transformers within transmission and sub transmission electricity networks and identify the online monitoring requirements to ensure effective early detection of issues. This would enable system operators to act appropriately to prevent unexpected failures. These requirements in the context of the capabilities and limitations in currently available Online Monitoring Technologies will also be discussed.

C. L. Kwong, C. Y. Tim, W. M. Kwong, L. C. Kit and K. Y. Yan, et.al [3] Effective power transformer condition monitoring and assessment system requires a great variety of state-of-art technologies to be applied for supporting a remarkable life cycle management in power networks. Power transformers are usually very reliable and durable components of the power generation, transmission and distribution networks. Their performance is often taken for granted and they are overlooked until a problem occurs. Unfortunately, when a fault occurs in a transformer, the result can be catastrophic and the failures are usually very expensive as it often results in the loss of the most expensive plant item in a substation if the power transformer is not uneconomical to repair. Cost of resulting loss in generation or transmission restraints is occurred until a replacement comes into effect. Clearly, despite the high reliability of power transformers, in view of the serious consequences of failures, it is important to employ an effective condition assessment system under smart grid operations so that faults can be detected at an early stage in order to improve the prospects for repairs and minimize the impact of any failures, under more optimization of operations.

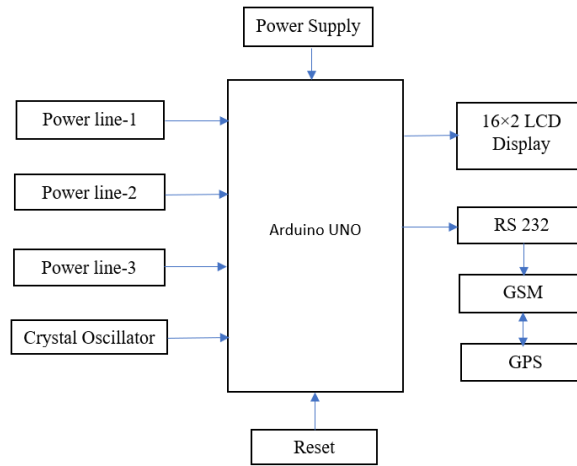## III. BLOCK DIAGRAM & WORKING PRINCIPLE

Fig.1: Block Diagram

Working

It's essential to maintain a continued power force due to the growing population and advancements in technology. However, it must be corrected as soon as possible to ensure that consumers admit a continued force, If a fault develops in the power lines or distribution side. We've completed a design grounded on IoT and GSM and GPS in case of any phase disfigurement being in the system and to cover the current and voltage inflow in the three power lines. The power force unit in the block illustration corresponds to the three-phase AC power line force, which corresponds to the factual three-phase AC power force. The Three Power Lines, Crystal Oscillator, RS232, GSM module, GPS module and LCD display are each connected to the Arduino Mega. The current and voltage values are shown on the LCD. Data about the voltage and current in the three Power lines are uploaded via the IoT module When a disfigurement occurs in the three Power lines, the GSM module is utilized as a device that sends an SMS alert to the authorized person and conservation platoon. So, that alert driver will know the disposition of power line along with location. Hence, this system can fluently cover the failure of the power line.

IV. MODULES DESCRIPTION

(1) Arduino IDE

The Arduino IDE (Integrated Development Environment) is used to write the computer law and upload this law to the physical board. It increases the readability of the law. It reduces the chances of crimes. Furthermore, it makes the program compact and small.
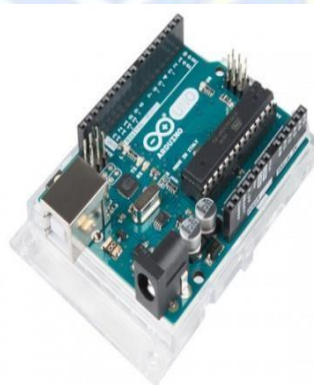

Fig.2: Arduino IDE

(2) Power Supply

A power force accessory that provides from 7 to 12V(Volts) of DC(Direct Current) is demanded. The accessory is plugged onto the wall socket and the other end goes directly onto the board's AC socket.
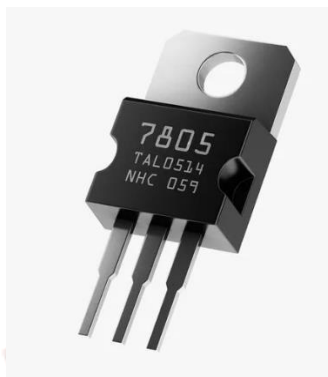

Fig.3: Power Supply

(3) LCD Display

16x2 LCD module is one of the most common devices on the market. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines.
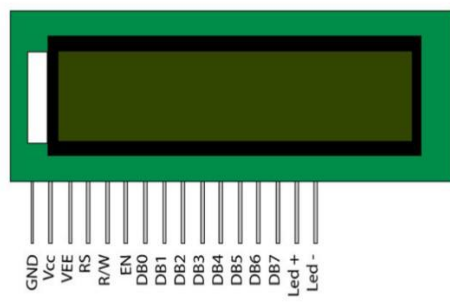

Fig.4: LCD Display

(4) Crystal Oscillator

A crystal clear oscillator is an electric oscillator type circuit that uses a piezoelectric resonator, a crystal, as its frequency-determining element.
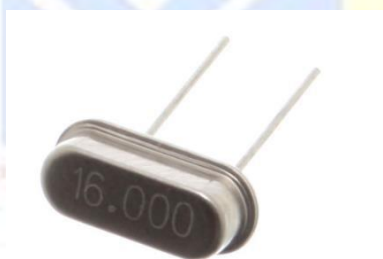

Fig.5: Crystal Oscillator

(5) RS 232

RS-232C is one of the earlier versions of the long-established standard RS-232. It defines a physical interface for relatively low-speed serial data communication between computers and related devices. The RS in RS-232C stands for "Recommended Standard," and the C refers to the version.
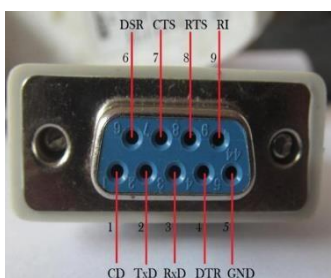

Fig.6: RS232

(6) GSM

The filled configuration of GSM is the across-the-board complex for Mobile Communication. GSM is a wireless technology that observe in hold. It's a cellular mesh that uses a SIM menu to concatenate to the mesh.

Fig.7: GSM

(7) GPS

A global positioning system (GPS) is a mesh of satellites and entering bias applied to decide the locality of being on Earth.
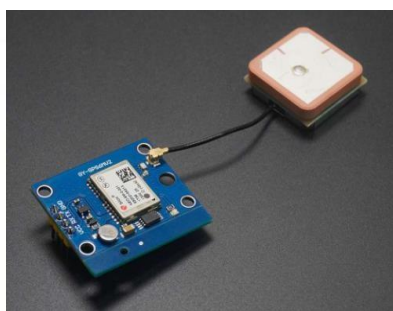

Fig.8: GPS

V. SOFTWARE AND HARDWARE REQUIREMENTS

Software Used:

- Keil and Proteus
- Arduino IDE

Hardware Used:

- Arduino UNO
- Crystal oscillator
- Power lines
- LCD Display
- RS232
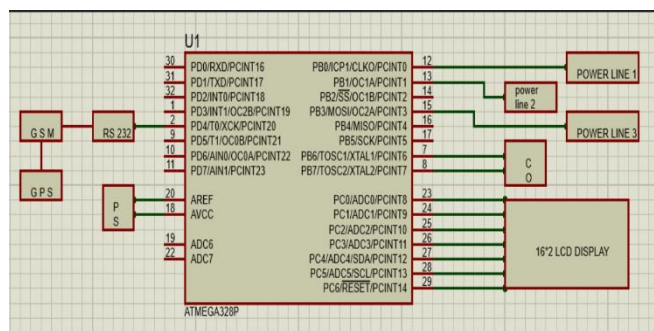- GSM
- GPS

VI. SCHEMATIC DIAGRAM

Fig.9: Schematic Diagram

VII. EXPERIMENTAL RESULT

In this system there is a fault or disconnection of a three phase power lines the SMS alert will sent through mobile by using GSM through it finds the particular location where the fault will occur by using GPS. And the result will display on the LCD.
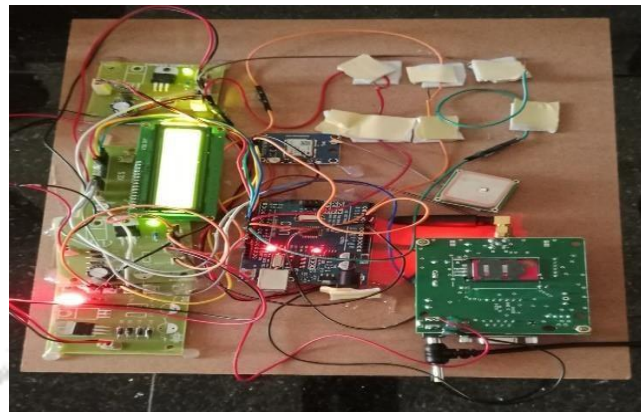

Fig.10: Experimental Set-Up

Fig.11: Displayed in LCD

If any one of the power connections is disconnected, we can get text message through location. For suppose power line 1 is disconnected then it displays the fault detection in power line 1 and it sends the text message through location, on the authority person number. If in case three power lines are disconnected same process in going on for this system. In this way, the authority gets instantly notified and they may take appropriate action to solve the problem.

Fig.12: Fault detection in power line 1

VIII. CONCLUSION

The three-phase power monitoring and failure alert system uses the Internet of Things to gather information about phase failure. The cloud server is informed of any power outages in any of the three phases. The demand for a constant supply of power is growing every day. Therefore, to overcome these issues three phase power failure monitoring system is introduced. An intelligent GSM-based fault monitoring system that is precise and that defect was correctly identified and located. As a result, the authority is immediately notified, and they can take appropriate action to solve the problem. The system makes use of GSM modems. This device will automatically find errors along location.

IX. REFERENCES

[1] A.S. Mane, Sushant. S. Mali, Vinayak. M. Davar, Aditya. M. Rathod, "Three Phase Power Failure Monitoring with SMS Alert", 2023, IRJMETS, doi: https://www.doi.org/10.56726/IRJMETS33418.

[2] C. Antoun, "High Voltage Circuit Breaker and Power Transformer Failure Modes and Their Detection," 2018 Condition Monitoring and Diagnosis (CMD), Perth, WA, Australia, 2018, pp. 1-6, doi: 10.1109/CMD.2018.8535655.

[3] C. L. Kwong, C. Y. Tim, W. M. Kwong, L. C. Kit and K. Y. Yan, "Remarkable life cycle management by effective condition monitoring and assessment system of power transformer in CLP power system," 2014 IEEE PES Asia-Pacific Power and Energy Engineering Conference (APPEEC), Hong Kong, China, 2014, pp. 1-5, doi: 10.1109/APPEEC.2014.7066192.

[4] C. Gong et al., "Intelligent Monitoring and Multi-parameter Identification of Power Distribution Network State," 2023 8th Asia Conference on Power and Electrical Engineering (ACPEE), Tianjin, China, 2023, pp. 1875-1879, doi: 10.1109/ACPEE56931.2023.10136019.

[5] X. Hou, Y. Li and J. Zhang, "Power Quality Monitoring Algorithm of Substation Based on Decision Level Fusion," 2023 3rd International Conference on New Energy and Power Engineering (ICNEPE), Huzhou, China, 2023, pp. 806-809, doi: 10.1109/ICNEPE60694.2023.10429490.

[6] T. -M. Zhou, K. Yan, F. Qin, Y. -G. Qian and M. -Y. Li, "Analysis of Failure Monitoring Parameters of Nuclear Power Electronic Product Based on FMMEA and Performance Analysis," 2023 6th International Conference on Electronics Technology (ICET), Chengdu, China, 2023, pp. 1033-1038, doi: 10.1109/ICET58434.2023.10212043.

[7] J. Naghibi, K. Mehran and M. P. Foster, "An Online Failure Assessment Approach for SiC-based MOSFET Power Modules Using Iterative Condition Monitoring Technique," 2020 IEEE 21st Workshop on Control and Modeling for Power Electronics (COMPEL), Aalborg, Denmark, 2020, pp. 1-5, doi: 10.1109/COMPEL49091.2020.9265830.

[8] Z. LV, Z. HU, B. NING, L. DING, G. YAN and X. SHI, "Non-intrusive Runtime Monitoring for Power System Intelligent Terminal Based on Improved Deep Belief Networks (I-DBN)," 2019 4th International Conference on Power and Renewable Energy (ICPRE), Chengdu, China, 2019, pp. 361-365, doi: 10.1109/ICPRE48497.2019.9034805.

[9] C. Choe, C. Chen, S. Nagao and K. Suganuma, "Real-Time Acoustic Emission Monitoring of Wear-Out Failure in SiC Power Electronic Devices During Power Cycling Tests," in IEEE Transactions on Power Electronics, vol. 36, no. 4, pp. 4420-4428, April 2021, doi: 10.1109/TPEL.2020.3024986

[10] M. Ni and M. Li, "Reliability Assessment of Cyber Physical Power System Considering Communication Failure in Monitoring Function," 2018 International Conference on Power System Technology (POWERCON), Guangzhou, China, 2018, pp. 3010 -3015, doi: 10.1109/POWERCON.2018.8601964.

[11] W. Chen, M. Guo, Q. Jin and Z. Yao, "Reliability Analysis Method of Power Quality Monitoring Device based on Non-Parametric Estimation," 2019 14th IEEE Conference on Industrial Electronics and Applications (ICIEA), Xi'an, China, 2019, pp. 1526-1529, doi: 10.1109/ICIEA.2019.8833999.