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IOT BASED SPEED SENSING AND FAULT MONITORING OF INDUCTION MOTOR USING GSM TECHNIQUE FOR INDUSTRIAL APPLICATION

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ABSTRACT

In the context of modern industrial production, where motor-driven machinery and industrial automation play pivotal role, ensuring reliable performance will help to mitigate the costly downtime. This research study introduces an innovative approach that integrate Internet of Things (IoT) with GSM technology, which is specially designed for industrial applications with a focus on the monitoring and optimization of induction motor performance. Utilizing an array of sensors and IoT devices, the proposed system enables continuous monitoring of critical motor parameters, including motor speed, temperature, voltage, and current. Real-time data collection is facilitated, and the central control unit processes this information by using advanced algorithms to comprehensively assess the induction motor performance and promptly detect potential issues. A distinctive feature of the proposed approach is the integration of GSM technology for enabling real-time alerts and remote monitoring capabilities. In the presence of abnormalities or defects, the proposed system triggers notifications through SMS or messaging platforms. This alert system significantly contributes to the reduction of maintenance costs and downtime by enabling swift response to the emerging problems. The proposed system offers a user-friendly interface tailored for operators and maintenance teams. This interface allows remote access to performance statistics, historical records, speed sensing, and fault monitoring. Empowering operators with insightful data supports informed decisionmaking and facilitates proactive maintenance planning by ultimately enhancing the overall reliability and efficiency of industrial processes with a specific focus on induction motordriven machinery.

I. INTRODUCTION

In the ever evolving industrial automation and production, the seamless integration of cutting-edge technology becomes imperative to not only ensure optimal performance but also to guarantee the highest standards of safety and efficiency. At the forefront of this technological revolution stands the Internet of Things (IoT), a paradigm-shifting invention that has fundamentally transformed the landscape of how industrial applications are monitored and managed. The transformative power of IoT manifests through its ability to facilitate real-time data collection, analysis, and remote control across a diverse array of processes and equipment. This capability plays a pivotal role in elevating the operational efficiency and dependability of industrial operations. One particularly promising application within this paradigm is the implementation of GSM (Global System for Mobile Communications)-based IoT-driven systems for speed sensing and motor defect monitoring. Under the strategic field of an IoT-based approach, motors are equipped with advanced sensors and networking hardware. These components collaborate seamlessly to gather and transmit real-time data to a centralized monitoring system, capturing critical parameters such as speed, temperature, voltage, and other relevant factors. Subsequent scrutiny of this data allows for the identification of variations from standard operating conditions, signaling potential problems or impending issues in the industrial machinery. A distinctive facet of this innovative approach is the incorporation of GSM technology, which further augments its efficacy. This technology enables not only remote monitoring but also instantaneous alerting mechanisms. Stakeholders of industrial processes are thus assured of swift and timely notifications, ensuring that anomalies are promptly communicated to the relevant personnel, regardless of their geographical location. In this intricate interplay of IoT and GSM technologies, a robust framework emerges, promising not just enhanced productivity but also fortified dependability in industrial operations.

II. EXISTING SYSTEM

Under the strategic field of an IoT-based approach, motors are equipped with advanced sensors and networking hardware. These components collaborate seamlessly to gather and transmit real-time data to a centralized monitoring system, capturing critical parameters such as speed, temperature, voltage, and other relevant factors. Subsequent scrutiny of this data allows for the identification of variations from standard operating conditions, signaling potential problems or impending issues in the industrial machinery.

III. PROPOSED SYSTEM

A distinctive facet of this innovative approach is the incorporation of GSM technology, which further augments its efficacy. This technology enables not only remote monitoring but also instantaneous alerting mechanisms. Stakeholders of industrial processes are thus assured of swift and timely notifications, ensuring that anomalies are promptly communicated to the relevant personnel, regardless of their geographical location. In this intricate interplay of IoT and GSM technologies, a robust framework emerges, promising not just enhanced productivity but also fortified dependability in industrial operations.

IV. LITERATURE SURVEY

IoT-based Electrical Safety Monitoring and Fault Diagnosis for Low-voltage Distribution Facilities. Chaoqun Li;Min Xue;Weihong Zhang;Daliang Hu…2022 China International Conference on Electricity Distribution (CICED)

In order to improve the operational safety and market operation efficiency of the prosumer energy community, to achieve comprehensive monitoring of abnormalities, fault alarms, and intelligent control and maintenance, to reduce the risk of information security, and to address the many types of operational testing and metering equipment in the prosumer community, the duplication of functions and hardware composition was performed, resulting in the waste of resources of monitoring and metering equipment. In the meantime, we proposed an intelligent perception device-based IoT platform architecture for power distribution communities by integrating the software and hardware of the original operation monitoring and metering equipment of the prosumer-integrated communities. The intelligent perception device for community IoT sensing was first introduced, and then, the operation monitoring and metering equipment in the distribution station area was integrated and optimized to enhance the panoramic state sensing capability of the intelligent terminal; the expansion application direction of data-driven distribution IoT was proposed from the typical application scenario of the terminal. In the context of the era of energy structure change, low-carbon transformation of electricity, and the sweeping digital wave (Bedi et al., 2018), the distribution network will enter a new development stage of integrated energy multi-energy complementarity (Bera et al., 2015) and deep information-physical integration (Zhao et al., 2020). The explosive growth of power information requires a more lightweight data management framework (Moness and Moustafa, 2016); the rapid expansion of emerging businesses requires a more open application structure (Huang et al., 2021), and the realtime complementarity of spatial-temporal energy requires decentralized coordination means (Chan et al., 2017). All the aforementioned applications rely on the completeness of panoramic data sensing capability (Primadianto and Lu, 2017). Due to the rapid expansion of prosumer clusters, the planning and operation issues of prosumer energy systems have been increasingly raised (Huang et al., 2019). In view of the urgent demand for energy infrastructure and energy management in the producer–consumer energy community and in order to make full use of the capabilities of the producer-consumer, this study proposes an IoT platform architecture scheme based on smart fusion terminals for producer–consumer status data monitoring, energy management, and control (Pineda and Morales, 2019). The cloud center is responsible for data mining and advanced business processing, and the edge computing terminal is responsible for data collection and local processing to meet the real-time requirements of business, and the cloud-edge collaboration mechanism provides an effective solution for in-depth analysis of power big data (Ciavarella et al., 2016). The low-voltage distribution community actively carries out applications such as station operation status monitoring, camping and distribution data interaction, and new energy coordination and control through station area intelligent perception devices based on real-time status data collection to achieve observable and controllable operation status of the low-voltage distribution network, which provides strong support for lean control of the distribution network.

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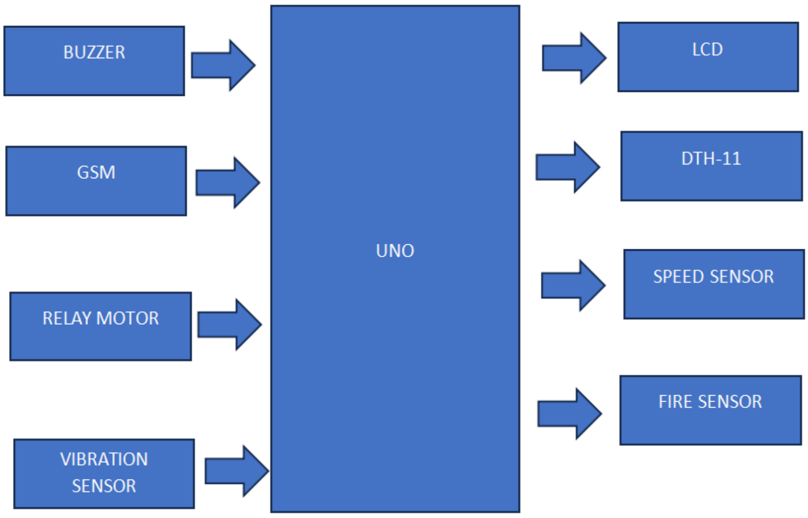
Block diagram



V. CONCLUSION

This system enhanced by GSM technology, represents an innovative solution for industrial applications. The real-time monitoring capabilities ensure swift fault detection, leading to improved overall industrial efficiency. The remote accessibility via GSM empowers proactive maintenance, reducing unplanned downtime and yielding substantial cost savings in terms of maintenance cost and increased equipment lifespan. The system's predictive maintenance capabilities, evidenced by historical data analysis, offer a strategic advantage in minimizing downtime and associated costs. Early fault detection not only contributes to industrial safety but also fosters a secure working environment. The scalability of the proposed system across various industrial applications showcases its adaptability, while its positive environmental impact through reduced energy wastage aligns with sustainability goals. The integration of GSM technology enables timely alerts and remote monitoring, making it a pivotal asset for the future of industrial automation and maintenance. The selected materials and components, coupled with the simulation using MATLAB, underscore the meticulous approach to system development. In summary, this innovative IoT-based system, with GSM technology at its core, emerges as a transformative force, providing realtime insights, operational efficiency, and substantial cost savings, thus positioning it as a crucial element in the evolution of industrial automation and maintenance.

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