ABSTRACT

INTERNET OF THINGS BASED FIRE EARLY WARNING SYSTEM USING ESP32-CAM WITH TELEGRAM NOTIFICATIONS

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The fire in the rice grain warehouse is a serious threat that can cause significant economic and environmental losses. This study aims to develop an early fire warning system based on the Internet of Things (IoT) using the ESP32-CAM and Telegram notifications. The system is designed for use in a rice grain warehouse in Kubangjero Village and integrates various sensors, such as the KY-026 for fire detection, DHT11 for temperature and humidity monitoring, MQ-2 for detecting hazardous gases, and the Neo-6M GPS module for fire location tracking. The IoT-based fire warning system has been developed to detect potential fires early using fire, temperature, and gas sensors while sending notifications via Telegram. The system employs MQ-2, KY-026, and DHT11 sensors and is equipped with an ESP32-CAM for visual documentation. When predetermined parameters are detected, such as MQ-2 gas levels exceeding 400 PPM and temperatures above 40°C, the system automatically activates an alarm in the form of a buzzer and LED while sending a warning notification to Telegram. Testing results indicate that the DHT11 sensor recorded temperatures ranging from 23.80°C to 40.60°C, while the MQ-2 sensor successfully measured gas levels between 181 PPM and 917 PPM, with the highest value recorded at a temperature of 31.30°C. The KY-026 sensor detected the presence of fire and triggered the warning system upon detection. The response time from detection to notification delivery via Telegram averaged between 1 to 3 seconds, depending on internet network quality. This system enables real-time fire condition monitoring and provides faster warnings compared to conventional systems. For further development, the system can be enhanced by adding automated protection features, time logging using an RTC, and a dedicated mobile application for monitoring.

Keywords: Internet of Things, ESP32-CAM, MQ-2 sensor, KY-026, DHT11, Telegram.