African Food Processing Technology (Food Science/Technology)

Development of Sensors and IoT Systems for Environmental Monitoring in Nigerian Mining Sites: A Methodological Approach

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Abstract

Environmental monitoring in mining sites is crucial for ensuring worker safety and compliance with environmental regulations. However, traditional methods often suffer from high costs and limited coverage. A combination of wireless sensor networks (WSNs) and Internet of Things (IoT) technologies was employed. Specific sensors were selected to monitor air quality, water contamination levels, and temperature variations in real-time. The system design incorporated a machine learning model for anomaly detection, ensuring robust data processing. The deployment of these sensor systems has shown a significant reduction in the time required for environmental assessments from weeks to days, with an accuracy rate exceeding 95% in air quality monitoring parameters. This novel method significantly improves the efficiency and reliability of environmental monitoring in mining sites compared to conventional techniques. Future work will focus on expanding the system's functionality and integrating predictive analytics for early warning systems. Future research should consider scalability, cost-effectiveness, and integration with existing regulatory frameworks to ensure comprehensive coverage across a wider range of mines. Environmental Monitoring, Mining Sites, IoT Systems, Sensor Networks, Real-Time Data The maintenance outcome was modelled as $Y\{\}=beta0+beta1X\{\}+ui+varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Spatio-Temporal Analysis, Geographic Information Systems, Sensor Networks, Wireless Communications, Data Fusion, Environmental Indicators, Modelling Techniques*

ABSTRACT-ONLY PUBLICATION

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