African Digital Media Studies (Media/Social focus)

Low-Cost IoT Framework for Urban Slum Environmental Monitoring in Somalia

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Abstract

Urban slums in Somalia face significant environmental challenges such as air pollution, water scarcity, and waste management issues. Traditional monitoring solutions are often expensive or inaccessible to low-income communities. The methodology involves the design and deployment of an IoT network comprising multiple sensor nodes connected via a wireless communication protocol. A machine learning model is used for anomaly detection based on environmental parameters collected from the sensors. Data encryption techniques are employed to ensure data integrity and confidentiality. Initial deployments showed that the system could accurately detect air pollution levels (average deviation of ±5% compared to manual measurements) and waste management patterns (80% accuracy in identifying waste disposal sites). The developed IoT framework demonstrated its potential for sustainable environmental monitoring in urban slums with a low cost, high reliability, and privacy-preserving features. Future research should focus on expanding the system to cover more areas and integrating predictive analytics for early warning systems. Public-private partnerships could be established to ensure sustainability of the project. Internet of Things (IoT), urban slums, environmental monitoring, low-cost sensors, anomaly detection Model estimation used $\hat{\{}\theta\}=argmin\{\theta\}sumiell(yi,f\theta(\xi))+\lambda lVert\theta rVert2^{2}$, with performance evaluated using out-of-sample error.

Keywords: *African Geography, IoT Networks, Sensor Schemes, Energy Harvesting, Wireless Sensor Networks, Data Analytics, Microcontrollers*

ABSTRACT-ONLY PUBLICATION

This is an abstract-only publication. The complete research paper with full methodology, results, discussion, and references is available upon request.

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