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Low-Cost IoT Solutions for Environmental Monitoring in Urban Slums of Nigeria: A Technological Perspective

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Abstract

Urban slums in Nigeria often face challenges related to environmental health due to inadequate monitoring infrastructure. The lack of resources and technical expertise hinders effective implementation of advanced environmental monitoring solutions. The research employs a mixed-methods approach combining IoT device development with field experiments to assess the performance and acceptance of proposed solutions among community members. Initial tests revealed that the low-cost sensors could accurately detect air quality parameters, achieving an average accuracy rate of 95% under controlled laboratory conditions. Community feedback indicated high acceptability rates for these devices. The developed IoT solutions demonstrate potential as a viable alternative to traditional monitoring methods in resource-constrained settings, especially when deployed at scale with appropriate community engagement strategies. Further research should focus on scaling up the pilot projects and integrating data into existing environmental management systems for broader impact. Internet of Things (IoT), urban slums, environmental monitoring, low-cost solutions, Nigeria 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, Sensor Networks, Wireless Communications, Data Analytics, Sustainability Metrics, Resource Allocation*

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