Low-Cost IoT Solutions for Environmental Monitoring in Urban Slums: A Systematic Review in Algeria

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Abstract

Environmental issues in urban slums are exacerbated by rapid population growth and inadequate infrastructure. The need for low-cost Internet of Things (IoT) solutions to monitor environmental conditions, such as air quality, water pollution, and waste management, is increasingly recognised. A comprehensive search strategy was employed, including electronic databases such as PubMed, Web of Science, Scopus, and Google Scholar. Studies published between January and December were considered. Data extraction focused on the design, implementation details, outcomes, and challenges associated with low-cost IoT solutions. The review identified a total of 34 relevant studies, focusing primarily on air quality monitoring systems using inexpensive sensors such as particulate matter detectors and temperature/humidity sensors. These devices were often deployed in collaboration with local authorities to address specific environmental issues. Low-cost IoT solutions have shown promise in enhancing the ability of urban slum communities to monitor their environment, particularly for air quality and waste management. However, challenges remain regarding data interpretation and dissemination among stakeholders. Future research should prioritise development of user-friendly interfaces and community engagement strategies to ensure the effective use of low-cost IoT solutions in urban slums. Environmental monitoring, Low-cost IoT, Urban slums, Algeria, Air quality 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: *Urbanization, Sub-Saharan, Sensor Networks, Data Analytics, Wireless Communications, Sustainable Development, Smart Cities*

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