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REVOLUTIONIZING URBAN NOISE MANAGEMENT: ADVANCED TECH SOLUTIONS FOR RAILWAY NOISE ABATEMENT

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Abstract

The goal of this research endeavour is to provide comprehensive framework that will increase the predictability of railway traffic noise in cities. Contemporary technologies are utilized, including 3D Convolutional Neural Networks (CNNs), Geographic Information Systems (GIS), Maximum Information Coefficient (MIC) analysis, and an inventive "Probabilistic Algorithm." The framework begins by collecting extensive data on train schedules, noise emissions, and urban geography. MIC analysis and GANs are then used to create a precise noise prediction model. GIS is employed for spatial analysis and noise mapping. 3D CNNs based on Moran's I method generate detailed 3D representations of noise distribution, capturing complex spatial patterns. A routing algorithm inspired by Dijkstra's method identifies optimal noise-minimized transportation routes. This research provides data-driven policy recommendations for noise reduction and transportation optimization while achieving 97% resource utilization rate for evacuations, minimizing route overlap, and ensuring smoother and more organized evacuations. Overall, this comprehensive framework represents a significant advancement in urban noise management and improving residents' quality of urban living.

Keywords: 3D convolutional neural networks, geographic information systems, noise prediction model, railway traffic noise, urban noise management

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