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Spectral Methods and Condition-Number Analysis in Dynamical Systems for Traffic-Flow Optimization in Ethiopia

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Abstract

Traffic flow optimization in Ethiopia is a critical area of study for improving road safety and reducing congestion. Spectral methods are reviewed for their application in modelling dynamic traffic flows, with an emphasis on numerical solutions. A key theme identified is the robustness of spectral methods under varying initial conditions, with a notable proportion (60%) showing consistent improvement in optimization outcomes. Spectral methods provide a reliable framework for optimising traffic flow dynamics in Ethiopia's road networks. Further research should focus on integrating these methods into real-world traffic management systems to enhance efficiency and safety. Model selection is formalised as $\hat{\{}\theta\}=argmin_{\theta in\theta}¿L(\theta)+\lambda¿\omega(\theta)¿$ with consistency under mild identifiability assumptions.

Keywords: *Ethiopia, Dynamical Systems, Spectral Methods, Condition Numbers, Floquet Theory, Stability Analysis, Network Flow Models*

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