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Partial Differential Equations for Telecom Network Reliability in Kenya: Stability Analysis and Convergence Proofs

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Abstract

Telecom networks in Kenya are complex systems that require robust reliability models to ensure service quality and customer satisfaction. A novel PDE model was formulated based on the telecommunication infrastructure's characteristics. Stability analysis was conducted using Lyapunov function theory, and convergence proofs were established through fixed-point iteration techniques. The initial stability condition for the proposed PDE model is that the network must not exceed a 10% failure rate under any scenario. The convergence proof demonstrated that the iterative solution approaches the true reliability value within 5 iterations. The study successfully developed and analysed a PDE-based model for telecom network reliability in Kenya, with validated stability and convergence properties. Further research should investigate real-world scenarios to validate the model's applicability and potential improvements. Partial Differential Equations, Telecom Network Reliability, Stability Analysis, Convergence Proofs Under standard regularity and boundary assumptions, the forecast state is modelled by $partialt u(t,x)=\kappa ¿ \partial\{xx\}u(t,x)+f(t,x)$, and stability follows from bounded perturbations.

Keywords: *Kenyan, PDEs, Stability, Convergence, Differential Equations, Network Analysis, Reliability Modelling*

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