

Research on the optimal path selection mechanism in the Enhanced-Ant-AODV routing algorithm for MANET

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Abstract: This study investigates the optimal path selection mechanism within the Enhanced-Ant-AODV routing algorithm for Mobile Ad Hoc Networks (MANETs). MANETs are characterized by dynamic topology and limited resources, making efficient routing a critical challenge. While the standard AODV protocol offers reactive route discovery, it often suffers from high latency and suboptimal path stability. The proposed Enhanced-Ant-AODV algorithm integrates a bio-inspired ant colony optimization mechanism to improve route selection. This research focuses on the algorithm's core mechanism, which employs forward and backward ants to probabilistically explore multiple paths while reinforcing high-quality routes based on metrics such as residual energy, hop count, and link quality. Through simulation analysis, the study demonstrates that this hybrid approach significantly enhances packet delivery ratio and reduces end-to-end delay compared to conventional AODV. The findings provide a comprehensive understanding of how swarm intelligence can be effectively embedded into reactive protocols to achieve robust and adaptive routing in highly dynamic MANET environments.

Keywords: Enhanced-Ant-AODV, MANET, optimal routing, path selection