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Transportation Network Optimization for Iligan City

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Abstract: This study applies a graph-theoretic framework to optimize traffic flow in Iligan City by integrating three key network algorithms: Dijkstra's algorithm for computing the shortest paths, the Edmonds-Karp variant of the Ford-Fulkerson algorithm for determining maximum flow, and Google OR-Tools for solving the capacitated Vehicle Routing Problem (CVRP). The road network is modeled as a directed graph, where intersections are nodes and road segments are edges with length- and capacity-based constraints. The study introduces an Integrated Traffic Flow Optimization Theorem, which formalizes the conditions under which a feasible and congestion-minimizing traffic assignment exists. Empirical data from Iligan City's road infrastructure validate the theorem, with computational results demonstrating effective shortest routing, maximized throughput between critical nodes, and feasible vehicle dispatch routes under demand constraints.

Key Words: traffic, network optimization, algorithm, Iligan City

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