A COMPARATIVE ANALYSIS OF PRIM, KRUSKAL, AND REVERSE-DELETE ALGORITHMS IN OPTIMIZING ROUTES WITHIN TERENGGANU'S AND PAHANG'S ATTRACTION ROAD NETWORK

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ABSTRACT

This paper presents a detailed comparison of three greedy algorithms—Prim, Kruskal, and Reverse-Delete—in optimizing the routes within Terengganu's and Pahang's attraction road network. The goal is to determine the most effective algorithm for constructing the minimum spanning tree (MST) that minimizes total travel distance. Prim's algorithm builds the MST by starting from an arbitrary node and continually adding the smallest edge that connects a vertex in the tree to a vertex outside the tree. Kruskal's algorithm, on the other hand, constructs the MST by sorting all the edges and adding the smallest edge to the tree, as long as it doesn't form a cycle. The Reverse-Delete algorithm works in reverse; it starts with the full graph and iteratively removes the largest edges, ensuring that the graph remains connected. This study meticulously evaluates each algorithm's computational efficiency, implementation complexity, and performance in generating optimal routes.

Upon analysis, it was found that all three algorithms—Prim, Kruskal, and Reverse-Delete—produced the same MST, indicating they are all effective in minimizing the total travel distance. To identify the best method for this specific road network problem, the time complexity of each algorithm was calculated. The results showed that Kruskal's algorithm has the lowest time complexity compared to Prim and Reverse-Delete. Consequently, for optimizing routes in Terengganu's and Pahang's Road network, Kruskal's algorithm offers an optimal balance of simplicity and efficiency. This makes it the most suitable algorithm for transportation planning and infrastructure development in this context.

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