

CENTRAL NODE IDENTIFICATION AND COST-EFFECTIVE ROUTING SYSTEM FOR GARBAGE COLLECTION NETWORK

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Environmental pollution is one of the most severe global challenges. It increases gradually and causes a grave impact on living organisms, including human beings. Therefore, waste management is a common issue in all developing countries. Colombo is Sri Lanka's most populated city that faces the biggest garbage problem than other cities. This research focuses on the Colombo municipal council area as it is a highly environmentally polluted city in Sri Lanka. The Colombo municipality area divides into six main administrative districts D1, D2A, D2B, D3, D4, D5, and each administrative district is divided into municipal wards. One municipal ward consists of several locations and streets for collecting garbage. Google map and Colombo municipal council website are used to find garbage collection places, and python software is used to construct a garbage collection network as an undirected graph, where each node represents a location. Each edge represents a path between two locations. In this study, centrality measures such as betweenness, closeness, degree, and eigenvector centrality measures are used to find central locations of the network. After calculating centrality measures, central nodes can be identified by choosing the highest closeness centrality values of the garbage collection network (GCN). Then central nodes of the GCN belonging to each municipal ward can be identified. By identifying central places, some machines or recycling trucks can be placed in those central places to deposit the waste. Those central locations help find the cost-effective route that could reduce the cost and collection time of the garbage collection procedure. The weighted graph was constructed by assigning average garbage amounts for the edges. Collected garbage weights, betweenness centrality and degree centrality, are used to identify the shortest garbage routings between central nodes in each municipal ward. Garbage collection trucks can use this shortest path in order to reduce their fuel cost and collection time.

Keywords: Centrality Measures, Garbage Network, Municipal Wards, Shortest Paths