OPTIMIZATION OF TRANSPORT NETWORKS: WITH SPECIAL REFERENCE TO FLUCTUATING DEMAND FOR FISHERIES

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Master of Science in Operational Research

Department of Mathematics

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This dissertation submitted in partial fulfillment of the requirements for the degree of Master of Science in Operational Research

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Declaration

I declare this is my own work, and this dissertation does not incorporate without acknowledgment any material previously submitted for a degree or diploma in any other University or Institute of higher learning, and to the best of my knowledge and belief, it does not contain any material previously published or written by another person except where the acknowledgment is made in the text. I retain the right to use this content in whole or part in future works (such as articles or books).

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The above candidate has carried out research for the Master's thesis/research under my supervision. I confirm that the declaration made above by the student is true and correct.

……. ….……..

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Abstract

The fish market in Sri Lanka is a perfectly competitive market in terms of price. The supply of fishery items can be changed due to various factors such as weather patterns, fishery harvest taken by fishing boats, etc. According to the availability of harvest the supply need to be adjusted for different selling points for optimum sales. Thus, this research considered a fisheries company which requires an established distribution network within Colombo, Sri Lanka. The focus is to distribute these products within a limited time because these are perishable items. When these fishery items are stored for a long time even in cold stores, the item quality will drastically decrease.

Integer programming is used to adjust the supply for the selling points. After the allocation of stocks for locations most profitable locations are selected for the selling operation. The distance matrix for the selected locations' is used to build a transportation network model. This "specific vehicle routing problem" was solved using the Google Colabs platform with the combination of using Python language and some set of traditional search algorithms. Results are taken using two stage of running these algorithms which were occupied with different iterations at each stage. The lowest number of kilometers for the operation given by the results were taken for the operation since the number of kilometers is an important factor in reducing the cost of the total operation.

This happens specially due to the high capacity cooler trucks with lower fuel economy are use to transport fisheries. In addition due to the lowest number of kilometers in the network ensure the lowest number of trucks in operation while bringing the carbon foot print at lowest possible.

The Tabu search method resulted in the minimum operational kilometers which is 146.573 km using five vehicles at a total cost of at a rate of 150 LKR per kilometer.

Keywords - Vehicle Routing Problem (VRP), Search algorithms, Integer programming, Transportation network model

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List of Abbreviations

Abbreviation	Description
VRP	Vehicle Routing Problem
IP	Integer Programming
AI	Artificial Intelligence
ML	Machine Learning
LP	Linear Programming
ILP	Integer Linear Programming
LAT	Latitude
LON	Longitude
GA	Genetic Algorithm
TL	Transport and Logistics
SN	Simulated annealing
TS	Tabu Search
GLS	Guided Local Search