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A MINIMUM 1-ARBORESCENCE ALGORITHM  
FOR NON-SYMMETRIC CARRIER-DISPATCHING PROBLEMS

by

PETER JIN-HER WAN

B.E. (I.E.), Chung Yuan Christian College  
of Science and Engineering, Chung Li, Taiwan,  
Republic of China, 1968

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Major Professor

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## CHAPTER I

### INTRODUCTION

Carrier-dispatching problem is one of the most frequently occurring real-world problems in the transportation field. The problem is of interest because it can be applied not only to the trucking industry but also to railways, airlines and waterway shipping. It is worth mentioning that the average annual expenditure of trucking industry alone is over \$42 billion annually. Hence, the development of an economical transportation system becomes more necessary.

Several approaches have been applied to carrier-dispatching problems in recent year, but neither one is powerful enough to handle one of the realistic size problems. It is not that these problems are mathematically very complicated to state, but they can usually be formulated into a simple mathematical programming form, for which methods of solution are readily available. Obviously, the difficulty lies in the combinatorial nature of the problem.

The carrier-dispatching problem can be viewed as a special case of a classical traveling salesman problem under resource constraints. It is a problem of determining the optimal delivery or pick-up routes in which a number of destinations or demand points to be covered by various carriers such that a certain objective is optimized. Among the objectives usually considered are: (1) the minimization of total time traveled, (2) the minimization of total traveling cost, (3) the minimization of total traveled distance, and (4) the minimization of total number of dispatched carriers. The carrier-dispatching problem has been approached