University | Graduate Studies
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Notice of the Final Oral Examination
for the Degree of Master of Applied Science

of

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BEng (Dalian Jiaotong University, 1993)

"Optimization of Freight Truck Driver Scheduling Based on Operation Cost Model for Less-than-Truckload (LTL) Transportation"

Department of Mechanical Engineering

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Engineering Office Wing
Room 430

Supervisory Committee:
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Abstract

Drivers are essential factors affecting the efficiency and management level of a carrier. In this thesis, the driver assignment problem is investigated and methods for obtaining lower total operational costs are introduced for small and medium-sized truck freight transportation companies. Three interrelated research topics, including the following, have been systematically studied.

Firstly, extending the traditional costing and Activity-Based Costing (ABC) method, the new Time-Driven Activity-Based Costing (TDABC) method, TDABC-FTC, has been introduced for truck freight companies. Detailed implementation process flow has been designed to streamline the easy incorporation of overhead cost.

Fuel costs hold about one-third of the total operational costs of truck freight transportation, and drivers' driving behaviors heavily influence the fuel consumption rate. In this work, the On-Board Diagnostics (OBD) Ⅱ, GPS tracker and Controller Area Network (CAN) bus are used to retrieve related truck operation data and transfer these data to a central database for later processing to obtain driving behavior parameters. An artificial neural network (ANN) model, built using MATLAB toolbox, is introduced to capture the relations between driving behavior and fuel consumption rate. The fuel consumption indicators for different drivers are then developed to reflect their relative fuel consumption rate quantitatively.

The driver assignment problem is modeled as an optimization problem for minimizing the total operational cost of the truck, and the NP-hard problem is solved as a mixed integer programming problem. Two exact solution methods, Branch and Bound, and the Hungarian algorithm, are used to solve the formulated driver assignment problem. The Hungarian algorithm has been modified to address two particular situations in the driver assignment problem.

Numerical experiments are conducted to validate the effectiveness of the newly introduced TDABC model, the fuel saving oriented optimal driver assignment method associating driver behavior to truck fuel consumption rate for different transportation tasks, and the solution methods for the special optimization problems formulated in this work. The newly introduced methods were tested using real truck fleet data, showing considerable benefit of the optimal scheduling techniques, and forming the foundation for further research in this area.