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Summer Internship 2024-2025 Shipping Operations Research

Title: Dedicated Fleet Optimizer Enhancement

Duration: December 1st 2024 - February 28th 2025

Objective: Improvements of the Dedicated Fleet Optimizer

Modality: Hybrid - 1 day / week at Melicidade (Osasco-SP)

Areas of Interest: Mixed Integer Linear Programming (MILP), Metaheuristics

Technical Leader: Toni Wickert

About the Project:

Full truckload (FTL) is a shipping mode in which a truck carries freight from an origin to a destination. In this mode, the contractor is only charged for the freight linked to this particular itinerary, while the transporter is responsible for managing the drivers and the vehicles.

From the contractor's perspective, the primary advantage of FTL is that it eliminates the need for additional operations management. However, drawbacks include limited truck availability during peak seasons and higher costs in comparison to fixed long-term dedicated fleet contracts.

In the latter case, the contractor is accountable for overseeing the entire process of allocating freight transportation for each vehicle in the fleet, all the while ensuring compliance with the drivers' working schedules.

The dedicated fleet problem considered here entails the scheduling of one to two-week-long itineraries where a vehicle is required to return to its initial location after reaching its final destination. This stipulation is in place to guarantee the consistency and repeatability of the itineraries from one week to the next.

Each itinerary consists of a sequence of travels encompassing loaded travels, waiting or rest periods, and unloaded -- or empty -- travels. Unloaded travels are costly and sometimes unavoidable, and aim at repositioning the vehicle from the destination of one loaded travel, to the origin of another loaded travel.

The objective of the problem is to fulfill a specified set of loaded travels while maximizing cost savings in transportation by switching the shipping mode of a subset of these travels from full truckload (FTL) to a dedicated fleet mode. The subset of travels for which the shipping mode changes must be decomposable into smaller groups that adhere to specific business constraints as well as the drivers' labor regulations.

This internship aims to review the existing MIP-based heuristic used to solve the dedicated fleet problem. Opportunities for improvements will be studied considering different modules of the existing approach, including: mathematical model, constructive heuristics and local search procedures.

Duration Details: 12 weeks in total (Christmas and New Year holidays excluded)

Internship Tasks & Activities:

1. Understanding of the business problem.
2. MILP understanding and review.
3. Constructive heuristic: understanding, review and improvements.
4. Local searches: understanding, review and improvements.
5. Performance tests to assess solution quality and processing time.
6. Final report.
7. Seminar.

Activity Schedule:

| Activity/week | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---------------------------|---|---|---|---|---|---|---|---|---|----|----|----|
| 1. Business problem | X | X | | | | | | | | | | |
| 2. MILP | | X | X | | | | | | | | | |
| 3. Constructive heuristic | | | X | X | X | X | | | | | | |
| 4. Local searches | | | | | | X | X | X | X | | | |
| 5. Performance tests | | | | X | X | X | X | X | X | X | X | |
| 6. Final report | | | | | | | | | X | X | X | X |
| 7. Seminar | | | | | | | | | | | | X |

Benefits:

- *Monthly Payments:*
 - *Stipend:* R\$ 3.375,00.
 - *Transportation Allowance:* R\$ 800,00.
- An accident insurance will also be provided covering the entire period of the internship.