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Transportation of mentally disabled people - Software developments and open problems

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Abstract:

Transportation of mentally disabled people is subject to many specific constraints due to medical or organisational reasons. We consider the problem of the daily transportation of persons from their home to specialized medical or social institutions. This concerns either mentally disabled children who attend specialised schools, or adults working in vocational rehabilitation centres. Most of them are unable to travel on their own; thus a dedicated transportation system must be managed by the centres. Daily inbound and return trips for dozens of persons are generally performed by costly taxis or minibuses. A software called Marika has been developed in Nantes to solve this problem for the centers of a local institution. This problem is adressed as a multi-period vehicle routing problem with time windows, heterogeneous fleet and additional constraints. The main characteristic of the model is to mix closed routes (that form loops from the centre) and open routes from the driver's home to the centre. We propose two objective functions aimed at minimising the transportation cost or finding a trade-off between the cost and the quality of service respectively. Regularity aspects are also considered for people that are transported several times per week. In this talk, we introduce the approach

developed for the practical solution of various aspects of this problem. The main procedure is based on a best insertion heuristic, several neighborhood functions and a Tabu search. Two interesting aspects of this problem have not been treated and are currently being investigated by the SLP team and colleagues. We present our initial work to provide a better model and solution of the regularity (or consistency) aspects of the multi-period problem. In addition, the institution identified that some cost savings could be realized by integrating the transportation service of several centers. The sharing of vehicles in this context provides some new interesting problems for the OR community.