Improving MCTS approaches for Vehicle Routing Problems

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Introduction : Utility companies manage large quantities of technical interventions. Itineraries that minimize cost and duration must be constructed. Real problems are too big to be tackled with mathematical programming approaches [1]. Progress in Tree Search techniques enable to test these methods on Vehicle Routing Problems. Nested Rollout Policy Adaptation is a recent refinement of MCTS and was tested on TSP [2] and VRP [3] problems. The objective of this work was to improve NRPA algorithm and adapt it to actual business problems.

Improving NRPA : NRPA uses probabilities of elementary actions to simulate solutions of the problem. Probabilities are refreshed depending on results of simulations. Several techniques were used to improve the algorithm by refining the criteria of probability refreshing.

Improving the model : The algorithm was first tested on literature data sets : Solomon VRPTW instances. The algorithm was then improved to take into account specificities of the business problems. It assigns appointments depending on technician skills and deals with limited numbers of technicians and priority between appointments.

Numerical Results : EDF current tool is based on greedy algorithm and local search approach. First results obtained with the implemented version of NRPA shows significant improvements compared to those produced by the current EDF tool both on academic and industrial data sets

References

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