Modern Approaches to The (Rich?) Vehicle Routing Problem

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ABSTRACT

VRP

Keywords

VRP

1. ABSTRACT

Henry: Autonomous navigation is cool and important. Routing, being a part of Autonomous navigation, is a problem. It is hard. Good routing saves a lot of money and time.

2. INTRODUCTION

Henry: Routing is cool and important, also Amazon prime, Uber, self driving cars, and mail. Routing is NP-hard and part of combinatorial optimization problems, which include things like the traveling salesman problem.

2.1 Routing in the real world

Henry: Definition of ye olde Vehicle Routing Problem. Also there are a lot of variants; here are the ones I can find good sources about most common ones (a bit of sarcasm; they are actually the most researched ones, at least recently. A variant with dynamic nodes was very popular pre-2006.)

2.2 History of routing and problem?

3. THE VEHICLE ROUTING PROBLEM

Henry: Describe VRP in general terms, introduce RVRP.

3.1 Decentralized Vehicle Routing Problem

Henry: It's agent flavored!

3.2 Vehicle Routing Problem with Time Windows

Henry: Deliveries during business hours only!

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4. APPROACHES

Henry: Generally, we use blackbox optimization, which is somewhat of a double-edged sword; it works well, and is computationally cheap(er), but it also does not produce any information about the data/problem it is working with. It is hard to gain insight into a problem given the output of a blackbox algorithm. This should maybe be a section for the following two items, but they're also the bulk (Guessing about 2/5ths) of my paper. Not sure what to do yet.

5. GENETIC AND MEMETIC ALGORITHMS

Henry: Of Memetic Algorithms: In general, the genetic algorithm improves the solution in large strokes, while the local optimization fine tunes the solutions generated by the GA.

6. AGENT-BASED MODELS AND PROBABILITY COLLECTIVES

Many problems in the rich vehicle routing category feature decentralized control, where each truck is modeled has having an independent agent who makes decisions out of self-interest. These decisions are often sub-optimal from the perspective of global optimization, and finding methods that allow for both autonomy and global utility is an ongoing research question. We have chosen to discuss two major approaches in modeling individuals - Agent-based models, the more traditional approach, and probability collectives, a relatively recent approach that has a legacy in genetic algorithms.

6.1 Agent-based models

6.2 Probability Collectives

7. HUMAN ASSIST (TAGGING)

Henry: 'Humans are really good at visually identifying good routes and tagging them accordingly. Also, server time is expensive and Amazon's Mechanical Turk is cheap.'

8. CONCLUSION

9. ACKNOWLEDGEMENTS

Henry: Thanks to caffeine, water, and stress; the raw elements that formed this paper.