

Dynamic Retail Vehicle Routing Problems as a Markov Decision Process

MSc. Project Proposal at the Autonomous Multi-Robots Lab, Cognitive Robotics, TU Delft

Brief description:

The desire of customers for faster and more reliable home deliveries is increasing strongly. At the same time, fleets of automated on-demand vehicles have the potential to disrupt urban commerce by providing last-mile delivery faster and cheaper than currently established traditional delivery channels. Yet to meet the challenging expectations of customers and fully utilize the benefits of such large-scale multi-robot systems, novel approaches for routing are needed.

Within this project we will therefore develop new methods for on-demand last-mile routing, such that the desired trade-off between the fleet composition, operation cost, and system performance is achieved. One connected master project is available:

- **“Dynamic vehicle routing problems as a Markov Decision Process”** In dynamic problems the time is evolving, hence an according model and sequential decision making is required [1]. Further information is revealed over time and decisions based on incomplete information need to be taken. In this project a retail related vehicle routing should be modeled as a MDP. After modeling the problem an algorithm to take a decision in each situation will get implemented, while developing a general code framework for this type of problem (C++). A good first overview is provided by [2][3].

Desired qualities:

- Motivated and independent
- Good problem solving skills
- Experience/interest in vehicle routing or optimization
- Experience in C++ or python programming

For further questions or to apply, please contact M.Kronmueller <m.kronmueller@tudelft.nl> or Ass. Prof. Dr. J. Alonso-Mora <j.alonsomora@tudelft.nl>. When applying, please provide a short motivation, up to date CV, a transcript of your current degree program and intended start date.

Group information: <http://www.autonomousrobots.nl/>

References:

- [1] Marlin W Ulmer, Justin C Goodson, Dirk C Mattfeld, and Barrett W Thomas. On modeling dynamic vehicle routing problems., 2018
- [2] Victor Pillac, Michel Gendreau, Christelle Guéret, and Andrés L. Medaglia. A review of dynamic vehicle routing problems. 225(1):1–11.
- [3] Ulrike Ritzinger, Jakob Puchinger, and Richard F. Hartl. A survey on dynamic and stochastic vehicle routing problems. 54(1):215–231.

