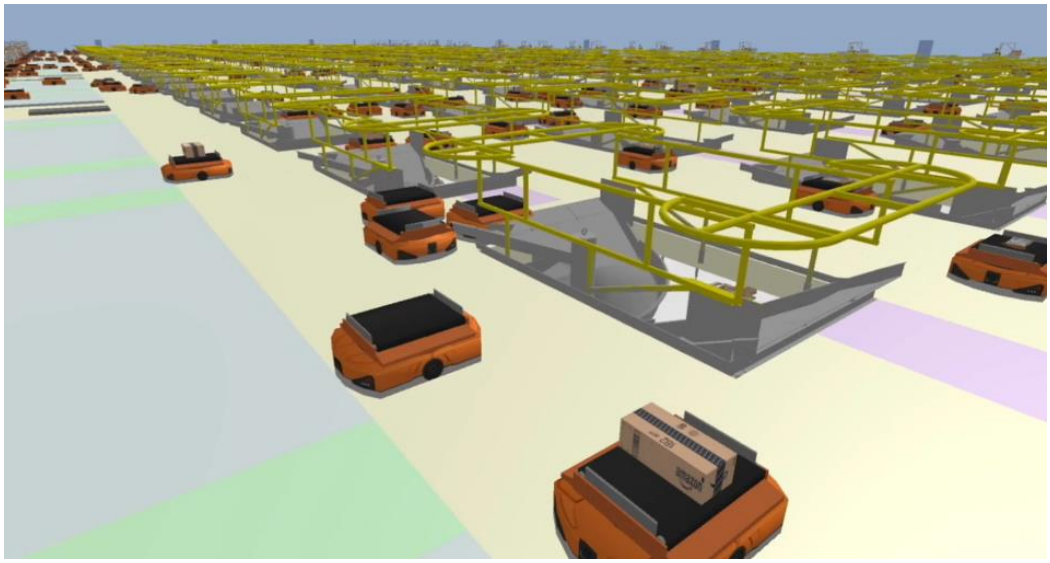
Multi-Robot Package Delivery Task Assignment in a Warehouse

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

Brief description: Autonomous robots/vehicles are increasingly used for pick-up and drop-off package delivery applications in logistic companies such as Amazon and DHL [1], where efficient and effective task assignment algorithms and path planning algorithms are necessary for improving the team's performance [2].

This project will investigate how to make task assignment and path planning for a fleet of warehouse robots to cooperatively transport a set of packages from their initial locations to corresponding destinations within given time-windows in the presence of both static and moving obstacles. The robotic task assignment and path planning are coupled, where the assignment for one robot to transport one package to its destination is ought to consider the potential static and moving obstacles on the robot's way to deliver the package. As the packages required to be delivered might dynamically appear in the warehouse, it is also necessary to investigate at which time instances to make a task reassignment and how to make task reassignment at each time instance for the robots in order to increase the package delivery quality. Some basic knowledge of the courses Computer Science, Graph Theory, and Optimization, is needed for the project, as well as programming skills.



For further questions or to apply, please contact X. Bai <X.Bai-1@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] M. Liu, H. Ma, J. Li, and S. Koenig, "Task and path planning for multi-agent pickup and delivery," in *Proceedings of the 18th International Conference on Autonomous Agents and MultiAgent Systems*. International Foundation for Autonomous Agents and Multiagent Systems, 2019, pp. 1152–1160.

[2] J. Alonso-Mora, S. Samaranayake, A. Wallar, E. Frazzoli, and D. Rus, "On-demand high-capacity ride-sharing via dynamic trip-vehicle assignment," *Proceedings of the National Academy of Sciences*, vol. 114, no. 3, pp. 462– 467, 2017.