Master Thesis Announcement

Fakultät für

Wirtschaftswissenschaften

# Exploiting Knowledge of Room Occupation for the Scheduling of Navigation Tasks of a Fleet of Robots in Office Environments

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**Date**: May 2020 – October 2020

Various robot platforms are becoming first citizens in our work and private environments. In order to carry out their tasks, such robots need not only to interact with people in order to identify their goals but also to learn the conditions that allow them to accomplish their objectives and schedule their activities accordingly. Due to the limited perspective available to the individual robots, the use of external information sources is essential to bridge the local knowledge gap.

In particular, the adoption of Internet of Things technologies as well as the sharing of personal information through, e.g., digital calendars, allow to build a first understanding of room occupancy in typical office environments. It becomes then possible to schedule the operation of robots based on the information gathered about room occupancy and the probability of finding a person in a given office. Furthermore, the robots can refine such knowledge while exploring the environment and adjust their operation based on locally gathered information.

These heterogeneity of information sources both from local sensors and from external sources, together with the possibility to coordinate a fleet of robots centrally as well as to allow distributed decisions, defines a complex space of possibility to optimally execute a set of tasks. The goal of this thesis is then to coordinate multiple robots to handle a set of tasks to be executed, e.g., visiting given rooms. The system as well as the individual robots can learn about office occupation through the interaction with, e.g., IoT systems and exploit this knowledge to take central and distributed decision on which task to execute taking into account the available tasks as well as system resources, e.g., the available energy. With this information, the robot can schedule alternative operations, e.g., when and in which order to visit different rooms, based on the probability of finding specific people in given places. This requires designing both a distributed as well as central scheduler to schedule activities optimally.

In summary, the work for the master thesis entails:

* Familiarization with the state of the art on scheduling a fleet of robot
* Design of a system able to share the information among sensors, robots and a central scheduler
* Design of algorithms necessary to perform centralized as well as distributed scheduling of operations
* Prototypical implementation of the approach
* Systematic experimental evaluation of the design and implementation
* Documentation and oral presentation of the results in the NES colloquium