Abstract

Imagine the following situation. You give your favorite robot, named Pippi, the task to fetch a parcel that just arrived at your front door. While pushing the parcel back to you, she must travel through a door opening. Unfortunately, the parcel she is pushing is blocking her camera, giving her a hard time to see the door to cross. If she cannot see the door, she cannot safely push the parcel through the door opening. What would you as a human do in a similar situation? Most probably you would ask someone for help, someone to guide you through the door, as we ask for help when we need to park our car in a tight parking spot. Why not let the robots do the same? Why not let robots help each other. Luckily for Pippi, there is another robot, named Emil, vacuum cleaning the floor in the same room. Since Emil can view both Pippi and the door at the same time, he can guide Pippi through the door, enabling her to deliver the parcel to you.

This work is about societies of autonomous robots in which robots can help each other by offering information-producing functionalities. A functional *configuration* is a way to allocate and connect functionalities among robots. In general, different configurations can be used to solve the same task, depending on the current situation. For the work on configurations, we have three steps. The first step is to foramlly define the idea of functional configuration. Second, to show how configurations can be automatically generated and executed. The third step is to address the problem of when and how to change a configuration in response to changing conditions. In this licenciate thesis we report initial work that focus on the two first steps: the third step is subject of future work. We propose a formal definition of functional configurations, and we propose an approach based on artificial intelligence (AI) planning techniques to automatically generate a preferred configuration for a given task, environment, and set of resources. To illustrate these ideas, we describe an experimental system where these are implemented, and show two example of it in which two robots mutually help each other to address tasks. In the first example they help each other to cross a door, and in the second example they carry a bar together.