Background
How many times have you moved to a new apartment? Imagine that you have a robot that helps you to unpack the content of the boxes. Unpacking and cleaning are some of the most repetitive tasks in a household environment. How wonderful would it be to have a robot doing these tasks for us? The goal of this project is to allow a robot to identify and grasp objects from inside a box and place them in the correct locations, for example, the robot will learn that cups and plates should most likely be stored in the cupboard in the kitchen. To achieve this several steps should be analyzed, such as the acquisition of knowledge, the creation of a robotic plan and the sequential definition of the robot’s executions (see below Figure).

Problem and goal
In this thesis, we will use existing technologies such as the virtual environment developed at the CRAFT lab at Chalmers, to collect data and learn the storing locations for different objects, e.g. https://www.youtube.com/watch?v=hEUEpQcrDlw. This work will focus on exploring the advantages of Large Language Models (LLMs), for example, ChatGPT, to query the possible location of new objects in the robot’s knowledge base. The robot will have an initial skill set as well as a probability distribution of objects and their learned locations, this information will be used to query LLMs to provide action plans that the robot should follow to store the found object in the correct location. The students will investigate and develop recent reasoning methods to learn robotic plans in complex scenarios. Thus, the robot should automatically create plans based on the output of the LLMs and the models obtained from the demonstrations.

This thesis is done in collaboration with the Ritsumeikan University, Japan, under the co-supervision of Assoc. Professor Gustavo Garcia, (http://www.em.ci.ritsumei.ac.jp/members/).

Number of students: 1-2
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Prerequisite: Basics of Learning algorithms and control and Basics of Computer Programming (ROS, Python or C++).
Language: The thesis is to be written in English.
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