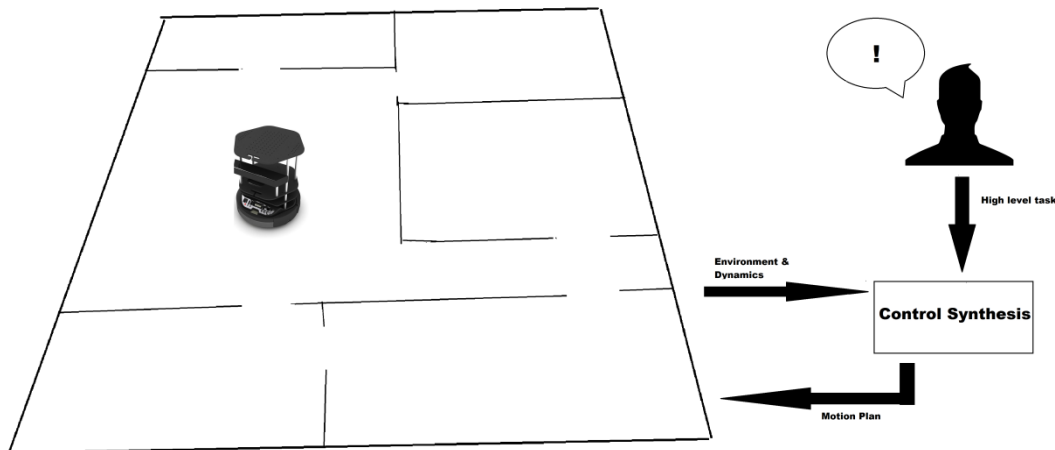


## High level motion planning for a robot



Controlling the motion of a robot can be done in multiple ways. One option, which would work well for implementations where non-technically trained people are involved, is control synthesis for high level tasks. High level tasks refers to more abstract tasks (e.g. visiting every room in the building) compared to low level tasks which are more specific (e.g. going to point  $x$  with speed  $v$ ). Control synthesis refers to automatically finding a plan based on information of environment and a given task. In this project we want you to suggest a framework for control synthesis for a single agent under linear temporal logic (LTL) specifications. LTL is a language in which high level tasks can be expressed. Single agent means that the framework only needs to be adapted for one robot. The project should address the following:

- Make a mathematical model of the environment the robot is moving in and the dynamics of the robot.
- Suggest a framework which returns a plan that satisfies a given task. The framework should work for all tasks which can be expressed by LTL. The framework should also inform the user of both the path the robot will follow and the completion time of the movement from start to finish.
- Illustrate that the suggested framework works with simulations. If there is time it should also be illustrated by implementations on a turtle bot. The implementation should include an approval of the user before the movement starts. To perform an implementation a working program based on ROS must be presented (using Gazebo for instance).
- Discuss the advantages and disadvantages of this approach. What limitations does the solution have?
- Reflect on the future of mobile robots in society and in settings where the operator has no technical background.