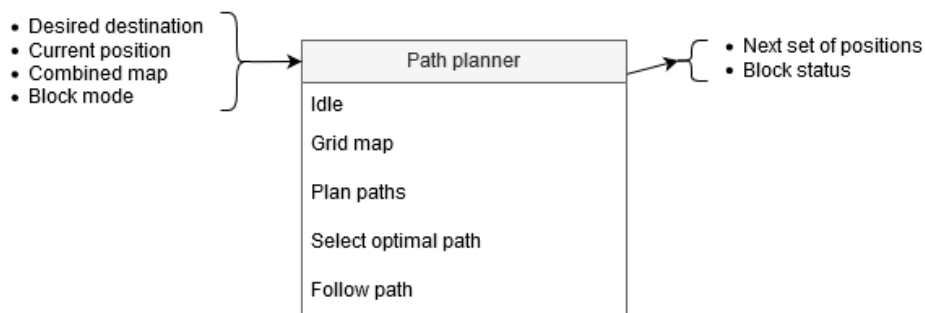


## Path planner functionality

The path planner determines the path for the PICO robot based on the combined map, the current location and the desired location. The planned path is a set of positions that the PICO robot is going to drive towards, this set is called the 'next set of positions'. This next set of positions is saved in the world model and used by the task manager to send destination points to the drive controller.

If the path planner is idle, it is waiting for the task manager to start planning. Once the path planner is planning the path from the position of the PICO robot towards a given destination, the following things happen. First the map is gridded, creating all possible locations that the PICO robot is able to move towards. Then different paths are planned, for example through different doors. After that the most optimal path is planned and sent to the world model as next set of positions. When the PICO robot is following the path, the path planner checks if no unexpected objects are interfering with the planned trajectory.



### Idle

When idling, all variables are set to their initial value and the path planner waits for the task manager to set the block mode to PLAN\_PATH to start planning. When the path planner is idling, the block status changes to IDLING.

### Grid map

In order to determine the possible paths, the map is gridded in squares of a predefined (configurable) width where the PICO robot can drive towards without interfering with an object. This enables the possibility to use an optimal path planning algorithm in which discrete steps are used. Gridding is done every time that the path planner is called from the task manager, because local disturbances might not be taken into account while planning a previous path.

### Plan paths

In this function all possible paths to the desired destination are planned based on the combined map. The path planning is based on the combined map. The planned paths are determined by taking the grid map and applying the A\* algorithm. Every planned path consists of a <Position> vector, where only the positions are listed where the PICO robot has to stop and rotate. All possible planned paths, for example through different doors, are stored in one vector and the optimal path is selected later.

### Select optimal path

Once all possible paths are planned, the optimal one has to be selected. This selection is done based on the distance and the number of points where the PICO robot has to stop and rotate. Once the optimal path is selected, it is stored in the world model and it can be used by the task manager. The block status is then changed to DONE.

**Follow path**

The planned path is followed every iteration of the loop to evaluate if the planned path is still optimal, for example when a random object is suddenly on the planned trajectory then it is possible for the path planner to adjust the planned path.