31390 – Demo Day

Challenge description and metrics

Challenge 1

Complete the challenge in the uASTA far from the pool. In this cage, you need to use the CrazyFlies that mount the loco positioning deck.

The goal of this challenge is to be able to navigate the 3D maze. Use either the greedy best-first or A* search algorithm to obtain a path which the drone can follow. The path must be scaled to match the real maze. An offset is also needed. You should have already found the scaling during the course period.

The starting position is marked E, F, G or H and it can be seen on the floor of the maze. The goal is to reach A, B, C or D, also marked on the floor of the maze.

A map of the maze will be given at the time of your turn. You will receive instructions where to find the map on the base station that you will use during the competition. The format of the map will be the same as with the one you have used to solve the exercises. The start and end point will also be assigned in the maze file, as it was done in the exercises (unscaled). The jury will communicate where to place the CF at start and the end point to reach.

There will be 3 stations in use during the challenge day. One station will be in use by the team competing. The second one will be used to setup for the next team. The third station will be used by the jury.

You have a maximum of 10 minutes to try your code in uASTA. Within these 10 minutes you should place the crazyfly on the start location, run your code, fly the drone in the maze, reach the final goal without crashing.

The challenge is considered successful if you reach the goal, starting from the assigned initial point, within a maximum of 2 minutes.

It should be clear when landing, that the CF was aiming at the specified end point.

NOTE: Challenge 2 is a mandatory step to be admitted to challenge 3.

Challenge 3 will run right after you can show that you are successful in challenge 2.

You have a total of 10 minutes to complete both challenge 2 and challenge 3.

Challenge 2

Complete this challenge in the optitrack arena close from the pool using the Optitrack 3D motion tracking system.

We will use a CF with reflective markers. You will be instructed prior your turn on the CF number, and you can verify in the optitrack and RVIZ that the trackable works fine.

There will be 3 stations in use during the challenge day. One station will be in use by the team competing. The second one will be used to setup for the next team. The third station will be used by the jury.

To succeed in challenge 2, you have to:

1) hover stably on point (1, 1, 1) for 10 s with a maximum error of 10 cm, and
2) move from setpoint (1, 1, 1) to (2, 1, 1) while ensuring that the overshoot is lower than 30 cm.

The jury will assess that your controller works within the specified limits.

Challenge 3

Complete this challenge in the optitrack arena close from the pool using the Optitrack 3D motion tracking system.

We will use a CF with reflective markers. You will be instructed prior your turn on the CF number, and you can verify in the optitrack and RVIZ that the trackable works fine.

One of the TAs will place the CF in the center of the mat with proper alignment of the CF w.r.t. the Optitrack frame of reference (O=[0,-2,0], yaw_CF=0). Starting from that position, you have to take off and navigate through the hoops standing in the optitrack arena. The order of the hoops to pass will be 1,2,3,4, but any other order is acceptable too.

You will have some time in the morning of the demo day, to setup your system. Precisely, you will have 10 minutes time slot to gather the hoops position. You will also be provided with a simulimk model that

loads the hoop positions and orientation in your workspace. The format of the hoop position and orientation is:

P_h=[x,y,z] meters

O_h = [nx,ny,nz] (unit vector representing the positive normal direction of the hoop)

NOTE: the normal positive direction is the direction you are supposed to pass through.

To succeed in this challenge, the CF has to pass at least once through a minimum of 3 hoops during the same flight, while performing a continuous smooth trajectory.

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