

Artificial Intelligence for Autonomous Systems

Spring 2024

Lab 5 - Time trial

This lab will be graded.

Available time : **3 lab sessions.**

Please submit all your code (not the binaries), and the file used to reproduce your Python environment on Cyberlearn before the lab session scheduled for **June 11th**. On this date you will participate in a drone race which will count for your evaluation.

1 Lab objectives

In this final lab, you will use all the tools and knowledge you've gained this semester to take on one last challenge. Your goal? To complete a lap of a circuit as quickly as possible, while keeping track of how many spectators your drone passes.

1.1 The track

The circuit is represented by a white line on a matt floor (just like for lab 2), with no intersections or breaks in the line. It is a closed loop, meaning that the start and finish are the same point marked by a perpendicular double line. You will have a maximum of 40s to complete the lap. If after this time you did not reach or find the finish line your drone must land safely.

An example track has been installed in room B08. You can ask for access to this room whenever you feel the need to test your implementation.

1.2 The race

The clock starts when your drone takes off. The objective is to complete a full lap as swiftly as possible, following the track at all times. Your drone must stay within a meter of the track. No maximum speed is enforced.

1.3 Counting your fans

Some fans may gather along the track to support your drone. These fans will be represented by bottles placed on the outside of the line (within 50cm). Your task is to count these bottles and print this value (either in the Python console or in CFClient) each time it is updated. The accuracy of your count will be one of the evaluation criteria.

2 Implementation

1. Utilize any available resources, ensuring clear distinction between your own contributions and borrowed elements in the code.
2. If necessary you can download and use a line detection model from Cyberlearn.
3. We have developed a reinforcement learning model, complete with a simulation environment, designed to effectively pilot the drone. Feel free to fork our GitHub repository for your use and customization.
4. Explore code examples here for drone communication and execution of flight commands.

3 Bonus

We will measure the time it takes for each group to complete a full lap of the track. We will rank them and the group with the fastest time will get a 0.4 bonus point on their lowest lab grade. Similarly, the second group will receive a bonus of 0.2 points.