

# W23 CMPUT 412/503 Exercise 4

## Don't Crash! Tailing Behaviour

Written report due: March 14th (Tuesday)

Oral demonstration: March 15/17th

Starting Template - [https://github.com/XZPshaw/CMPUT412503\\_exercise4](https://github.com/XZPshaw/CMPUT412503_exercise4)

### Description

For our fourth mini exercise you will need to implement an autonomous safe tailing behavior on your Duckiebot.

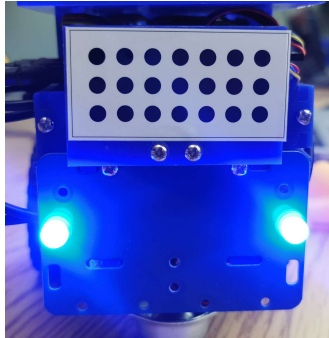
#### Your Duckiebot needs to:

- Tail (follow) another Duckiebot autonomously at a safe driving distance
  - You will need to decide what is a “**safe driving distance**” for your bot
    - It should be close enough that it can still detect when the “leader” bot starts moving again but far enough away that it doesn’t run into the “leader” if it should stop abruptly
  - **Do not run into** the Duckiebot you are following
  - If the Duckiebot you are following stops, your bot should also **stop at a safe distance behind it**
  - If the Duckiebot you are following turns at an intersection, your bot should **stop** at the intersection, **turn on its LED signal light**, and then **turn the same direction** to continue following the other Duckiebot
  - If there isn’t a Duckiebot in front of your bot to follow then it should autonomously drive around the town following the rules of the road (listed below) until it finds another Duckiebot to follow
  - As soon as another Duckiebot is detected your bot should **automatically start tailing it**
- While following at a safe distance, your bot should still follow these rules of the road:
  - Drive within the lane (yellow dotted line on your left and white line on your right)
  - Stop at the intersections before turning or driving straight
    - If you are following a bot, continue following it through the intersection
    - If you are not following a bot, you can choose whether to turn or drive straight through the intersection
  - Blink the appropriate rear LED to signal left or right turns at the intersection

#### Tips:

- To tail another Duckiebot you first need to **detect** them. You can do this a number of different ways. We suggest using the dot stickers, color masking, or using the time of flight sensors.

- Starting template with Duckiebot detection package:  
[https://github.com/XZPshaw/CMPUT412503\\_exercise4](https://github.com/XZPshaw/CMPUT412503_exercise4)
- For testing purposes you can drive the “leader” (i.e., the Duckiebot you are tailing) around the town using **manual keyboard control**



## Deliverables

### Include in your written report:

- A video of your Duckiebot **safely** driving around the town behind another Duckiebot
  - Your video should show your Duckiebot taking a right hand turn and left hand turn at the intersections and drive at least two full laps of the town
- A short introduction (2-3 sentences)
- A brief paragraph describing your implemented strategy for maintaining a safe driving distance and avoided collisions
- A brief paragraph discussing your results; please answer these questions:
  - How well did your implemented strategy work? Was it reliable? In what situations did it perform poorly?

### On eClass one member of your team will submit:

- A pdf printout of your published report
- A link to your team written report hosted on your website
- A link to your exercise 4 repository

**For the oral demonstration you will need to run your program and safely follow the TA's Duckiebot around the town (we will be driving it manually using keyboard control). Please make sure your program runs on both team member's robots just in case one isn't working the day of the demo.**

## Resources

You can use any material on the internet as long as you cite it properly. You are encouraged to collaborate with your labmates and if you develop a solution together please acknowledge who you worked with in your written report.