EIE3105
Integrated Project (Part II)
(**Updated version for Group Q students**)

Dr. Lawrence Cheung

Semester 2, 2021/22

Teaching Staff

- Lecturer: Dr. Lawrence Cheung
  - Office: DE628
  - Tel.: 2766-6131
  - Email address: encccl@polyu.edu.hk
  - Consultation Hours:
    - **Monday to Friday: 10 a.m. – 12 noon, 2 p.m. – 4 p.m.**
    - **You are better to make an appointment through email since I may have other meetings in the consultation hours.**

Teaching Staff

- Tutor: Mr. Shu-yuen Lam
  - Office: DE618 (or CF005)
  - Tel.: 2766-6239
  - Email address: shuyuen.lam@polyu.edu.hk
  - Consultation Hours:
    - **Monday to Thursday: 10 a.m. – 12 noon, 2 p.m. – 4 p.m.**
    - **Mr. Lam may not be available on every Friday.**

Course Schedule

- Laboratory
  - 10 am to 12 noon, 2 pm to 5 pm CF005

Course Outline

Week	Tasks (Very intensive!)
23 to 27 May	Lab Exercise Demonstration 1: Robot Car and Ultrasonic Sensor Development (Hardware and Software Development) Demonstration 4A: Ball Hitting (Group)
30 May to 3 Jun	Demonstration 2: Line Tracking
6 to 10 Jun	Demonstration 3: Car Parking
13 to 17 Jun	Demonstration 4B: Relay Race (Group) Report and Presentation

Pick up Things

- Laboratory Exercises
  - One tri-light LED (if you need it)
  - Three photo-resistors (if you need them)
  - One toolkit (if you need it)
- Arena (3 ft. $\times$ 3 ft.)
- Robot Car Components (if any)
- Robot Car Label

Continuous Assessment

Component	% Weighting
Project Demonstration	40
Project Report and Presentation	10
Project Logbook	8
Test (AVR and ARM)	4
Lab	2
TOTAL	64

Continuous Assessment

- Continuous assessment in Semester 1

Component	% Weighting
6 Lab Exercises (AVR and ARM)	10
3 Quizzes (AVR) and Final Test	26
TOTAL	36

- Overall
  - Semester 1: 36%
  - Semester 2: 64%

Continuous Assessment

- Logbook (8%)
  - You need to submit your logbook every week to Blackboard. I expected ***4 WEEKS***.
  - You can stop writing your logbook when you finish all your works.
  - Write a short essay (less than 100 words) to show your progress
    - What did you do? What will you do?
  - The deadline is the end of each week (***11:59 p.m., Saturday***).

Continuous Assessment

- Lab: AVR and ARM Interfacing (2%)
  - PWM, Input Capture and ADC
  - Deadline for submission: **5 p.m., 27 May 2022 (Fri)**
  - Submit demonstration videos and projects (program files) to Blackboard.
- Test: AVR and ARM Interfacing (4%)
  - 2 to 4 pm, CF504, two questions
  - If you cannot come to campus, we will arrange an online test to you later.

Continuous Assessment

- Demonstrations (40%)
  - Demonstration 1: Robot Car and Ultrasonic Sensor Development (10%)
  - Demonstration 2: Line Tracking (10%)
  - Demonstration 3: Car Parking (10%)
  - Demonstration 4: Ball Hitting (Group, 5%) and Relay Race (Group, 5%)

Continuous Assessment

- Report and Presentation (10%)
  - Write a short report (less than 5 pages) to describe your work in Demonstrations 1, 2, 3 and 4.
    - Show your design
    - Tell the difficulties you have and how to overcome them
  - Give a 5-minute presentation video with demonstration videos for all demonstrations.
  - Submission deadline: **5 p.m., 17 Jun 2022 (Fri)**

Demonstrations

- Demonstration 1: Robot Car and Ultrasonic Sensor Development (10%)
  - Materials: The website below and Blackboard

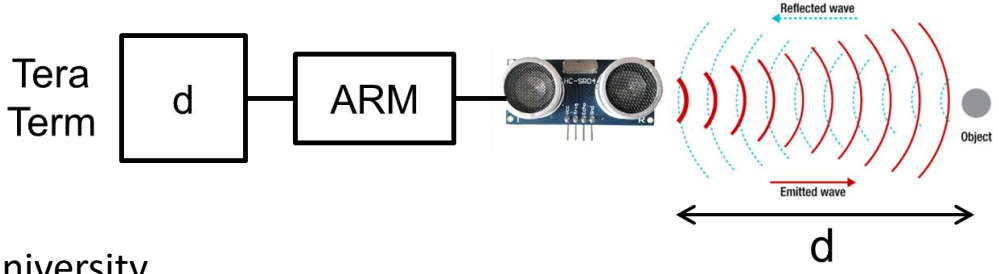
https://ensylam.blogspot.com/

Demonstrations

- Hardware development (6%): Use the sample program in Blackboard to check whether the hardware components work properly or not.
  - If not, ask Mr. Lam for help.

Demonstrations

- Software development: Write a program to remotely control your robot car and get the reading from your ultrasonic sensor.
  - Product 1: Remotely control your car to move forward, move backward, turn left and forward, and turn right and forward.
  - Product 2: Measure the distance d (3 times with 3 difference distances) by using the ultrasonic sensor and a ruler. They should be roughly the same.

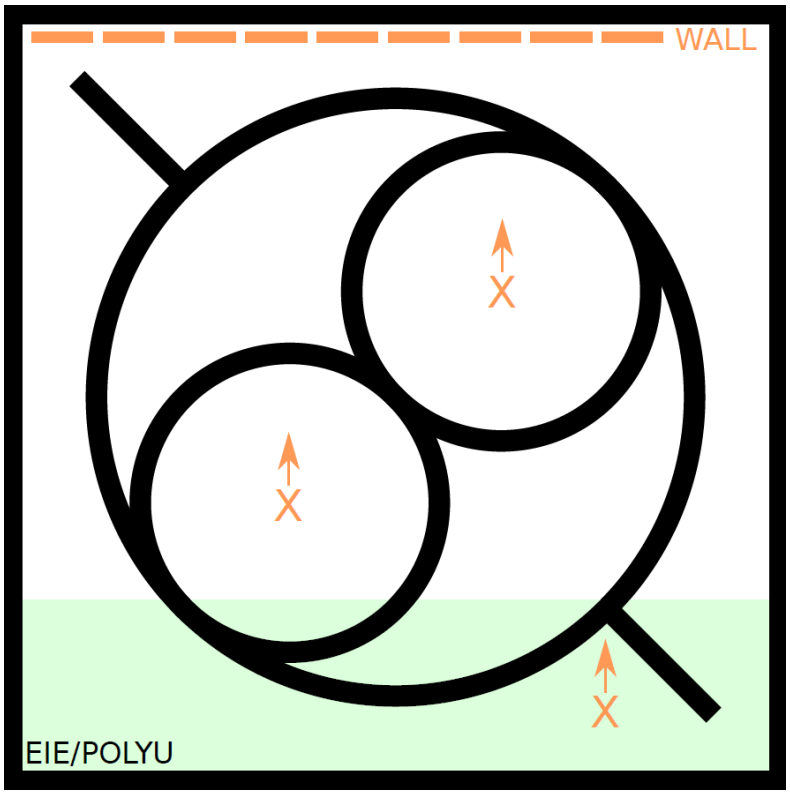


Demonstrations

- Product: Make demonstration videos.
  - Zip your program code and demonstration videos into a single file.
  - Submit it to Blackboard.
- Important reminder: No editing is allowed. You will score ***NO marks*** if the demonstration video is edited.
- Submission deadline: **5 p.m., 27 May 2022 (Fri)**

Demonstrations

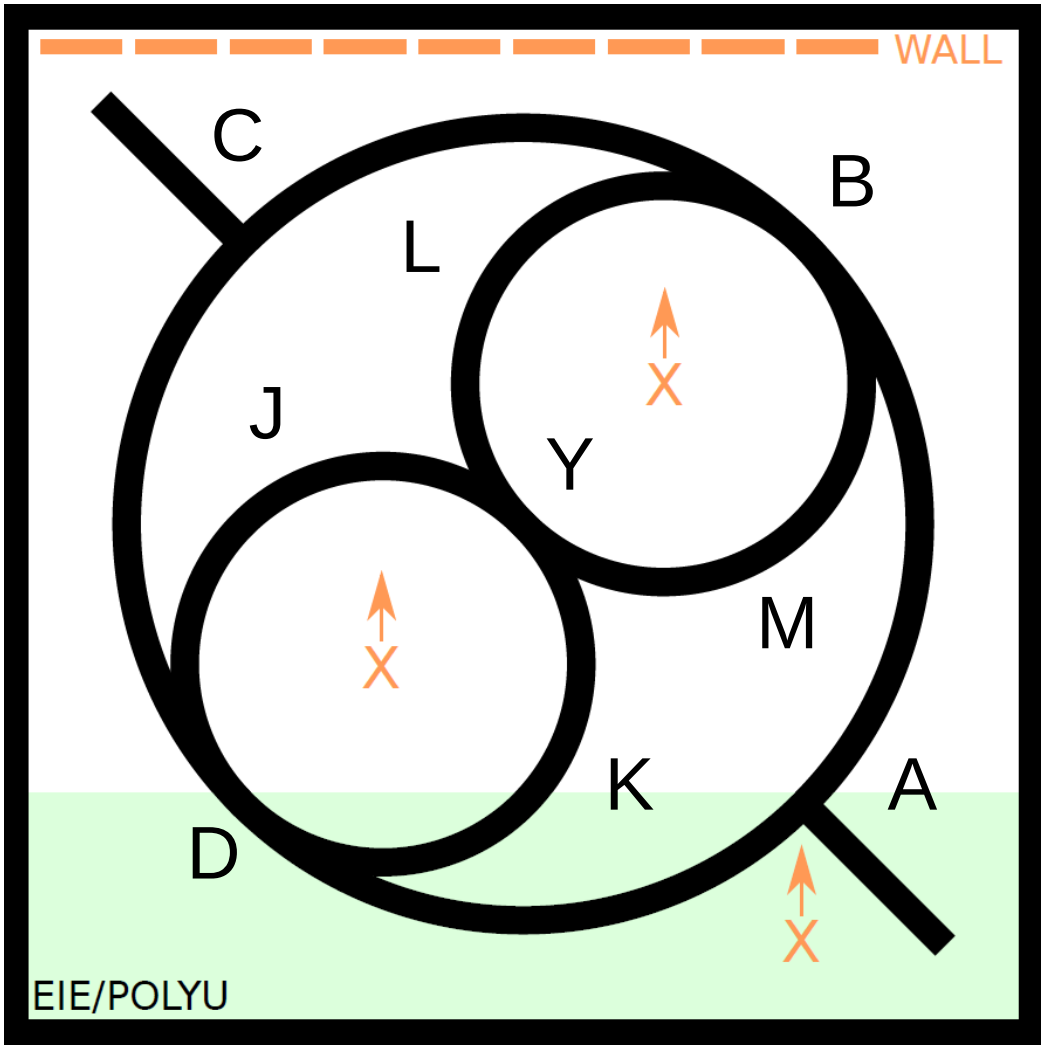
- Demonstration 2: Line Tracking (10%)



Demonstrations

- Follow the track
- Sequence:

A ➔ B ➔ C ➔ D ➔ A ➔ B ➔ L ➔ Y ➔ K ➔ D ➔ J ➔ Y ➔ M ➔ B ➔ C ➔ D ➔ A



Demonstrations

- It is acceptable if your car sometimes does not follow the track but the duration must be short (not more than **ONE** second).
- I expect the car cannot move very fast since the arena is small.

Demonstrations

- Marking criteria
  - Score 50% of total if your car can finish it within 60 seconds.
  - 50% of the total is proportional to the time taken to follow the track.
    - Top 30%: 50% (full marks)
    - Top 31% to 50%: 30%
    - Top 51% to 75%: 10%
    - Last 25%: 0%

Demonstrations

- Product: Make a demonstration video.
  - Zip your program code and demonstration video into a single file.
  - Submit to Blackboard.
- Important reminder: No editing is allowed. You will score ***NO marks*** if the demonstration video is edited.
- Submission deadline: **5 p.m., 3 Jun 2022 (Fri)**

Demonstrations

- Advices
  - If your car is too fast, it cannot detect the line properly and thus it cannot follow the track.
  - If your car is too slow, you cannot score high marks.
  - Your car should be sometimes fast (e.g., when your car is not turning) and sometimes slow (e.g., when it switches from one line to another line).

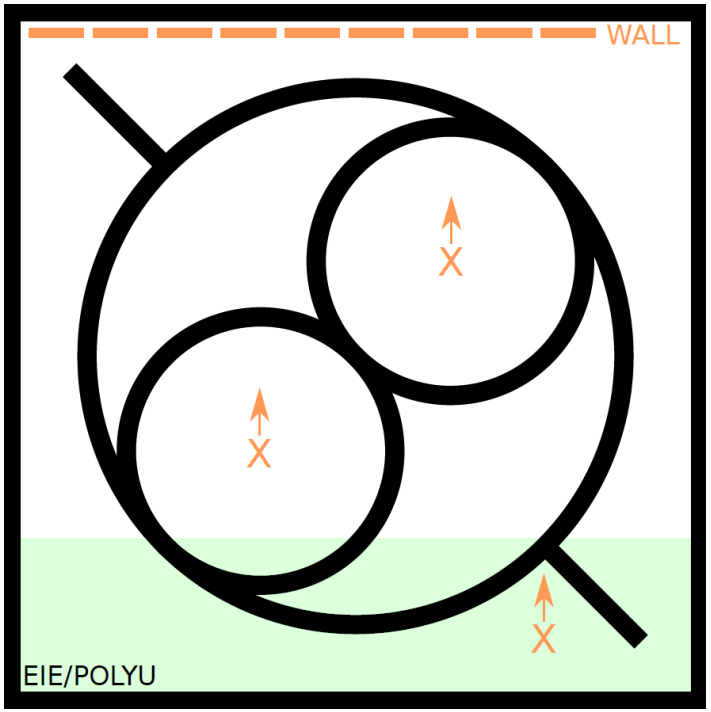
Demonstrations

- Event lookup table

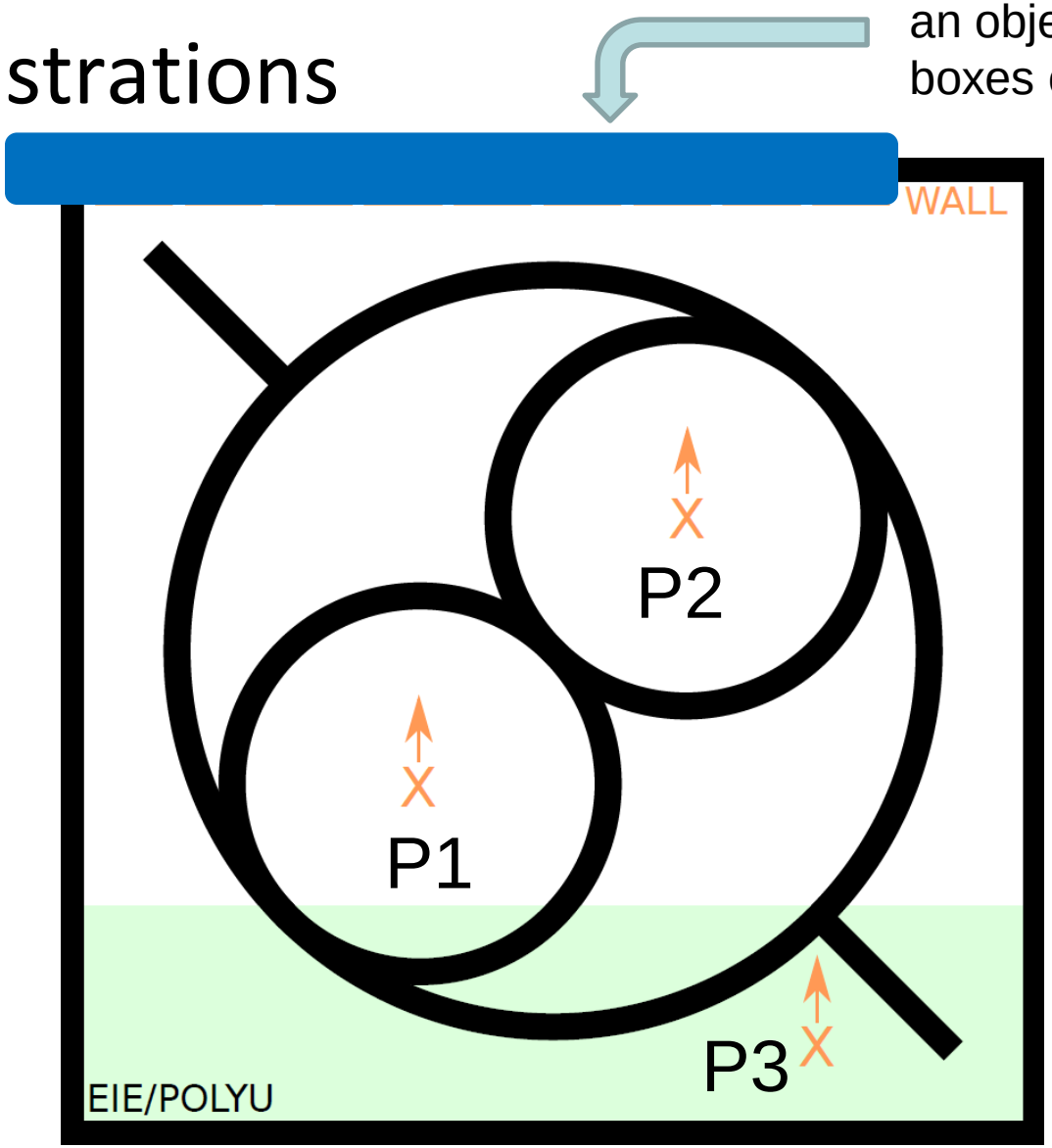
Previous State	Event (Reading)	Actions to be taken (PWM values)	Next State

Demonstrations

- Demonstration 3: Car Parking (10%)
  - Your car can get close to the wall closely but not hit the wall.



Demonstrations



Demonstrations

- The sequence is: P1 ➔ P2 ➔ P3
- You need to build the wall by yourself, e.g. few boxes of lemon tea on the line.

- Marking criteria
  - Score 50% of total if your car can get close to the wall from the three specified positions and each time the distance between the car and the wall is less than 10 cm.

Demonstrations

- 50% of the total marks is proportional to the total time taken (t) of the car to finish the parking from the three specified positions (25%) and the total distance (d) between the car and the wall from the specified positions (25%).
  - Top 30%: 50% (full marks)
  - Top 30% to 60%: 30%
  - Top 60% to 80%: 10%
  - Last 20%: 0%

Demonstrations

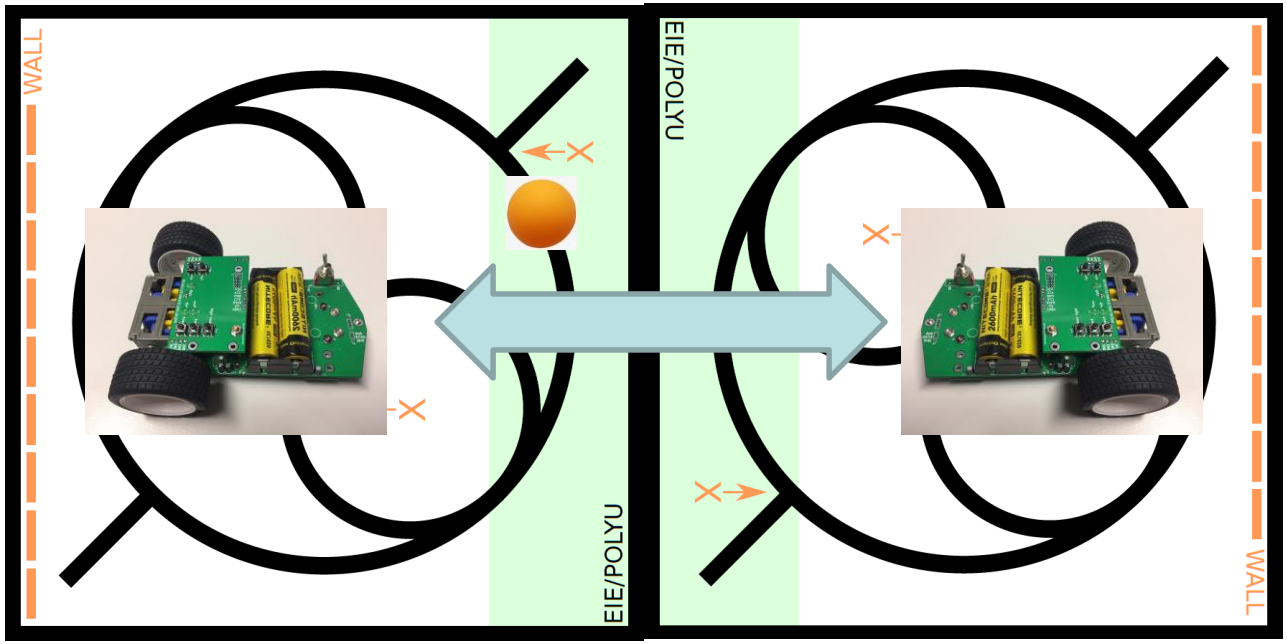
- Product: Make a demonstration video.
  - Before putting your car into a specified position, you should power off and then power on the robot car. Then put the car to the position and press the on-board button to start moving.
  - The above procedure should be repeated three times in three different specified positions (i.e., P1, P2 and P3).
  - Zip your program code and demonstration video into a single file.
  - Submit to Blackboard.

Demonstrations

- Important reminder: No editing is allowed. You will score ***NO marks*** if the demonstration video is edited.
- Submission deadline: **5 p.m., 10 Jun 2022 (Fri)**

Demonstrations

- Demonstration 4A: Ball Hitting (Group) (5%)



Demonstrations

- Requirement: Hit a table tennis ball **SIX** times so that the ball can be passed from one car to another car.
  - Use a remote control to control the movement of a car.
  - Both cars cannot go into the central **GREEN** region.
  - The ball should always stay inside the arenas.
  - Robot cars can move outside the arenas.
  - Each car hits the ball 3 times (total 6 times for two cars).
  - The ball must be hit by two cars alternatively.
  - If you cannot find a partner, let me know and I will help.

Demonstrations

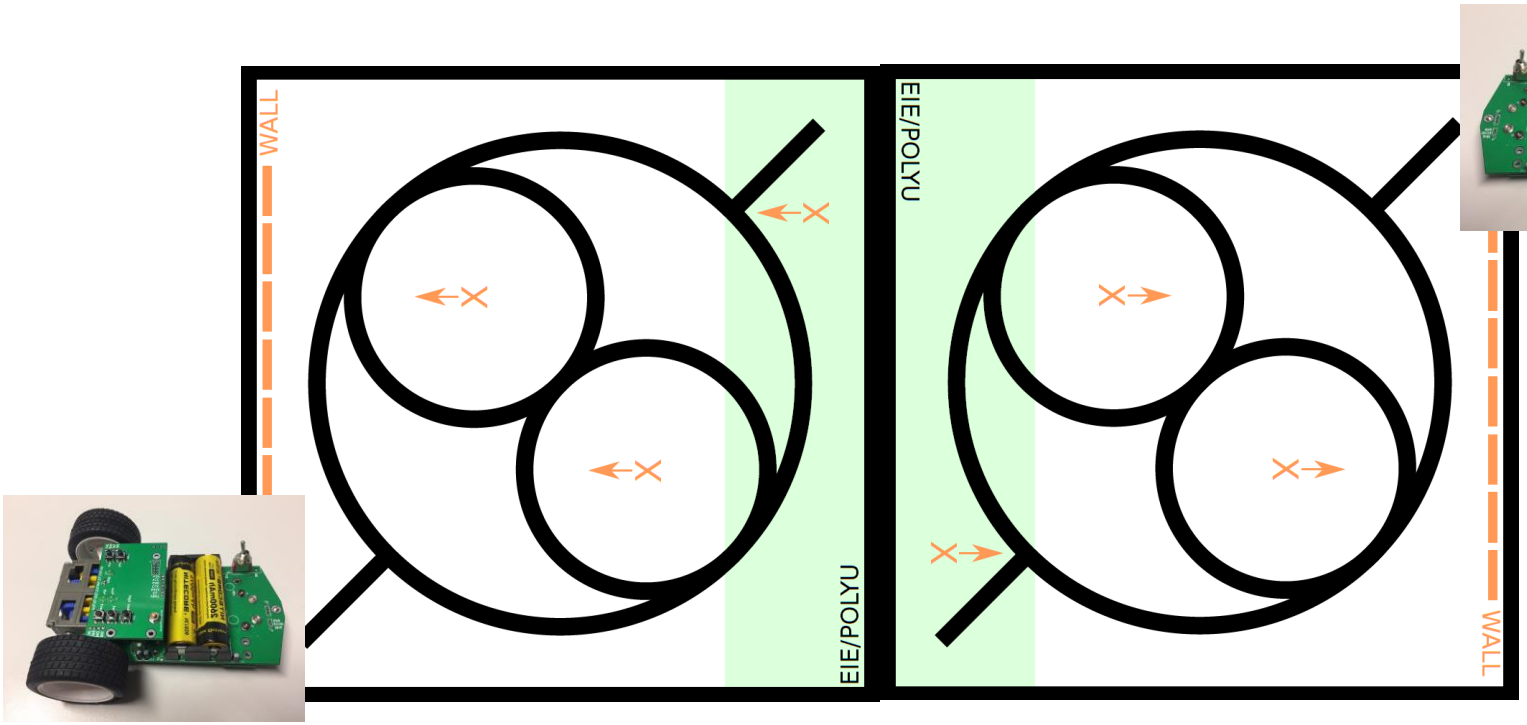
- Marking criteria
  - Score 50% of total if your car can finish it within 90 seconds.
  - 50% of the total marks is proportional to the time taken to finish the whole process.
    - Top 30%: 50% (full marks)
    - Top 30% to 60%: 30%
    - Top 60% to 80%: 10%
    - Last 20%: 0%

Demonstrations

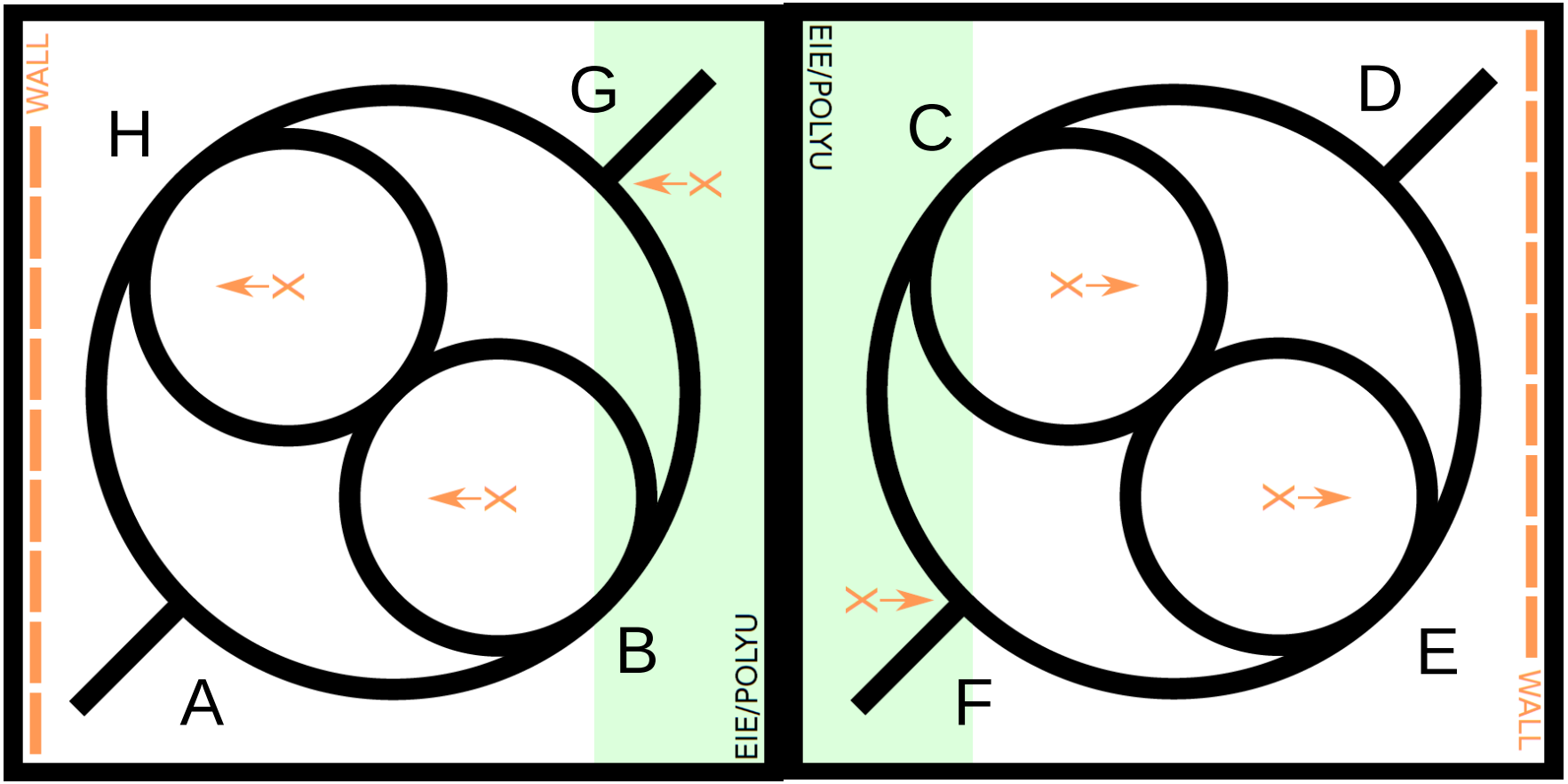
- Product: Make a demonstration video.
  - Zip your program code and demonstration video into a single file.
  - Submit to Blackboard.
- Important reminder: No editing is allowed. You will score ***NO marks*** if the demonstration video is edited.
- Submission deadline: **5 p.m., 27 May 2022 (Fri)**

Demonstrations

- Demonstration 4B: Relay Race (Group) (5%)



Demonstrations



Demonstrations

- Requirement:
  - Car 1 (at A): A ➔ B ➔ C ➔ D
  - Car 2 (at D): D ➔ E ➔ F ➔ G ➔ H ➔ A ➔ B ➔ C ➔ D
  - Car 1 (at D): D ➔ E ➔ F
  - Automation
  - Two cars are not allowed to be hit.
  - Two videos
    - Student A's car = Car 1, Student B's car = Car 2
    - Student A's car = Car 2, Student B's car = Car 1

Demonstrations

- Marking criteria
  - Score 50% of total if your car can finish it within 90 seconds.
  - 50% of the total marks is proportional to the total time taken to finish the whole process.
    - Top 30%: 50% (full marks)
    - Top 30% to 60%: 30%
    - Top 60% to 80%: 10%
    - Last 20%: 0%

Demonstrations

- Product: Make a demonstration video.
  - Zip your program code and demonstration video into a single file.
  - Submit to Blackboard.
- Important reminder: No editing is allowed. You will score ***NO marks*** if the demonstration video is edited.
- Submission deadline: **5 p.m., 17 Jun 2022 (Fri)**

Advices

- Do **NOT** start working on a demonstration **TWO** days before the deadline.
  - You will find that you do not have enough time to finish it.
- It is time consuming to work on each demonstration. Thus, **time management** is very important.

Advices

- In all your demonstration videos, you need to show the label of your car before showing your demonstration.
  - It is very important for you to work out all demonstrations by your car but not your classmate's car.

Summary of Deadlines

Deadline	Tasks
5 pm, 27 May	Lab Exercise Demonstration 1: Robot Car and Ultrasonic Sensor Development (Hardware and Software Development) Demonstration 4A: Ball Hitting (Group)
5 pm, 3 Jun	Demonstration 2: Line Tracking
5 pm, 10 Jun	Demonstration 3: Car Parking
5 pm, 17 Jun	Demonstration 4B: Relay Race (Group) Report and Presentation

Summary of Deadlines

Deadline	Tasks
2 to 4 pm, 30 May, CF504	Test
11:59, Saturday, from 23 May to 17 June	Logbook

End