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# MECH6631 Project Report

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# Abstract

technology

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# Chapter 1

# Introduction

As shown in Figure 1.3, two robots perform a competition in this project. Two robots chase each other and try to hit the opponent with laser, which are controlled via intelligent algorithms. This report mainly introduces the algorithms for image processing and robot control.

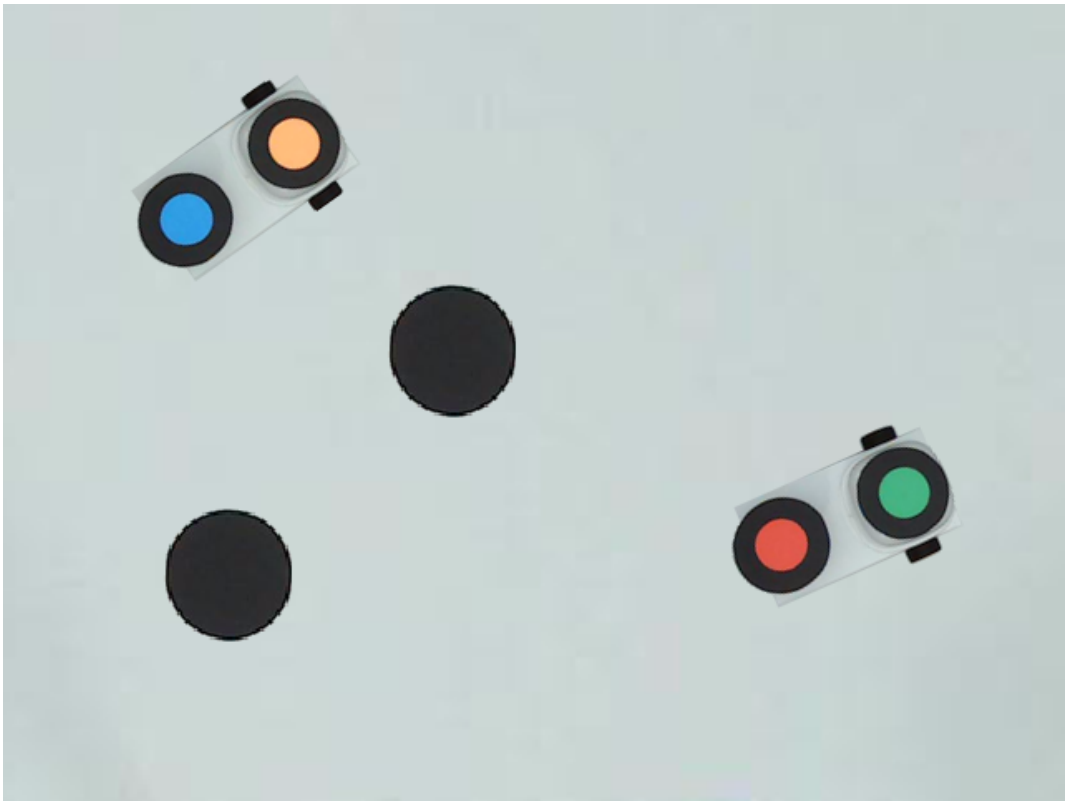

Figure 1.1: Overview of the project.

## 1.1 Modelling of the Robot

There is no wheel slipping,

$$v_r = \omega_r R$$

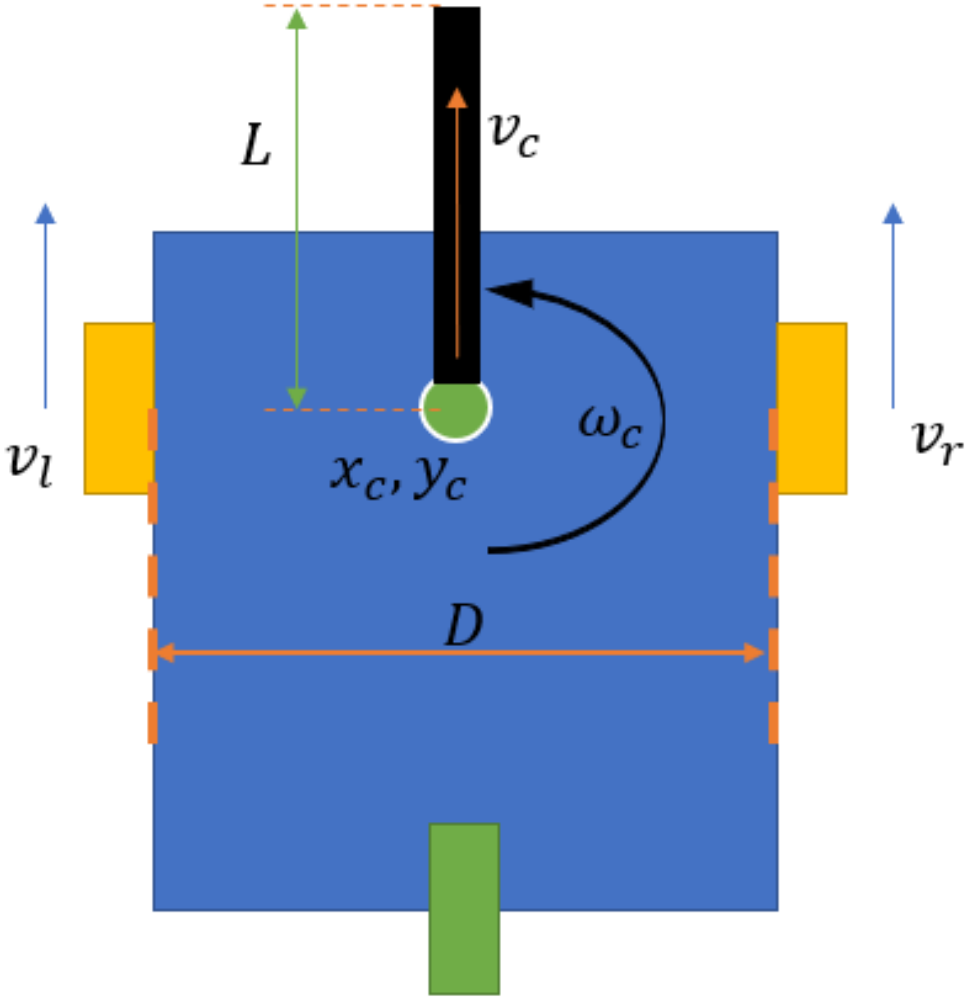


Figure 1.2: vehicle model.

Where $v_r$ is the linear velocity, $R$ is the radius of wheel, and $\omega_r$ is the angular velocity.

$x_c$ and $y_c$ is the coordinate of the vehicle centre. $\theta$ is the direction of vehicle. $D$ is the distance bewteen two wheels. The geometry model of this vehicle is shown below:

$$v_c = (v_r + v_l)/2$$

$$\omega_c = (v_r - v_l)/D$$

$$\dot{\theta}_c = \omega_c = (v_r - v_l)/D$$

## 1.2 Teamwork

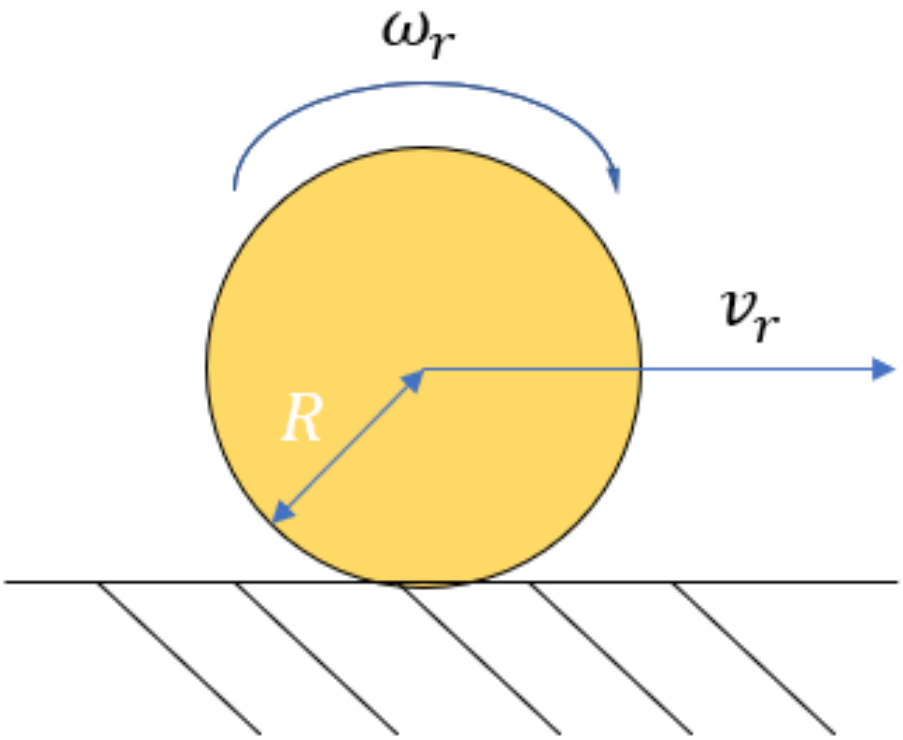


Figure 1.3: wheel model.

| Name | Project Management | Image Processing | Robot Control | Report Writing |
|---|---|---|---|---|
| Qiaomeng Qin | System design | Coding | | Introduction<br>Integration<br>Image Processing |
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| Yuelong Wu | | | | |
| Mario | | | | |

# Chapter 2

# Image Processing

| Colour | Red Value | Green Value | Blue Value |
|---|---|---|---|
| Green(A1) | 67 | 180 | 131 |
| Red(A2) | 226 | 90 | 77 |
| Orange(B1) | 255 | 189 | 124 |
| Blue(B2) | 48 | 158 | 228 |

### 2.0.1 Known Issues

1) The theta of self robot is calculated wrongly some times, since the rear of self robot is not recognized.

2) Once any part of robot move out of the map (as shown in Figure 2.1), the code will report an error that the access error as shown in Figure 2.2. This is the reason that the algorithm is trying to read a memory address is out of the map, which is larger than the coordinates of image. But according to the competition rules, this should be avoided.

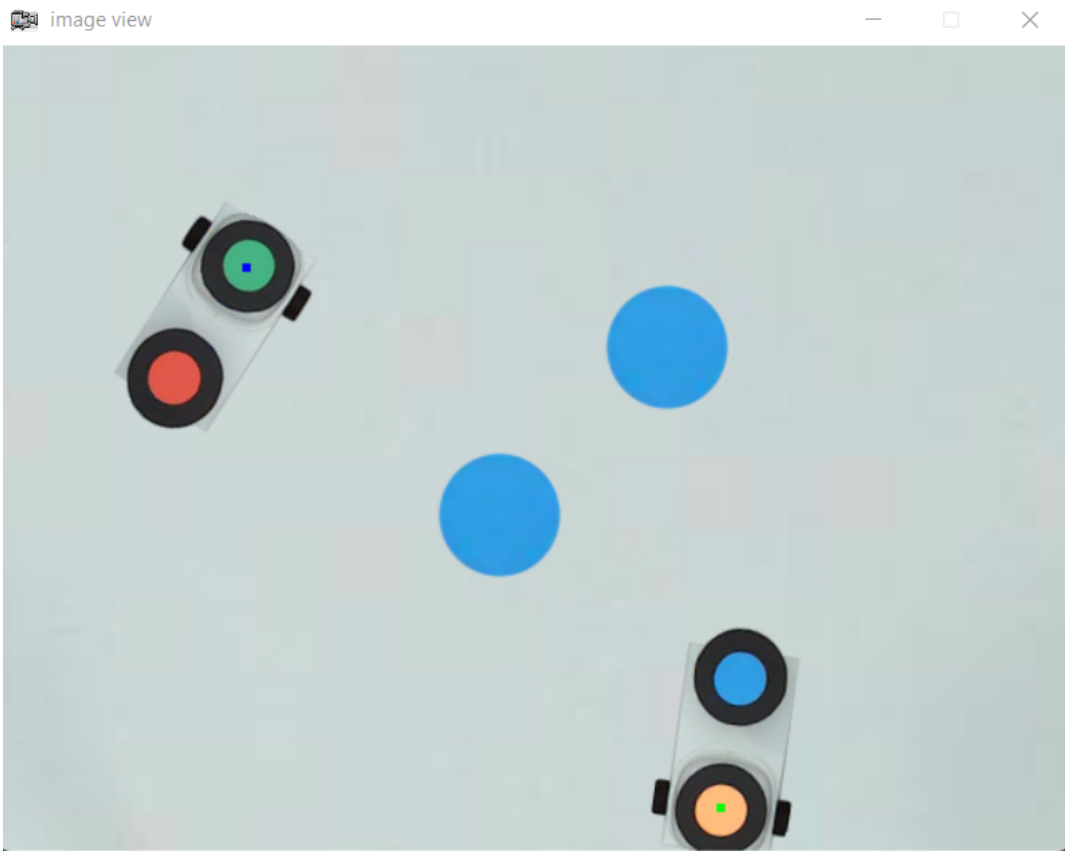


Figure 2.1: an example of positions that will cause the problem.

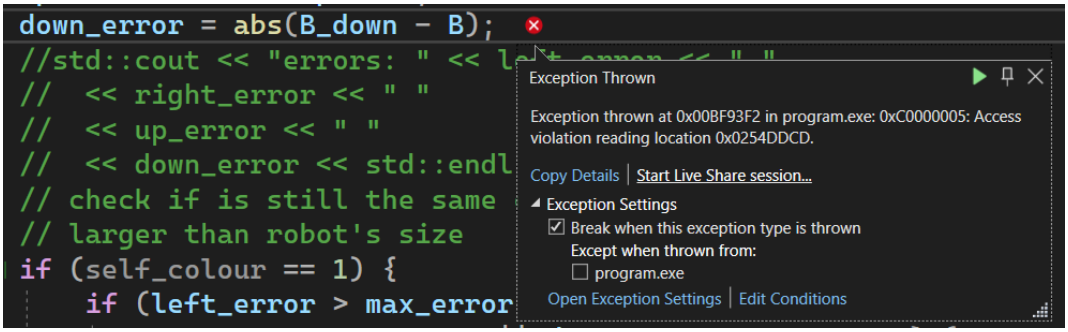


Figure 2.2: access error that happens while at the wrong positions.

# Chapter 3

# Robot Control

# Chapter 4

# Hiding and Attacking Strategies

## 4.1 Hiding

Always hide self robot behind a obstacle and keep two robots and obstacle at a straight line, as shown in figure 4.1:

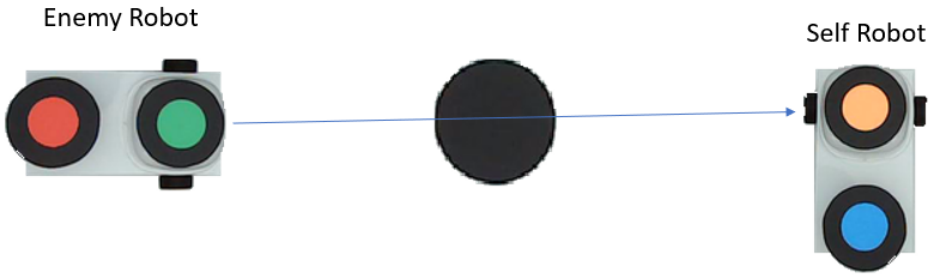


Figure 4.1: an example of positions that satisfies the hiding strategy.

## 4.2 Attacking

Since there is only one chance to fire the laser, it should fire until there is no obstacle between two robots. In order to do so, attacking robot should chase another robot.

Method 1: Move the robot to the position of another robot as soon as possible.

Method 2: Searching the nearest point that is at the straight line with another robot without an obstacle as shown in figure 4.2:

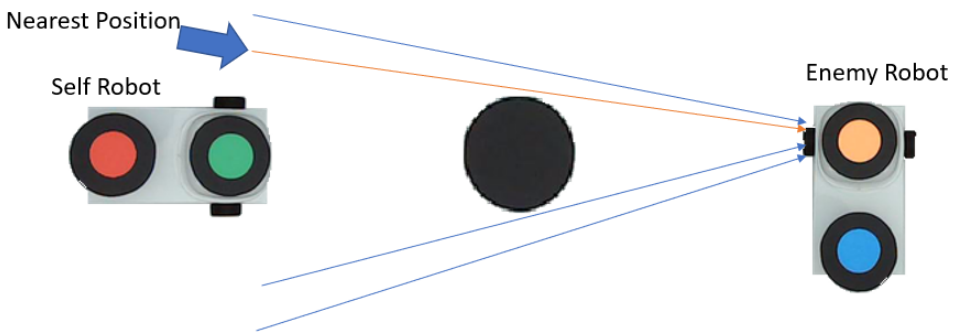


Figure 4.2: an example of positions that satisfies the attacking strategy.