AERONAV 2022

INTRODUCTION

Welcome cadet. We've been informed that for the past few weeks, the Academy has been training you in some important concepts critical to success of this mission. Therefore I'm entrusting you to help our armed forces in this moment of crisis. While traversing through our border roads, the military convoy has come to a halt due to a local, warning them about possible explosives installations up ahead by our enemies. They tell us that the enemy has kept boxes and balls of explosives of various colours on the road which I think is their way of mocking us.

You have been provided with a drone and as you yourself can't go through the explosive covered road, you'll have to autonomously program the drone to fly through and count the number of explosives present on the road. Friendlies have installed QR codes on the other side of the road to help you land. However, we can't let our enemies know the landing location of our drone. Therefore we've devised an equation which you'll use to land on a random QR code. With your help we'll be able to diffuse the threat as quickly as possible without wasting time.

MISSION

What you have to do exactly is to devise a PID controller for the drone and have to use the onboard camera and OpenCV to mask out the explosives containing boxes and balls and note down their numbers. This information would be useful for you in landing on the correct QR code, which you'll again scan using OpenCV.

GAMEPLAY

1. At the beginning of the simulation, your drone must be standing atop the starting platform with its stands in contact with it.
2. You will devise a function on the controller that will take input 2 different RGB values at the start which you'll input on being provided with the colours of our choosing while the drone rests atop the starting platform.
3. Only after manually receiving the 2 RGB values, should the drone take-off from the pad.
4. It would then fly above, below a particular height, following the road.
5. On its path, the drone must use the camera provided underneath it to count the number of balls and boxes having the colours provided at the start (Point 1).
6. After counting all the relevant boxes, you'll have to use the values in solving the equation :-

$$X = | 2 \times RGB1 - RGB2 |$$

Where RGB1 & RGB2 are color values input at the start of the simulation.

7. Finally you have to scan all the QR codes which contains 3 values :- An id and the xy coordinates of the QR.
8. Mission will be accomplished as soon as you land your drone upon the QR with the id same as that of the solution of the Equation (value of X) provided in Point 6.
9. The number of objects of both colors, as well as the correct QR id and position must come up on the WeBots terminal.

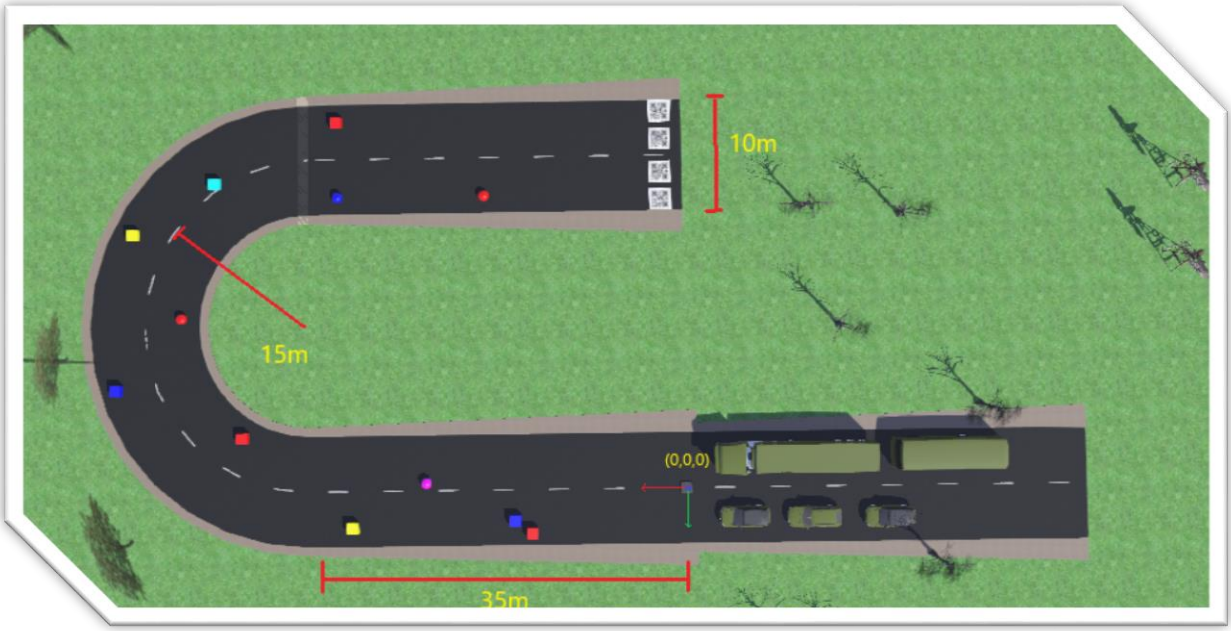

Figure 1:- Arena Specifications

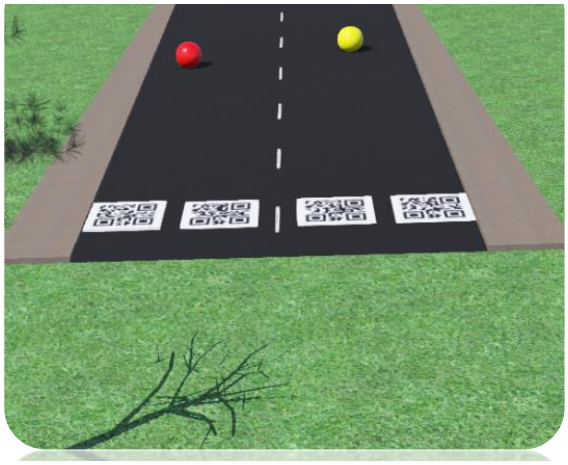

Figure 2:- QR Positioning

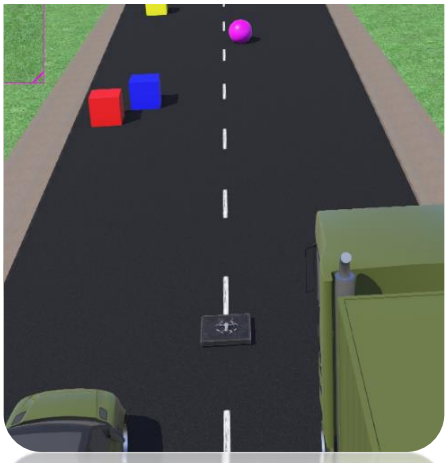

Figure 3:-Starting Platform

RULES

1. The time limit for the completion of the challenge is ***15 min*** during which 3 restarts are allowed. Crossing this limit will incur penalties per restarts.
2. The drone must be autonomous at all times except at the start where you input the RGB values.
3. The drone, at all times, must be directly above the road and should not stray from it. Every time it goes out of the path, you will be penalized.
4. The drone must not fly above a height of ***23 m***.
5. The drone must not collide with the walls, the road or any other object in its path and appropriate points will be deducted in case it does.
6. Bonus points will be given towards the efficiency and creativity of your solution.
7. The exact marking scheme will be disclosed at the time of the event.

BOT SPECIFICATION

1. The bot for the task is DJI Mavic Pro 2. It is a quadcopter developed by DJI, a frequently heard name in drone providers.
2. It has been fitted with 4 sensors including a GPS, a Gyro, an accelerometer and a Camera which you'll be using to complete the task.

DISQUALIFICATION

1. Any kind of plagiarism found in your code will result in disqualification of all the teams whose codes are found similar.
2. Manual interruption after the RGB values have been input will be considered as a cause for disqualification.
3. Any attempt to modify the provided world on your own in order to facilitate the completion of the task will also result in disqualification.

The final submission details will be informed to you in due time however we do advise you to record a video of your solution simulation and keep it with you in case we ask you for it.

The final decision in any kind of deadlock or discrepancies lies with the organizers and the decision will be final and binding to all.