School of Computer Science

CPS 607 – Autonomous Mobile Robotics - Final Exercise
Olympic Rollerball
(Fall 2018-last updated 6 November 2018**)**

Introduction

The year is 2018 in a futuristic society where corporations have replaced countries. A violent game known as,"Rollerball" is the recreational sport of the world, with teams representing various areas[1]. One player, fights for personal freedom and threatens corporate control. Shortly after rollerball was invented the International Olympic Committee (IOC) agreed to make rollerball an official Olympic sport[2]. Olympic Rollerball is played by robots equipped with burning torches. Competitors are viable players as long as their torch is burning.

Concepts

Velodrome

Olympic Rollerball is played in a "velodrome" consisting of a flat track made to form a figure of 8 surrounded by indestructible walls on the perimeters of the 8.

Figure 1 Olympic Rollerball Velodrome

Full Jam

A round of play in rollerball is called a "jam". During a jam, two opposing players start motionless at their respective ends. After a horn is sounded, a magnetic ball is dropped somewhere onto the track and the players are allowed to move. The aim of each robot is to find the ball, and move it to the goal in order that the ball makes contact with the goal and sticks. The goal of the robot is also to stop the opposing robot from scoring a point. Once a point is scored, the horn is again sounded marking the end of the jam at which time the robots are returned to their start positions, repairs can be made, and a new jam can begin. During play, the ball, goals and robots must remain in plain sight to all players.

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[1] See: https://vimeo.com/160649196

[2] Six former members of the International Olympic Committee have been accused of receiving bribes in exchange for votes in the awarding of sports events. The allegations have emerged from an on-going investigation into accusations surrounding the awarding of flagship athletics events, such as the world athletics championships (not Rollerball) to major cities across the globe. See: https://www.independent.co.uk/sport/general/athletics/ioc-members-bribes-accused-votes-olympics-a7623691.html

Half Jam

A half jam is a version of a full jam where a robot can attempt to score a goal without a competitor present in the velodrome.

Game Ball

The ball used in Olympic Rollerball is a steel ball bearing 1 inch in diameter. The game ball is placed in an arbitrary location at the start of a full or half jam.

Figure 2 Plain Steel Ball Bearing

Goal

A goal is scored when the robot brings the game ball to the goal and stops. If the robot brings the ball to the goal but fails to stop, the goal will not be counted. The goal is attributed to the robot that touched the game ball last. The actual goal will be marked with black electrical tape covering an area of 3" x 3".

Figure 3 Goal

Torch

A torch is made of a tea light candle defined as a small, squat candle in a metal case, normally used for decoration or within a stand to keep food or drink warm. Tea lights have the approximate dimensions of 1.5" x 0.75". A normal tea light candle will burn for approximately 4 hours. In Olympic Rollerball, a competitor's torch must be carried at their rear, on a flat platform, one inch above the travelling surface measured from the base of the candle to the surface. A competitor's torch shall not be shielded or obscured from view. The flame of a torch must be maintained by its fuel source only.

Figure 4 Tea Light Torch

Line

Lines are made of black tape affixed to the floor leading to the goal. The configuration of the lines cannot be predetermined.

Figure 5 Tape Line

Starting Point

There are two starting points in a velodrome where competitors begin jams. The starting points are at the far ends of the velodrome and are marked by an "X".
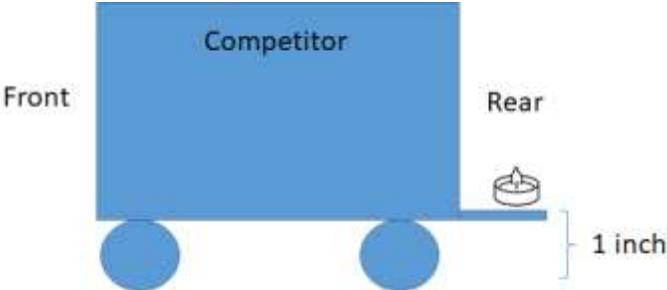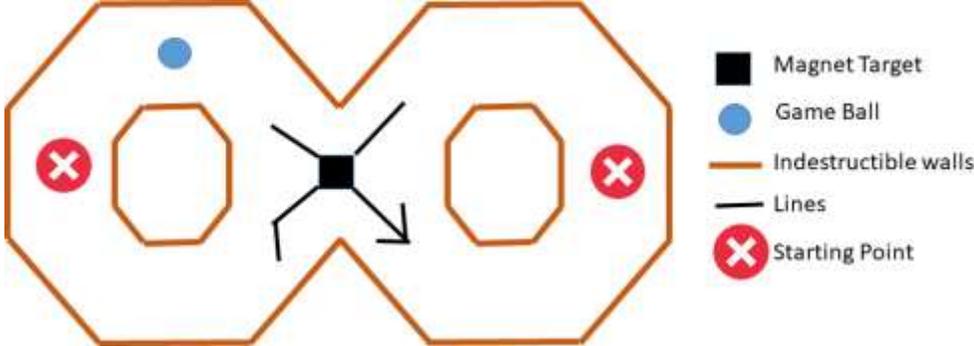

Figure 6 Starting Point Marker

Configurations

Competitor

For illustration purposes, the figure below is a correctly configured competitor with respect to placement of its torch. NB: the robot need not look like the one in the figure.

Figure 7 Correctly Configured Competitor

Empty Track

Figure 8 Track With No Competitors

Required

- Working in groups of 2 or 3, students are to create AMRs that are capable of playing Olympic Rollerball in half jam and full jam settings.
- Prior to the commencement of the exercise, each group must present the TA with a printed, 1 page description of their robot, a description of their strategy for successfully completing the exercise and the names and student numbers of the group members and the name of their AMR. (Diagrams and photos welcome).
- Each group must have their robot participate in at least 1 half jam and at least 1 full jam.

Restrictions

Group members should not touch their robot while it is being tested in the velodrome. AMRs cannot exceed the dimensions of a cube with 12" sides. Robot cannot damage the velodrome or competitor's robots. Groups can attempt the test 3 times.

Scoring

The exercise will be marked out of 20 marks. Marks are cumulative (marks from half jam and full jam added together to form final mark). Marking will cease once the maximum mark is achieved.

Marks will be allocated as follows:

Marks available	Description	Notes
2	8.5" in x 11" printed sheet with the title "`CPS697 Fall 2017 Final Exercise`" and all the additional information requested in the "Required" section of this document.	
2	Submit an edited video file named "`CPS607FinalEx<robotname>.mov`" no longer than 1 minute showing the performance of their AMR.	
2	Find Game Ball	Ball is considered "found" when it is under the control of the competitor
2	Line followed	Awarded only once per full jam or half jam
2	Move Ball to Goal	Move game ball under control (need not result in a goal scored)
5	Goal scored	Half jam
10	Goal scored	Full jam
5	Stop competitor from scoring a goal	Full jam
-10	Competitor permanently damages velodrome or competitor's robot	
-2	Student touches their AMR once it begins a run	Per instance