

# CPS607 mid-term test

Fall 2018

## Instructions

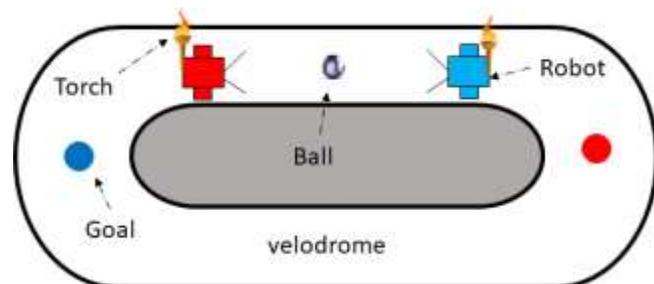
1. This is a take-home test. It is due at the start of class on **24 October 2018**.
2. You can consult with whatever and whoever you like but the document you produce, fulfilling the requirements of this test, must be your own work.
3. You must place your full name and student number on every page you hand in.
4. **Undergraduate** students will answer the question labelled, "For Undergraduate Students: Olympic Rollerball". Answer must be  $\leq 2$  pages of text. Ignore item 5 in this list.
5. **Graduate** students will answer the question labelled, "For Graduate Students: Natural Autonomous Systems Literature Review". Answer must be  $\leq 10$  pages of text, citing  $\geq 25$  sources in APA format<sup>1</sup>. Ignore item 4 in this list.
6. Written work must be word processed in an 11 point font or larger pre-checked for grammar and spelling errors.
7. Pages must be stabled together.
8. Diagrams may be used and do not count against the maximum page count.
9. The test will be marked out of 10. This means you had better have at least 10 useful ideas to explain in sufficient detail so that someone could understand and critique your answer.

## For Undergraduate Students: Olympic Rollerball

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<sup>2</sup>. One player, fights for personal freedom and threatens corporate control.

Rollerball is played in a "velodrome" consisting of an oval flat track surrounded by a barrier on both the inner and outer perimeters. Magnetic goals are placed at either end of the oval, marked by red LEDs on one goal, and blue LEDs on the other. A round

of play is called a "jam". During a jam, two opposing players start at their respective goals moving around the track in opposite directions. After a horn is sounded, a magnetic ball is dropped somewhere onto the track. The aim of each robot is to find the ball, and move it to the opposing player's goal in order that the ball make contact with the goal and stick. A point is awarded when this occurs. The goal of the opposing robot is to stop the opposing robot from scoring a point. Once a point is scored or the ball is lost, the horn is sounded marking the end of the jam at which



<sup>1</sup> See: <http://learn.library.ryerson.ca/citationhelp/apa>

<sup>2</sup> See: <https://vimeo.com/160649196>

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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.

A variation of this sport is called “Olympic Rollerball”. In Olympic Rollerball each player carries a torch. If the torch goes out, the player is disqualified from continuing a jam until the torch can be relit at the end of the jam. The torch must remain in plain sight and unshielded during a jam.

Describe a robot that you can actually build that would be an effective player in Olympic Rollerball. Make reference to strategies of how the robot: finds, carries and drops the ball, finds the goal, stops a robot from scoring a goal.

### **For Graduate Students: Natural Autonomous Systems Literature Review**

Biomimetic refers to human-made processes, substances, devices, or systems that imitate nature. The art of designing and building biomimetic systems is also known as biomimicry because they mimic biological systems. A lesser studied area is that of using natural systems to perform autonomous tasks that humans find useful. For example, specially trained dogs are used to perform many tasks that have no better machine solution (searching for trapped people in rubble, for example). In your literature review, cite and briefly describe natural systems that are used to perform tasks that we find useful and have no man-made replacements. In your review, analyze the types of autonomous functions that natural systems perform and discuss the challenges faced by human-made systems that seek to replace them.

