

# CPS607 mid-term test

Fall 2017

## Instructions

- This is a take-home test. It is due at the start of class on **25 October 2017**.
- 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.
- You must place your full name and student number on every page you hand in.
- You may not hand in any more than 2 pages of writing.
- Written work must be in an 11 point font or greater.
- Writing must be word processed and corrected for English grammar and spelling.
- Pages must be stabled together.
- Diagrams may be used and do not count against the maximum page count.
- The test will be marked out of 10. This means you had better have at least 10 useful points to say about how you would resolve the problem in sufficient detail so that someone could actually implement the solution you propose.

## Drunk Autonomous Roaming Puppy Acquisition (DARPA)--Challenge

Because you are an excellent student you have been awarded the valuable and extremely rare “Puppy Prize” being stored at a secure location in Challenge, Ontario. The puppy is being tended by a secure and very reliable system that will use facial recognition to recognize you when you come to pick up the puppy somewhere on a vacant lot in the city.



*Figure 1 Your Rare and Valuable Puppy Prize*

You immediately grab an Uber to Challenge. However, before you collect your prize you are in the mood to celebrate and ask the driver to drop you off at a pub in Challenge. Just as the Uber drives off you realize you have left your phone in the car. Oh well, time to celebrate!

It is now hours later and your mental faculties are befuddled. Your long-range vision is really impaired as is your spatial reasoning.



*Figure 2 Your Current State in the Pub*

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You realize that you had better go find your puppy. It is late at night and most of the residents of Challenge have gone home and turned off their lights. You realize at this point that you were never given the puppy’s location.

As you leave the pub, you reach into your pocket. The only thing in your pocket is a flashlight. As you look outside, it seems very dark. From the light coming from your flashlight (which provides a weak light only illuminating 1 or 2 buildings where it is pointed), there are people walking about the street. You make a mental note to avoid bumping into them. It seems like all the buildings in the city look alike. As you enter the street, you see a distant flickering gas light. The street has a few pedestrians on it, but no one can understand you as they only speak “Challenge”.

Fortunately, you know a few things about Challenge. The city is a very old European garrison-style town with regular streets laid out in a grid pattern. The entire city is surrounded by a wall with solid steel gates providing access during daylight hours. Buildings exist on lots on street “blocks” similar to the image below. Each street supports 2-way pedestrian traffic. Blocks are separated by streets that meet perpendicularly at intersections. To create a better living environment, Challenge’s City Council passed a bylaw banning vehicular traffic within the city. Before this ban, streets were provided with two-way traffic lanes separated by painted lines. Each intersection is lit by an open gas light that is lit at dusk and blown out at dawn.



Figure 3 Example Challenge City Block Showing Streets, Sample Puppy and Start Locations, Streets and Gas Lights (Image for illustrative purposes only).

How will you go about finding the puppy while dealing with the facts that there are wandering people, you don’t know the exact location of the puppy, it’s too dark to see very far, you cannot ask anyone, you have no access to modern information technology and you are impaired?