Quiz 0
COMP 417
January 5, 2017

Instructions:
This quiz is not for marks, but to help us get to know you and to understand your skills and background. You do not need to write your name or your student number if you don't want to. The knowledge items are NOT required to do well in the course since each will be taught during the term. It's always OK to say "I don't know", but please do try your best to answer.

Part 1: Questions about your preferences and goals

1) What is your major and which year are you in your undergraduate studies?

2) Which classes are you taking this semester? Please enter approximate titles, not course numbers.

3) What programming languages do you have practical experience with, and to what comfort level? Place a star next to your favorite language.

4) In your opinion (if you have one), what are the most interesting robots that exist today?

5) Why are you taking this class? What do you hope to learn from it?

6) What is the final mark you are going to try to get?

7) Are you planning to do your assignments on the Trottier machines?

8) If not, what is roughly the CPU model of your laptop/desktop (e.g. i3, i5, i7)? Also, are you comfortable using a Linux distribution (e.g. Ubuntu) on your machine? Note: The Gazebo 3D simulator runs best on an i5 or i7 CPU, particularly if you have a discrete GPU. So, if you do not have access to such a machine, or if you cannot install Ubuntu on it, we'll need to know early on in the semester to find a solution.

Part 2: Background Knowledge

For each of the following concepts, estimate your level of knowledge and comfort in the range 0-5 where: 0 means you have never heard the word before, 5 means you'd be happy to answer a final exam question on it tomorrow and intermediate numbers are linearly scaled between the two. Again, the purpose of this quiz is for us to get to know better what your background needs are and how to best address them.
Core Computer Science:
1) Loops, conditionals, classes, modularity
2) Data structures: lists, queues, stacks, hash maps/dictionaries, trees, graphs
3) Threads, callbacks, remote procedure calls, serialization
4) Breadth-first and depth-first search

Linear Algebra:
1) Dot product
2) Cross product
3) Matrix multiplication
4) Matrix inversion
5) Determinant
6) Gaussian elimination

7) QR decomposition
8) Cholesky decomposition
9) Singular Value Decomposition (SVD)
10) Least squares

Probability:
1) Probability density functions in 1D
2) Probability density functions in higher dimensions
3) Cumulative density functions in 1D
4) Cumulative density functions in higher dimensions
5) Expected value of a random variable
6) Variance of a random variable
7) Covariance and correlation of two random variables
8) Independence of two random variables
9) Conditional probability
10) Bayes' rule
11) Maximum likelihood estimation

Calculus/Numerical Optimization:
1) Single-variable derivative
2) Gradient
3) Jacobian matrix
4) Hessian matrix
5) Taylor approximation
6) Finding local minima/maxima
7) Saddle points
8) Gradient descent/ascent

Part 3: Tutorials

We are planning to offer a few tutorials this semester to teach you how to robustly translate into code some of the concepts presented in class. These tutorials are going to be completely optional and the material presented in them will NOT appear on any exam. For each of the following tutorial topics, enter a number from 0 to 2 where: 0 means you are not interested in attending this tutorial, 1 means you have no opinion on it or not enough information to decide, and 2 means you are going to try your best to attend.

1) Intro to the Robot Operating System (ROS)

2) Refresher on linear algebra and least squares

3) Refresher on basic probability and continuous distributions

4) How to align 3D pointclouds (e.g. from lasers). Demo of the PCL library.

5) How to implement a Kalman Filter

6) How to implement a Particle Filter

7) Intro to the OpenCV library: how to do tracking and triangulation.

8) How to fit samples from a (complex) function using a set of (simple) basis functions.

If there is a topic you would like these tutorials to cover that is not included in the list above, feel free to mention it here: