

CS 444 - Quiz 4 Review Suggestions - Spring 2015

last modified: 2015-04-28

- You are responsible for material covered in class sessions and individual assignments; but, here's a quick overview of especially important material related to this upcoming quiz.
- You are permitted to bring into the quiz a single piece of paper (8.5" by 11") on which you have **handwritten** whatever you wish on one or both sides. This paper must include your name, it must be handwritten by you, and it will **not** be returned.
 - Other than this piece of paper, the quiz is closed-note, closed-book, and closed-computer.
- This is a quiz on material since Behavior-based robotics, up to and including balancing.
 - You are expected to still follow Java conventions and class coding standards in your quiz answers.

course text - Chapter 9 - Building 101

- what is meant by a Lego design pattern?
- what is a caster wheel? what property does a caster wheel have? when might a caster wheel be useful on a robot? what placement of caster wheels on a robot helps caster wheels to work best?
- what are some common design goals, common desired properties? what are some means for attaining these goals or properties?
- be familiar with the general design advice in this chapter -- for example,
 - define functionality - determine the primary function of your robot-to-be and focus on that
 - start with the requirements and design around them
 - before making the design beautiful, make it work
 - use as few parts as possible -- optimize your design to use as few pieces as possible without compromising the essential features of your robot
 - the trade-off with speed is power -- since the specifications of the Lego NXT motors are the same, you can have speed or power, but not necessarily both
- why are two-wheeled robots one of the common "platforms" in robotics? what are often used with these to help maintain balance?
 - for a two-drive-wheeled robot with a caster wheel, where should you center the mass of your robot, for stability?

course text - Chapter 18 - walking - shambler/Crawler.java

- what are some rules-of-thumb for robot stability?
 - (e.g., top-heavy vs. bottom-heavy? taller vs. shorter? likelihood to tip over during high acceleration vs. low acceleration? mass centered over the robot's base vs. centered elsewhere?)
- what is the center of gravity/center of mass?
- to maintain a robot's stability, you must keep its center of gravity within the center of a polygon defined by

what?

- what are some of the challenges of making a walking robot in general? what are some of the challenges of making a walking robot when one has motors that provide circular motion?
- (if we'd had the right pieces...) how is the shambler robot supposed to be able to change its direction?

robot control

- what is an example of simple control? what are some problems/issues/limitations of simple control?
- how does feedback control seek to improve on simple control?
- what is a control loop?
- what is a PID controller? What does PID stand for?
 - what, basically, are the three parts of the PID control algorithm?
 - what, basically, does the PID control algorithm seek to do?
- what were the trends discussed in robotic control in the 1960s/1970s? 1980s? the two branches since the 1990s?
- what are some classes of robot control architectures? how can each, basically, be characterized?

balancing a robot - NXTway/Sejway

- what is meant by dynamic balance?
- what type of sensor does the NXTway robot use for helping it to maintain its balance?
- what kind of control loop does the Sejway program use with that sensor to try to maintain the NXTway robot's balance?