

MCE/EEC 647/747
Homework 1 - Spring 2015
Part I due 1/20/15

1. Read chapter 1 of SHV and chapter 1 of the Robotics and Automation Handbook (link to material provided in class)
2. Select any field of application that you find interesting (space exploration, medical, industrial, etc.). Then search for an applications-oriented article on robotics from one of the journals available through the CSU Library's Journal Finder, for example:
 - Robotica
 - IEEE Transactions on Robotics
 - International Journal of Robotics Research

Feel free to use other literature sources, but the article must be from a technical journal (no magazines or online materials).

Write a 2-page (max) summary of the article focusing on the purpose of the robot/system described, the author's objectives, methodology and results. Attach a copy of the article.

Answer the following questions on the basis of chapter 1 of the Robotics and Automation Handbook:

- What was the first practical industrial application of the Unimate robot?
- According to the article, which robot was the first to incorporate force sensing capabilities to develop a sense of touch?
- Isaac Asimov postulated his famous laws of robotics¹ and then created fictional stories where robots could behave in strange ways as a consequence of obeying these laws.

Suppose a man is about to commit suicide by throwing himself under a bus. A humanoid robot is nearby and has detected the human's intentions. The robot has enough speed and force to hold the person before he jumps. The human realizes that the robot is about to intervene and gives it the order to walk away. Meanwhile, the robot has located the man in its database and determined that he is one of the scientists who built the robot. If coming in close contact to the robot, the scientist can press its self-destruct button, which will result in a powerful explosion killing anyone near. The robot is aware of this. If the robot has been programmed to obey the four laws, what will it do next?

¹Note that a "higher order law" means a lower-numbered law. So the zeroth law has higher order than the rest, the first law has a higher order than the second and third, and so on

Part II due: 1/27/15

Read chapter 2 of *Linear Algebra and Its Applications* by Strang, de-emphasizing or skipping sections 2.2, 2.4 and 2.5. Then solve the following problems:

- Set 2.1, ex. 3 (p. 82)
- Set 2.1, ex. 9 (p. 84)
- Set 2.3, ex. 13 (p. 111)
- (Doctoral students only) Set 2.3, ex. 2.8 (p. 113)
- Set 2.6, ex. 2 (p. 149)
- Set 2.6, ex. 6 (p. 149)
- Set 2.6, ex. 36 (p. 152)
- Review set, ex. 1.23 (p. 157)

A randomly-selected subset of problems will be graded.