Homework 5: Chapter 8 and 9

DUE: Monday, Nov 1, start of class.

1. Consider the list of five proposed requisites for life on p. 116. What is one additional requisite that would be on your list defining "life", and why? Write one or two paragraphs arguing either than computers can or cannot fulfill this requisite.

2. Consider the short video we watched in class of roboticist Hod Lipson's talk at the TED (Technology, Entertainment, Design) conference: (http://www.ted.com/talks/lang/eng/hod_lipson_builds_self_aware_robots.html). Write a paragraph giving your view on how the robots he shows demonstrate (or don't demonstrate) any of the requisites for "life" discussed in the textbook, p. 116.

3. The textbook states that before von Neumann developed his theory of self-reproducing automata, some people believed that it would be impossible for a machine to reproduce itself; they believed that for a machine to make a copy of itself it would need to contain a description of itself. However, the description, being part of the original machine, would also need to be copied, so there would need to be a description of the description, and so on, leading to an infinite regress. Explain in one paragraph how the self-copying program described in the book gets around this dilemma.

4. As described in the book and in class, Robby the Robot's strategies are represented as strings of 243 numbers (each between 0 and 6), where each number corresponds to the action Robby would take in the corresponding situation
    a. . Explain where the number 243 came from.
    b. Give examples of two situations that are counted in the 243 situations, but that Robby would never actually encounter in the 10x10 world.

5. Suppose we added memory to Robby's abilities. That is, suppose that in addition to the abilities described in the book, at each step Robby was able to remember the contents of the N, S, E, W, and his own square from the previous time step, and to use this memory in his strategy. Describe what changes you would need to make in the "string-of-numbers" representation for Robby's strategies. How long would the string of numbers representing a strategy need to be in this case?