ELEC96005 Artificial Intelligence – Tutorial 2 – Search

1. You are given two beer glasses. You are told that one holds 7 pints and the other holds 5 pints, but there are no measuring markers on either of them. There is a beer pump that can be used to fill the glasses. You are asked to get exactly 4 pints of beer into the 7-pint glass.

   Formulate the search space in Prolog or other declarative notation, so that it could be used with the Prolog General Graph Search Program (GGS) discussed in the lectures and lecture notes. Indicate for each state-change rule, what action it represents in the 'real' world.

2. The *ISN System* utilises three letters of the alphabet, I, S and N. Sequences of the ISN System are composed of just these three characters. There are four rules for generating a new sequence from an old one. Letting x and y stand for arbitrary sequences of I, S and N, these four rules are:
   (1) From xS, generate xSN
   (2) From Ix, generate Ixx
   (3) From xSSSy, generate xNy
   (4) From xNNy, generate xy

   The problem is to show that from the sequence IS, the ISN-System can generate, by one or more application of the rules, the sequence IN.

   Formulate the search space of the ISN System in Prolog or other declarative notation, so that it could be used with the GGS program.

3. You are given 7 balls. They are identical in size, shape, colour and texture, but you are told that one is slightly heavier than the others.

   You are also given a weighing machine with two pans. There is a button and a display on the machine. When the button is pressed, the display will indicate which of the pans is heavier, or if they are of the same weight. However, you are told that you can only press the button twice before the weighing machine self-destructs.

   Formulate the search space for this problem in Prolog or other declarative notation, so that it could be used with the GGS program.

4. The river Pregel divides the town of Konigsberg into four separate land masses, W, X, Y, and Z. Seven bridges connect the various parts of town, and some of the town's curious citizens wondered if it were possible to take a journey across all seven bridges without having to cross any bridge more than once.

Formulate the state space in Prolog or other declarative notation so that it can be used with the GGS program. How would you show that it is not possible to solve this problem (before Euler managed it).