Assignment 1, Constraint Satisfaction For Decision Making (CE884-7-SP), 2012-13
Set by Edward Tsang, University of Essex

1. Introduction:

This is an assignment on problem formulation. This assignment accounts for 10% of your total marks in this course. This assignment should be submitted electronically. The deadline of this assignment is ***15:59:59, Friday 22 February 2013***.

2. Objective:

The objective of this assignment is to test your ability to formulate a constraint satisfaction problem.

3. The Project Selection Problem:

In some business projects, such as telecom projects, an initial investment is made in the first year. Income will grow over the subsequent years (see Project choices 1 and 2 in the following table). In other projects, such as construction projects, investments have to be made in the first few years before the income arrives on completion (see Project choices 3 and 4 below). For simplicity (without loss of generality), we can assume that the profit is the total net cash inflow by the end of the all years. So if all four projects were taken on, profit would be 1,209,782.

Given a fixed budget, an investor has to pick the projects carefully. Profitability is important, but cash flow constraints must be satisfied given the budget. For example, if one's budget is 2,000,000, one may only take on a subset of the four projects, because the cash demand for all projects in the first year is over 2,000,000.

Project choices	Year 1	Year 2	Year 3	Year 4
1	-840,139	218,436	321,101	484,863
2	-1,354,776	406,433	593,392	789,211
3	-422,806	-483,598	-366,261	1,603,558
4	-292,582	-249,558	-325,754	1,128,262
Net cash flow per year	-2,910,303	-108,287	222,478	4,005,894
Overall net cash flow (profit)				1,209,782

4. Your task:

The attached Excel file contains a spreadsheet called Portfolio10, which contains 10 projects. Your task is to formulate the problem in this spreadsheet as a constraint satisfaction. You must clearly state the variables, domains and constraints. You must also provide a function using the variables you define to express the profit (which is to be maximised). What is the size of your search space?

5. Submission requirements:

Submit a report explaining how the above problem can be formulated as a constraint satisfaction problem. The report must be within 500 words. There is NO NEED to solve the problem in this Assignment.

6. Assessment criteria for this assignment:

The most important criteria for assessment are correctness and clarity. Correctness in formulation is the main criteria for evaluating your report. It is essential that you explain your formulation clearly, to enable the marker to understand whether your answers are correct.

7. Notes:

- You may be asked to defend your submission in an interview.
- Please refer to the Student's handbook on the School's Policy on Plagiarism and Late Submission