50.021 – AI

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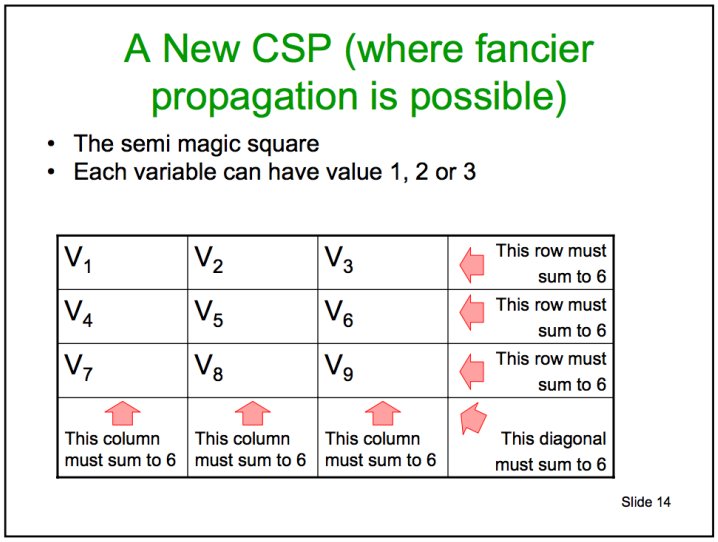
Week 3 Coding - Constraint Satisfaction Problems

Due: 16th June, 11:59pm
Submission: via eDimension

1 Coding: Semi-Magic Square

Consider a 3×3 array, each of whose entries can be either 1, 2 or 3. We want to find an assignment to each of the entries so that the entries in each row, in each column and in one of the diagonals are different. Note that this will also ensure that these row, colum and diagonals add up to 6 $(1+2+3)$. But, note that the "adding to 6" constraint is not a "binary constraint", that is, it involves more than three variables. However, the constraint that each pair of values in the row, column or diagonal be different is a "binary constraint".

You can find a description of the Semi-Magic Square problem in the attached slides (constraint05.pdf), in particular in Slide 14 (reproduced here).



Your tasks are as follows:

1. Implement a CSP that captures this problem. Use the file `semi-magic.py` in the code distribution. It also imports csp.py. You should use the variable names in the image above in your CSP formulation.

2. Experiment solving this problem with the various solution methods, ranging from pure backtracking and its various enhancements/heuristics such as variable and value orderings, forward checking, etc.

3. Look at the number of assignments attempted by each algorithm, that should give you some idea of the effectiveness of the methods on this problem. Elaborate on your findings from these results, i.e., what you understand.