COMP417 Artificial Intelligence
Term Project - Progress Report
Local and Constraint Satisfaction Search Algorithms for N-Queens Problem

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1 Introduction

The n-queens problem, a combinatorial search problem, concerns the non-attacking placement of n queens on a $n \times n$ chessboard. The n-queens and similar Constraint Satisfaction Problems (CSPs) are classical examples of the limitations of simple backtracking search, with an exponential worst case performance that renders solving for large n impractical [1, 2]. Although many efficient heuristics have already been proposed for this problem [3–7], it still is a popular test bed for new Artificial Intelligence (AI) search problem methods. Whilst a toy problem per se, it has found some practical applications such as VLSI routing and testing, data compression, maximum full range communication and parallel optical computing [3, 4].

This problem has (at least) two variants depending on the desired number of solutions. A single solution can actually be found trivially without search, since explicit solutions exist $\forall\ n \geq 4$ [8]. On the other hand, finding all possible solutions is non-trivial. In this project we will focus on the former variant, implementing and comparing the performance of two different search algorithms: a local search algorithm, and a constraint satisfaction method. We will first describe the problem mathematically and define the performance indicators for our comparison. In Section 3 we will describe the implemented algorithms, and we will subsequently illustrate and discuss their performance.

2 Problem Formulation

2.1 Mathematical Model

2.2 Performance Indicators

3 Methods

3.1 Min-Conflicts Algorithm

3.2 Forward Checking with Most Restricted Value Algorithm

4 Results

5 Conclusions

References

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