The n-Distinguishable-Queens Problem, an Extension of a Classical AI Problem

Endre Fülöp

The n-queens problem is to place n indistinguishable objects (queens) on an n*n grid (chess board) so that no two objects are placed on the same row, the same column, or the same diagonal. Since this classical combinatorial problem has a simple and regular structure, it has been traditionally used as a test-bed to develop and benchmark new AI search problem solving strategies. In this paper we present an extension of the classical n-queens problem. We provide the queens with different personality, i.e. individual wishes to be placed on particular parts of the chess board. (For instance Queen No. n may prefer the black squares against the white ones.) So the solutions of the original problem will not have an uniform goodness. One implements the queenly desires better than the other. The new problem is to find the best of all solutions of the original n-queens problem, the solution, which satisfies the wishes as far as possible. To solve this extended constraint satisfaction problem we present an algorithm based on effective probabilistic local search strategies published in recent years by R. Sosic and J. Gu and we also describe a practical, engineering application where this model and algorithm can be used successfully (scheduling of university lectures and rooms).