FAI lecture 5 constraint satisfaction problems

constraint satisfaction problems

a special subset of search problems;

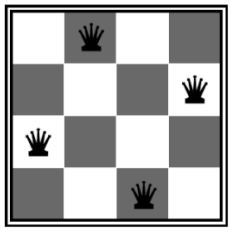
Search state is defined by variables X_i and a domain D

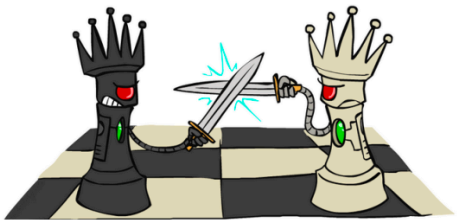
goal test is a set of constraints

- N-Queens problem

Example: N-Queens

- Formulation 1:
  - Variables: X_{ij}
  - Domains: $\{0, 1\}$
  - Constraints:





$$\forall i,j,k \quad (X_{ij}, X_{ik}) \in \{(0,0),(0,1),(1,0)\}$$
$$\forall i,j,k \quad (X_{ij}, X_{kj}) \in \{(0,0),(0,1),(1,0)\}$$
$$\forall i,j,k \quad (X_{ij}, X_{i+k,j+k}) \in \{(0,0),(0,1),(1,0)\}$$
$$\forall i,j,k \quad (X_{ij}, X_{i+k,j-k}) \in \{(0,0),(0,1),(1,0)\}$$

$$\sum_{i,j} X_{ij} = N$$

constraint graphs

- Binary CSP: each constraint relates at most two variables
- Binary constraint graph

backtracking search

- consider only one variable in every search node
- Check constraints as you go

forward cheking (filtering)