Previous class

Sudoku
CSP Constraint satisfaction problems

\[ \sqrt{\text{I}} \] I love Math

n 4 3

map coloring as a search problem

\( V = \{ \text{WA, NT, Q, NSW} \} \)
\( \sqrt{SA, T} \)

domains: \{3, 4, 5, 6\}

n variables

\( \text{d values in each domain (max assignment)} \)

I state

\( \text{WA} = 3 \) ?
\( \text{NT} = 3 \) ?
\( \text{Q} = 3 \) ?
\( \text{NSW} = 3 \) ?
\( \text{SA} = 3 \) ?
\( \text{T} = 3 \) ?

goal: every variable has an assignment that doesn't violate the constraints

(no mention of preferences)
\( \text{state:} \quad \begin{array}{c}
\text{WA} = 3r^2 \\
\text{NT} = 3r^2
\end{array} \quad \begin{array}{c}
\text{WA} = 3g^2 \\
\text{NT} = 3g^2
\end{array} \quad \begin{array}{c}
\text{WA} = 3b^2 \\
\text{NT} = 3b^2
\end{array} \)

at every level we make one assignment

pick a variable
Could we pick a value to assign rather than a variable to be assigned values?

Perhaps

b: d

How many solutions are possible with $n$ variables and $d$ values in each domain?

$\binom{d \times d \times \ldots \times d}{n}$

combinatorics
2^{100} \text{ nd } 2^{1000} \text{ grows exponentially with the size of the number.}

BFS or DFS?

Optimality

Heuristics

Fewer values to choose from

Diagram showing a tree structure with nodes and edges.
1. Choose the most constrained variable

2. Tie breaker: most constraining variable

\[ V_m = \frac{1}{2} \]

- \( V_a \) - least constrained value
- \( V_b \) - most constrained value