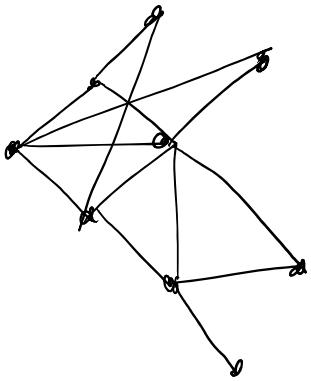
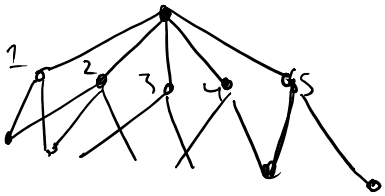
S. KIMMEL

Graph Search



- Web crawlers
- Maps
- Decision

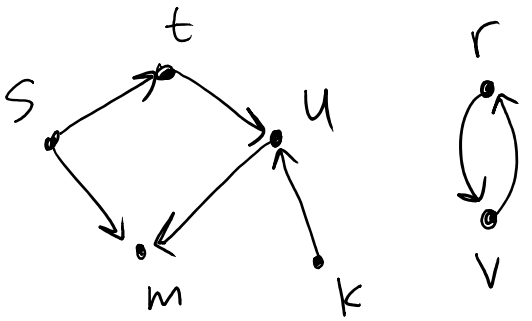
Sudoku



- Filled correctly

Desired Properties

1. Finds all nodes reachable from starting node
2. Efficient (doesn't explore same node over and over)



Q: Which nodes are reachable from s?

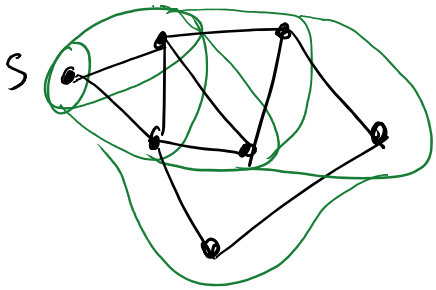
A) t, m

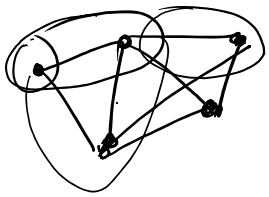
B) t, m, u ⟸

C) t, m, u, k

D) all nodes.

S. KIMMEL



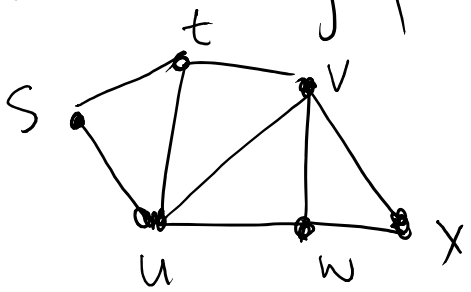


Graph Search Algorithm

Input: $G=(V,E)$, starting node s

1. $Exp = \{s\}$ Exp = set of explored nodes
2. While $\left(\exists\ \{u,v\} \in E : \left(u \in Exp \wedge v \notin Exp\right)\right)$
3. Add v to Exp

Q: Consider the graph:



Which sequence of explored vertices is not possible?

A) s, t, u, w, x, v B) s, u, v, x, w, t

C) s, u, v, t, x, w D) s, t, w, x, u, v

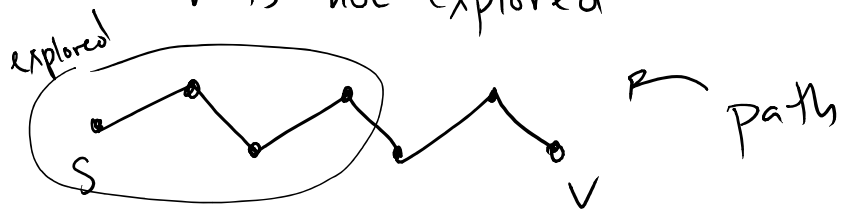
S. KIMMEL

Q: Prove: Vertex v is explored $\iff$ there is a path from s to v

$\Rightarrow$ If v is explored, must have taken a sequence of edges from s to v

$\Leftarrow$?

Contradiction: Suppose there is a path from $s \to v$ but v is not explored



Algorithm had to terminate with part of path unexplored. But then contradicts how alg. works, because there is an edge from explored to unexplored, so alg should have explored.