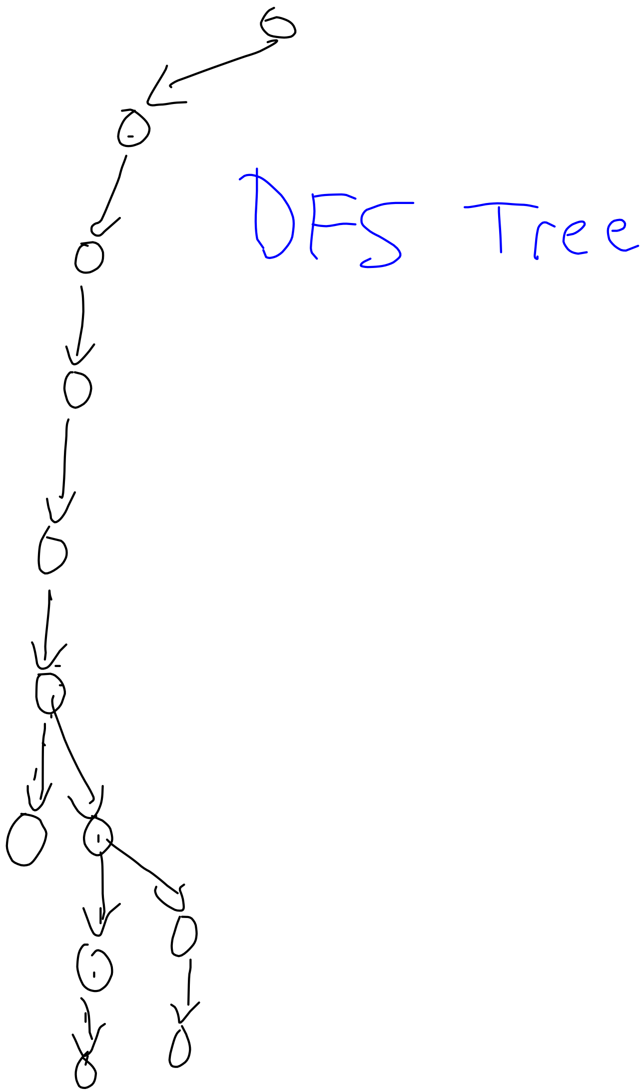
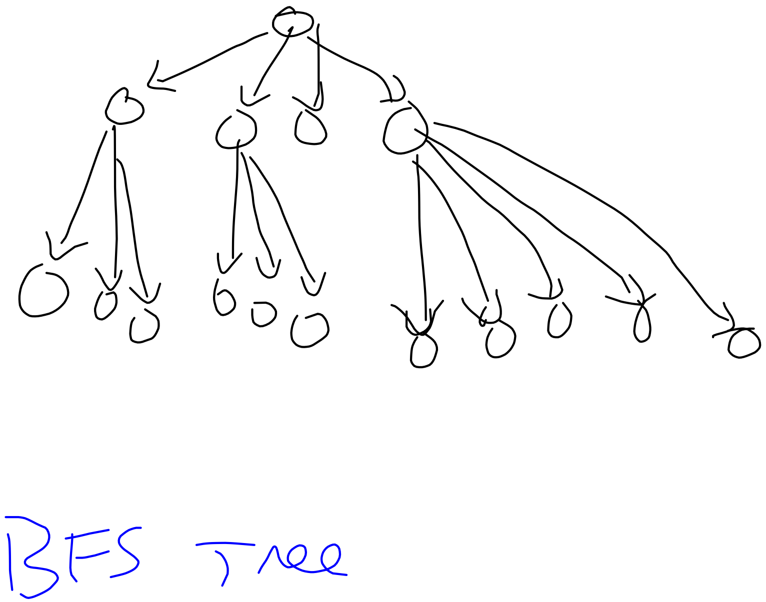
Depth First Search

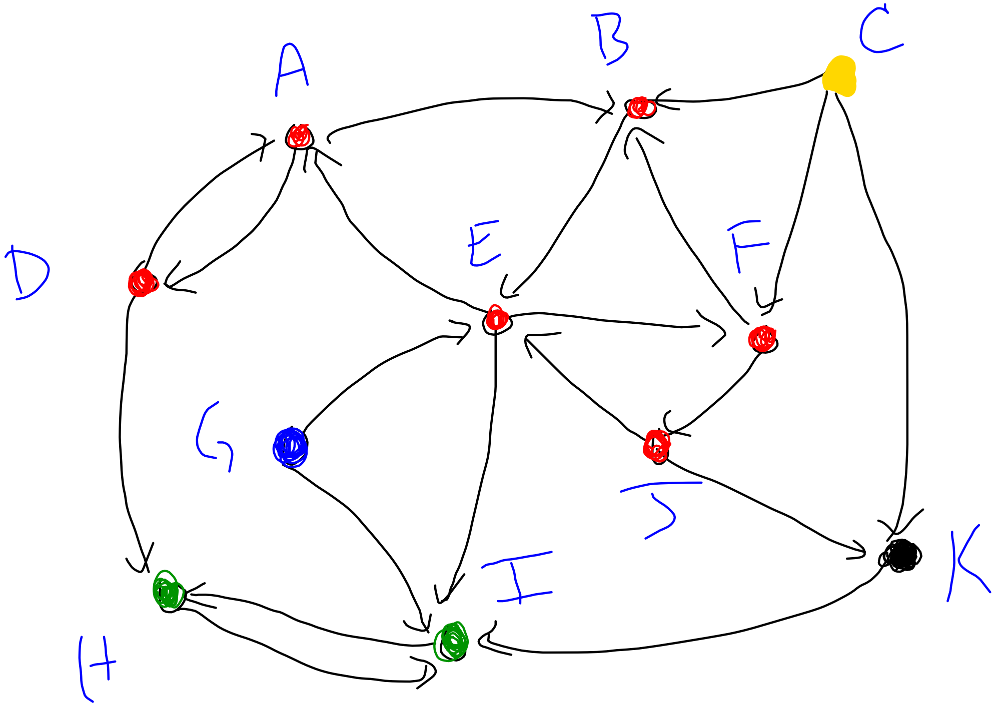


Breadth-first search.



Def: A strongly connected component in a digraph D is a maximal set C of vertices so that for each pair v, w of vertices in C, there is a directed path from v to w.

maximal = can't add any vertices to the set and stay strongly connected.



- If there is a cycle in D, then all vertices on that cycle are in the same SCC. (Strongly Connected Comp.)
- Any vertex with indegree = 0 or Outdegree = 0 is a SCC unto itself.
- The relation "$a \sim b$" means "a and b are in ~~a~~ SCC together" is transitive

$$\boxed{a \sim b \text{ and } b \sim c \longrightarrow a \sim c}$$

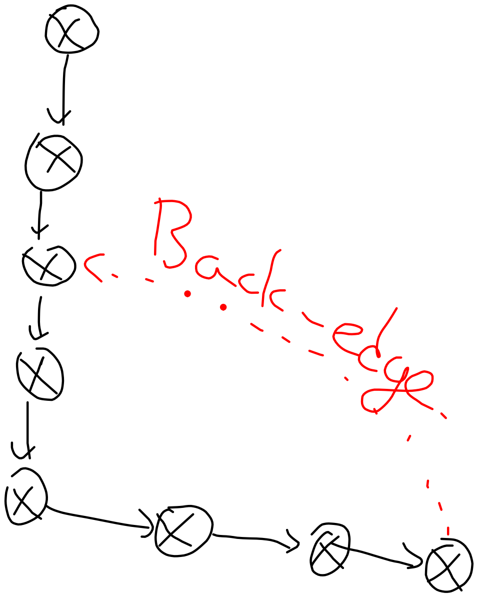
- it's also symmetric and ~~ref~~ reflexive

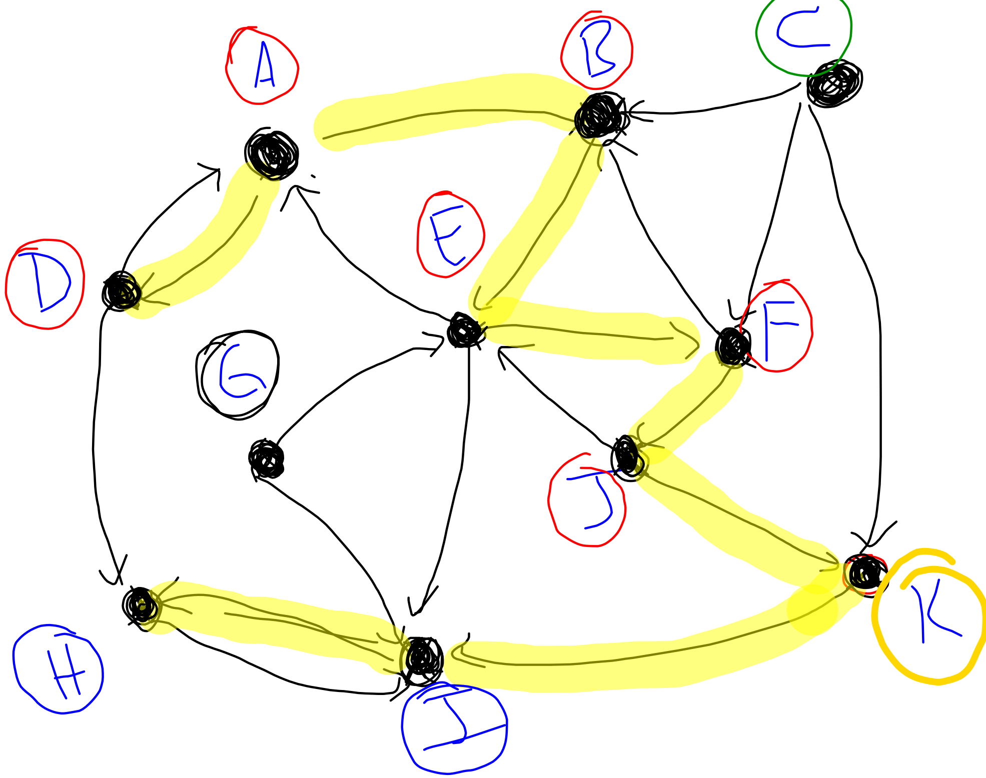
$$\boxed{a \sim b \longleftrightarrow b \sim a} \qquad \boxed{a \sim a}$$

Since "~" is symmetric, reflexive and transitive, it breaks the vertices of D into <u>Equivalence Classes</u> = the SCC's

Algorithm for finding SCC^s in a digraph

<u>Lemma:</u> the set of grey vertices at any point in a DFS form a directed path from root to current vertex.





<u>Fact:</u> A back edge gives a cycle, and all those vertices are in the same SCC.

$\boxed{+10\ XC}$

- Write up a precise description of how we just used DFS to find SCC.
- Writedown the lemmas that need to be proved.

DFS

DFS.VISIT

added code

$\boxed{+10\ XC}$

- prove those lemmas.

Due Wednesday. @ 4/5/06