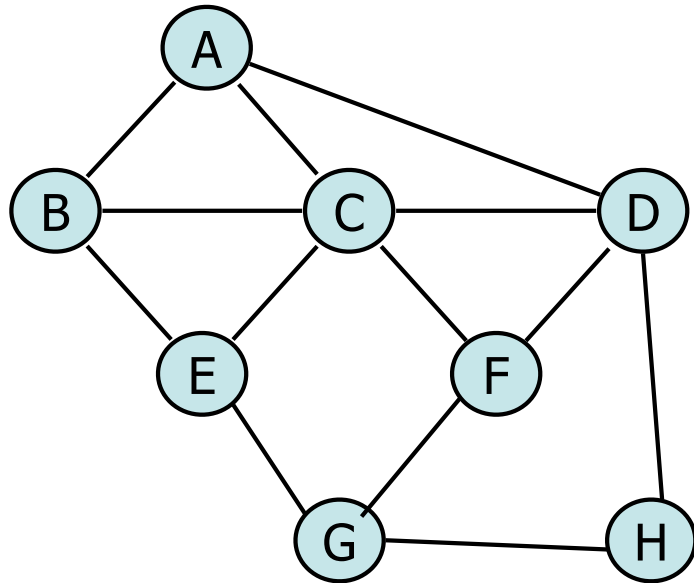


Today's announcements:

MP7 available. Due 5/2, 11:59p.

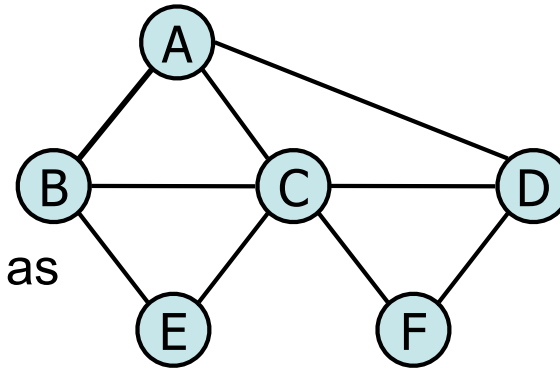
Graphs: BFS example



		A	C B D
		B	A C E
		C	B A D E F
		D	A C F H
		E	B C G
		F	C D G
		G	E F H
		H	D G

Graphs: Traversal – BFS

Visits every vertex and classifies each edge as either “discovery” or “cross”



Algorithm BFS(G)

Input: graph G

Output: labeling of the edges of G as discovery edges and back edges

For all u in G.vertices()

 setLabel(u, UNEXPLORED)

For all e in G.edges()

 setLabel(e, UNEXPLORED)

For all v in G.vertices()

 if getLabel(v) = UNEXPLORED

 BFS(G,v)

Algorithm BFS(G,v)

Input: graph G and start vertex v

Output: labeling of the edges of G in the connected component of v as discovery edges and cross edges

queue q;

setLabel(v, VISITED)

q.enqueue(v);

While !(q.isEmpty)

 q.dequeue(v)

 For all w in G.adjacentVertices(v)

 if getLabel(w) = UNEXPLORED

 setLabel((v,w),DISCOVERY)

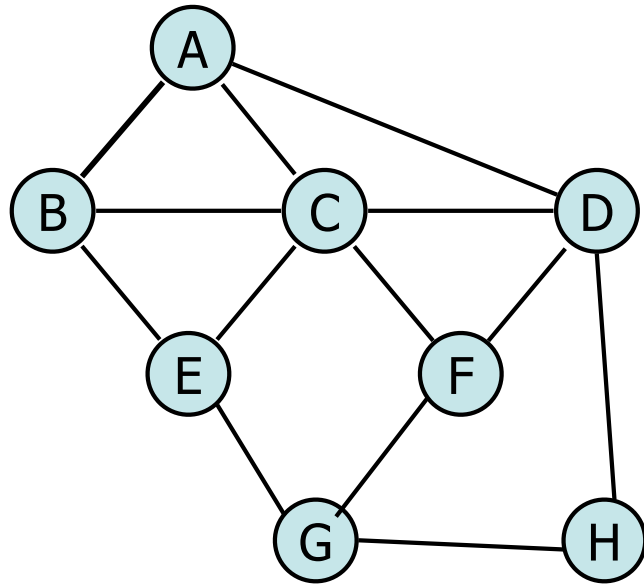
 setLabel(w, VISITED)

 q.enqueue(w)

 else if getLabel((v,w)) = UNEXPLORED

 setLabel((v,w),CROSS)

Graphs: BFS example



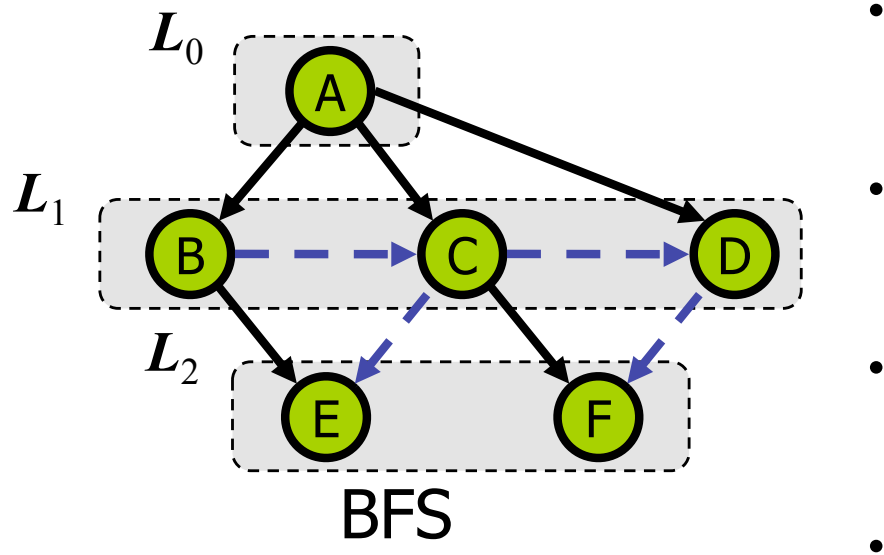
A	C B D
B	A C E
C	B A D E F
D	A C F H
E	B C G
F	C D G
G	E F H
H	D G

While loop

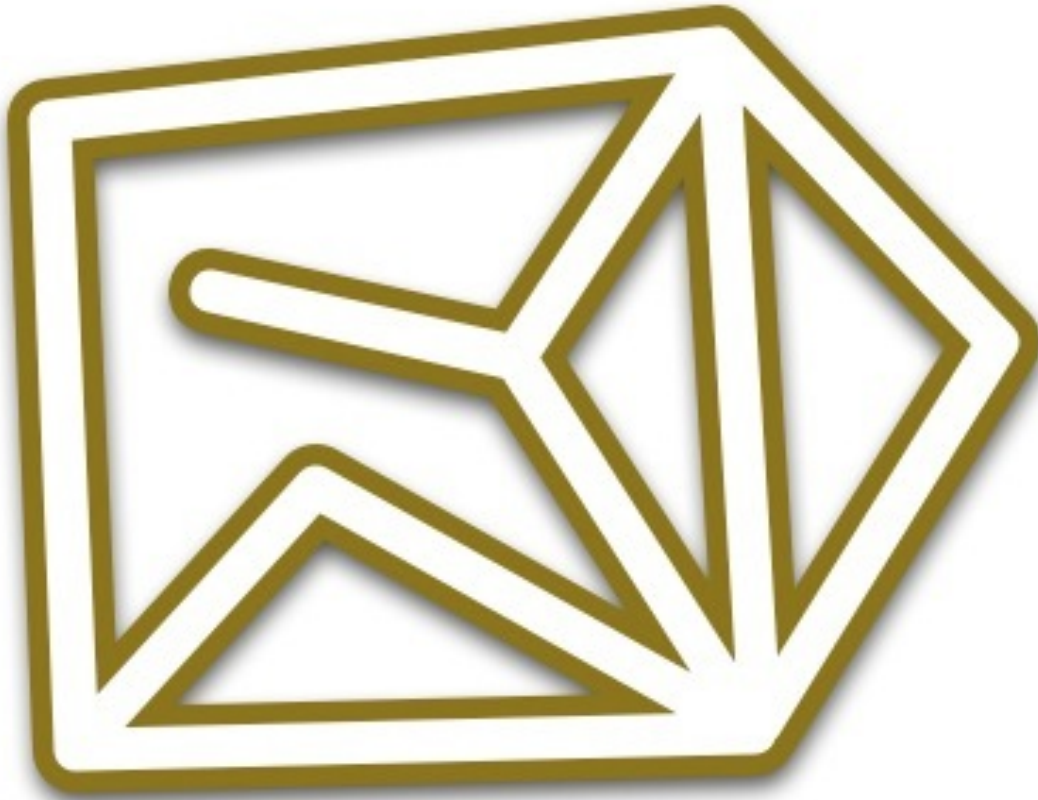
For loop

TOTAL RUNNING TIME:

Graphs: BFS observations



Graphs: Traversal - DFS



Ariadne, Theseus, and the Minotaur

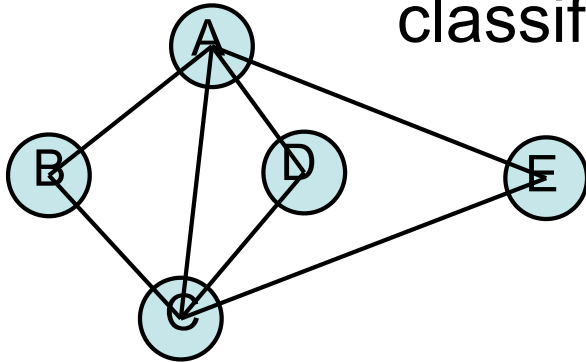
<http://www.cs.duke.edu/csed/jawaa2/examples/DFS.html>

<http://www.student.seas.gwu.edu/~idsv/idsv.html>

<http://www.youtube.com/watch?v=8qrZ1clEp-Y>

DFS: “visits” each vertex

classifies each edge as either “discovery” or “back”



Algorithm DFS(G)

Input: graph G

Output: labeling of the edges of G
as discovery edges and back edges

For all u in G.vertices()

 setLabel(u, UNVISITED)

For all e in G.edges()

 setLabel(e, UNEXPLORED)

For all v in G.vertices()

 if getLabel(v) = UNVISITED

 DFS(G,v)

Algorithm DFS(G,v)

Input: graph G and start vertex v

Output: labeling of the edges of G in the
connected component of v as discovery edges and
back edges

setLabel(v, VISITED)

For all w in G.adjacentVertices(v)

 if getLabel(w) = UNVISITED

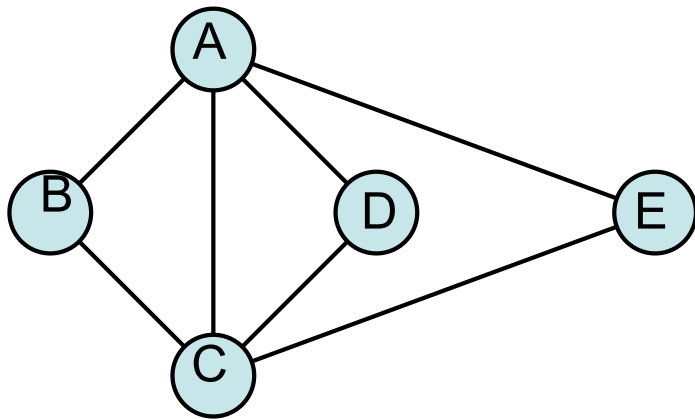
 setLabel((v,w),DISCOVERY)

 DFS(G,w)

 else if getLabel((v,w)) = UNEXPLORED

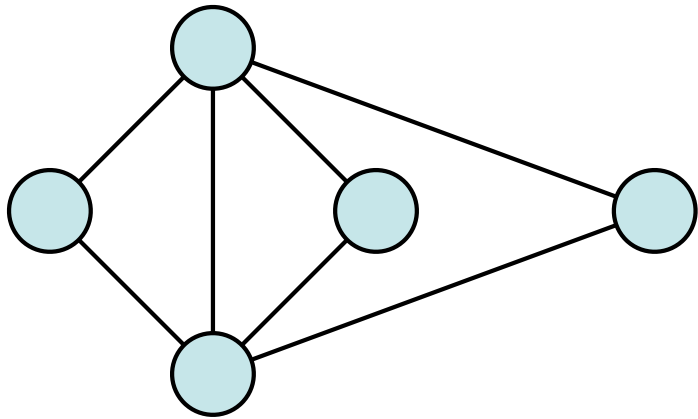
 setLabel(e,BACK)

Graphs: DFS example



A	B	C	D	E
B	A	C		
C	B	A	D	E
D	A	C		
E	A	C		

Graphs: DFS Analysis



setting/getting labels

every vertex labeled twice

every edge is labeled twice

querying vertices

each vertex

total over algorithm

querying edges

TOTAL RUNNING TIME: