Comp 352 Winter 2019

Tutorial 7

March 20, 2019

Outline

1. Definition
2. Terminology
3. Properties
4. Presentation
5. BFS
6. DFS
7. Spanning Trees
8. Path

Announcement

1. Assignment (Format)

Definition

$$G = (V, E)$$

- $V = \{v_i\}$
- $E = \{e_i\}$, where $e_i = (v_i, v_j)$

Terminology

- Directed, Undirected
- End vertices (or endpoints): u, v for $e = (u, v)$
- Edges incident on a vertex
- Adjacent vertices
- Degree of a vertex
- Parallel edges
- Self-loop

Path

- Path
- Simple path
- Cycle
- Simple cycle

Properties

- $\sum_v \deg(v) = 2 \cdot n_e$
- Undirected graph, no self-loops, no multiple edges: $n_e \leq n_v(n_v - 1)/2$
  - Prove by Property 1.

Presentation

- Matrices

BFS

Breadth-first Search

- Algorithm
- Application: Shortest Path

DFS

Depth-first Search

- Algorithm
- Application: Maze Traversal Application: Topological Sorting (DAGs)

Minimum Spanning Trees

Tree of minimum total weight

- Kruskal Algorithm: Edge with the lowest weight, until a spanning tree.
- Prims Algorithm: Breadth, always choose the edge with the lowest weight, until a spanning tree.

Path

- Hamiltonian Paths
- Hamiltonian Cycles Shortest Paths