CSE 321 Discrete Structures

Winter 2008
Lecture 25
Graph Theory

Announcements

- Readings
  - This week
    - Graph Theory, 9.1 – 9.4
- Schedule
  - Lecture Monday, Wednesday
  - Quiz Section, Thursday
  - No class Friday.
  - Review Session, TBA
  - Final Exam, Monday, March 17

Highlights from Lecture 24

- Composition by Matrix Multiplication
- Equivalence Relations
- Ordering relations
  - Total Order
  - Partial Order

Ordering examples

- Total Orders
  - Lexicographic Order
- Partial Orders
  - Prerequisites
  - Dominance order

Graph Theory

- Graph formalism
  - G = (V, E)
  - Vertices
  - Edges
- Directed Graph
  - Edges ordered pairs
- Undirected Graph
  - Edges sets of size two

Graph examples

- Communication Networks
- Road networks

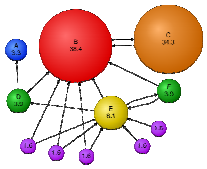
Social networks

- Community Graph
  - Linked In, Face Book
- Transactions
  - Ebay
- Authorship
  - Erdos Number

The web graph

Page Rank

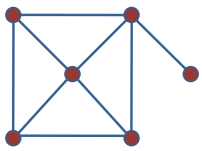
- Determine the value of a page based on link analysis
- Model of randomly traversing a graph
  - Weighting factors on nodes
  - Damping (random transitions)



Graph terminology

- Neighborhood
- Degree

Degree sequence



- Find a graph with degree sequence
  - 3, 3, 2, 1, 1
- Find a graph with degree sequence
  - 3, 3, 3, 3, 3

Handshake Theorem

$$2e = \sum_{v \in V} \deg(v)$$

Directed Degree Theorem

$$\sum_{v \in V} \deg^-(v) = \sum_{v \in V} \deg^+(v) = |E|$$

Special Graphs

- Complete Graphs K_n
- Cycle C_n
- Hypercube Q_n
- Mesh $M_{n,m}$

Bipartite Graphs