

# IE 495 Lecture 15

October 19, 2000

# Reading for This Lecture

- Primary
  - Horowitz and Sahni, Chapter 4
  - Kozen, Lecture 3
- Secondary
  - Miller and Boxer, Chapter 12 (up to page 286)

# Baruvka's Algorithm

- At each step, select all edges that connect some component of the graph to its nearest neighbor.
- Add all these edges to the tree simultaneously.
- Why does this work?
  
- Sequential Implementation

# Component Labeling

- Given a graph  $G = (V, E)$ .
- Component labeling is numbering each vertex according to which component it belongs to.
- Sequential Component Labeling Algorithms
  - Breadth-first search
  - Union-find
- This is the equivalent to finding the equivalence classes in a set.

# Parallel Component Labeling

- Algorithm
- Analysis

# Parallelizing Baruvka's Algorithm

- Assume CRCW (minimum number written)
- Assume  $|E| + |V|$  processors
- Algorithm
  - Initialization
    - Find minimum edge adjacent to each node and mark them.
  - Iterate
    - Perform parallel component labeling.
    - Find minimum edge connecting each node to another component.
    - Find overall minimum edge connecting each component to another.
    - Add all these edges into the graph