

CSE 633 2010 Fall

Parallel Connected Component Labeling For Image Analysis

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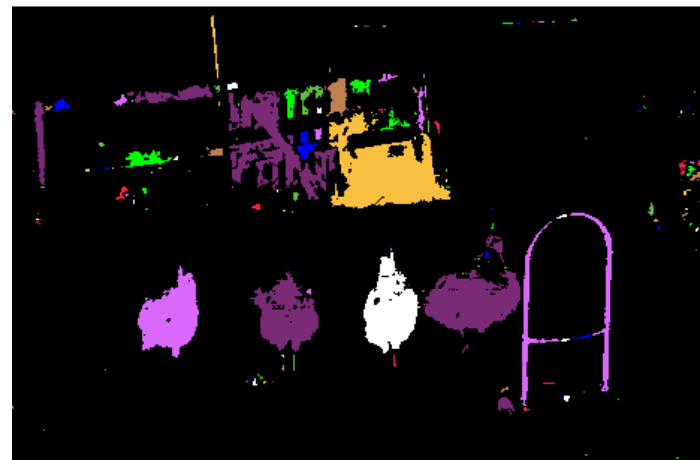
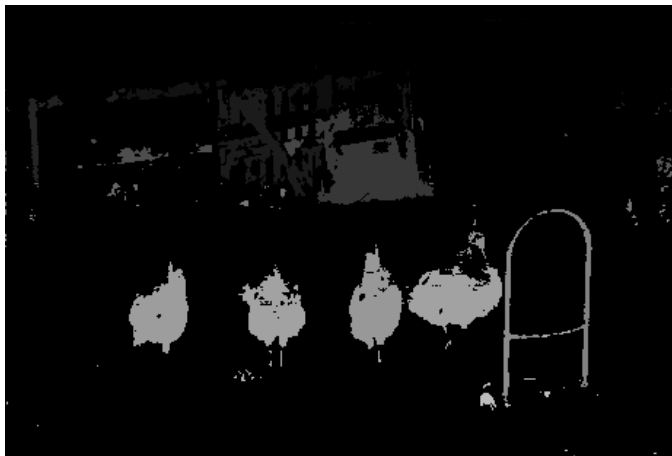
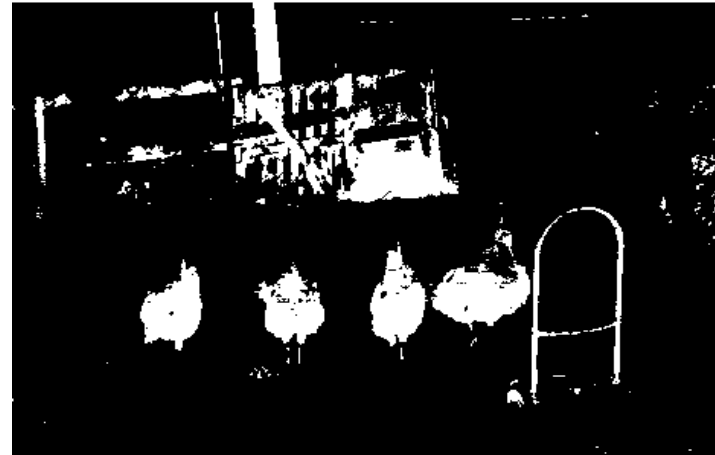
Computer Science and Engineering

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Connected Component Labeling Application

- Widely used to group connected Pixels in Image
 - Distinguish segments of an image
 - Application: Medical Testing and Meteorological Image
 - Problem belong to subset of Connected Components in Graph
- Several Parallel problem about this topics

Image Analysis Example



Problem Description

- Using Binary image as example
pixels have two value 1 (object pixels)
0(background pixels)
- Labeling object
pixels with value equal to 1
Under 4-connectivity, adjacent pixels mark
as the same label

Two Pass algorithm

- **First Pass**

 - Scan each element of data by row

 - Assign temporary label to each element

 - Store equivalence between adjacent pixel

- **Second Pass**

 - Based on the equivalence table, scan image again

 - Relabel the element with the lowest equivalent label

Parallel

- **Why parallel**

time-consuming, need maintain large table for equivalent label

- **Parallel Method**

Divide pixels into n parts

Assign each part to different processors

Try to decrease computation time of this algorithm

- **Advantages**

Each scan only on small size

Don't need maintain large equivalent table

Experiment

- Edge machine
- Used functions

MPI_Scatter MPI_Gather

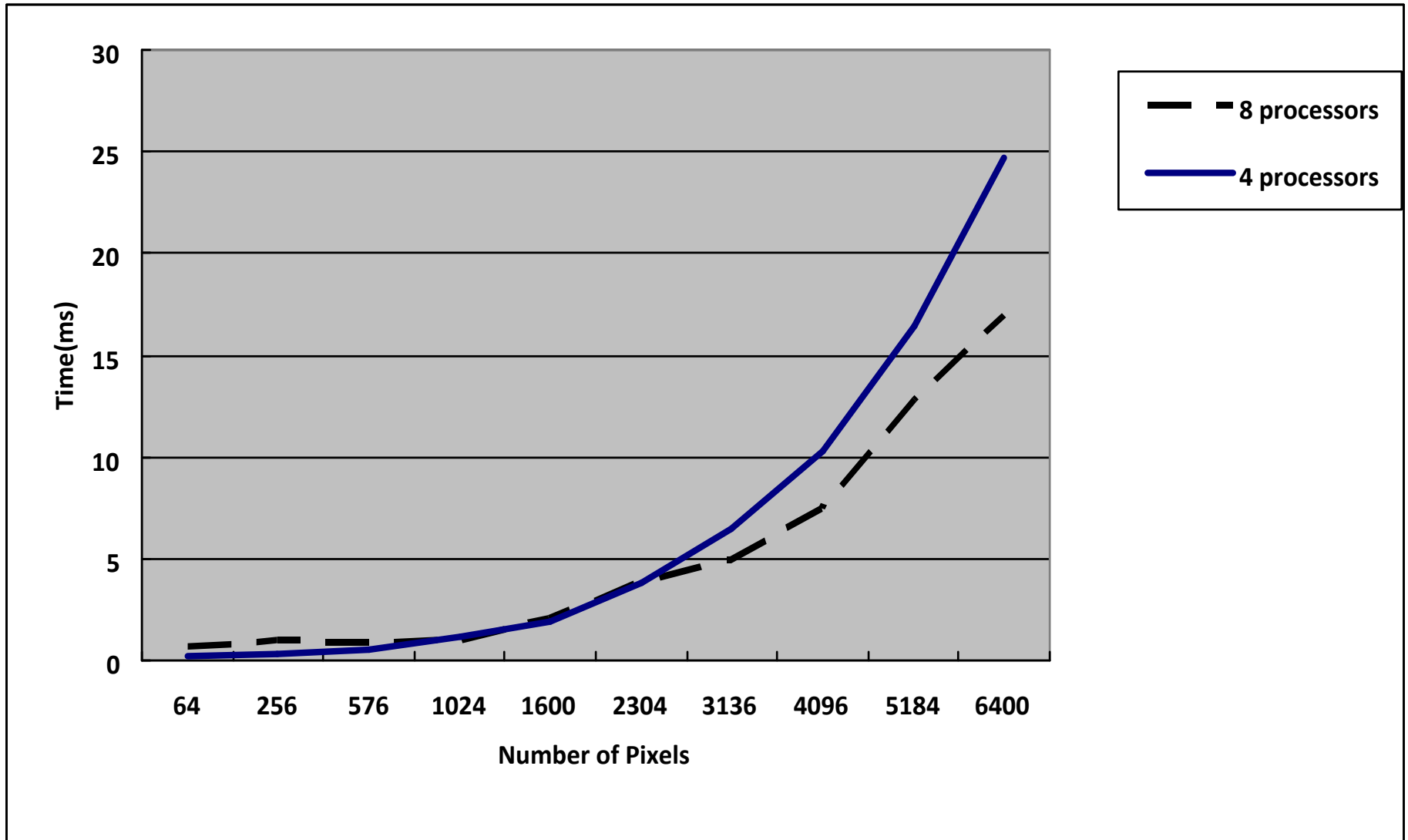
- Input Image

Simulate binary image as two-dimensional matrix (two-dimensional array)

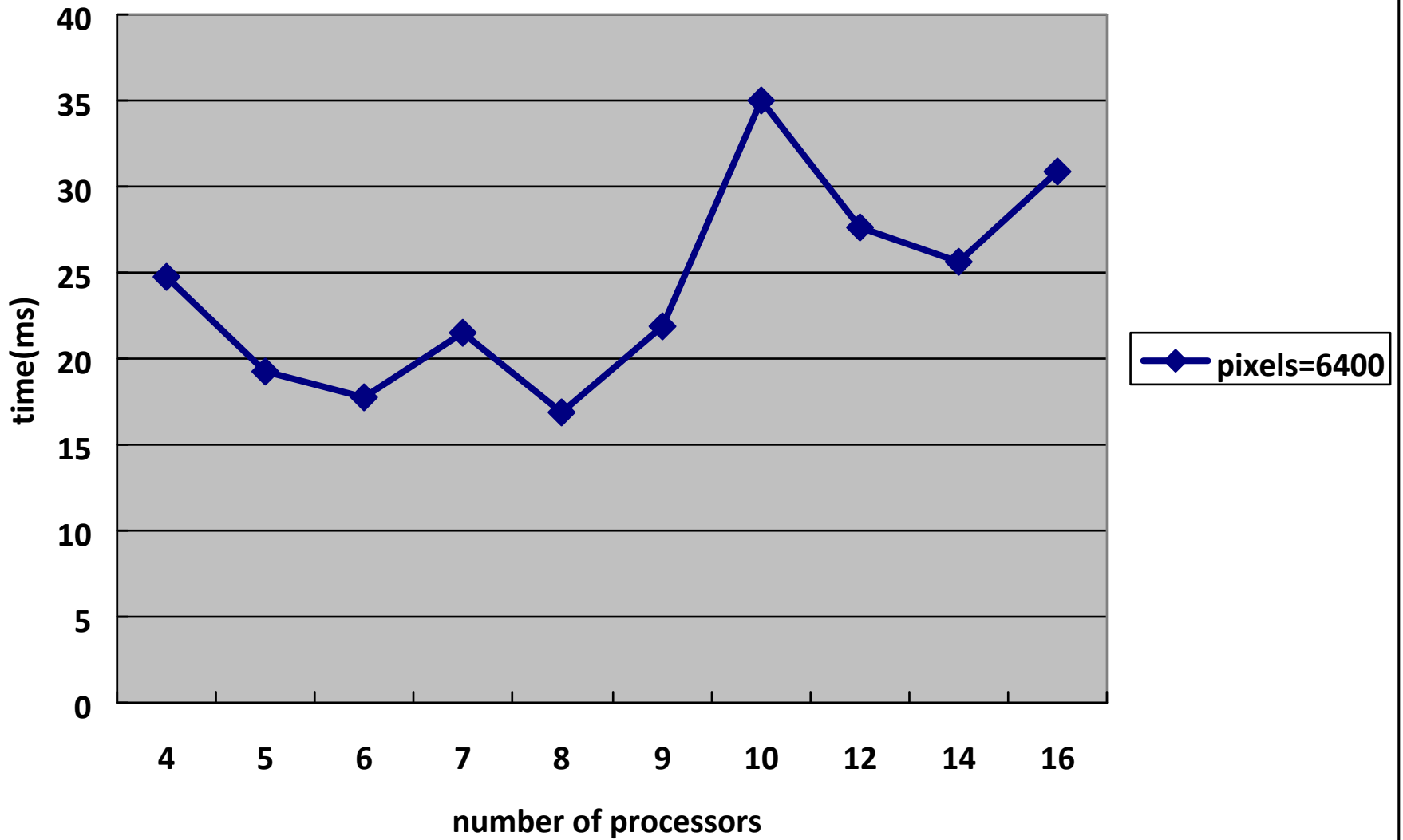
Implementation

- Generate two-dimensional matrix on root processor
- Assign each part to other processor by MPI_Scatter
- Run two- pass algorithm on each processor
- Collect label information from each processor
- Relabel adjacent pixels on boundary and relative pixels

Result



Result



Reference

Susanne Hambruch

A Study of Connected Component Labeling Algorithm on The MMP

D. S. Hirschberg

A Parallel Graph Algorithm For Finding Connected Components

Jung-Me Park, Carl G.Looney

Fast Connected Component Labeling Algorithm Using A Divide and

Conquer Algorithm