ECE 563 Project: Parallelizing Image Mosaicing

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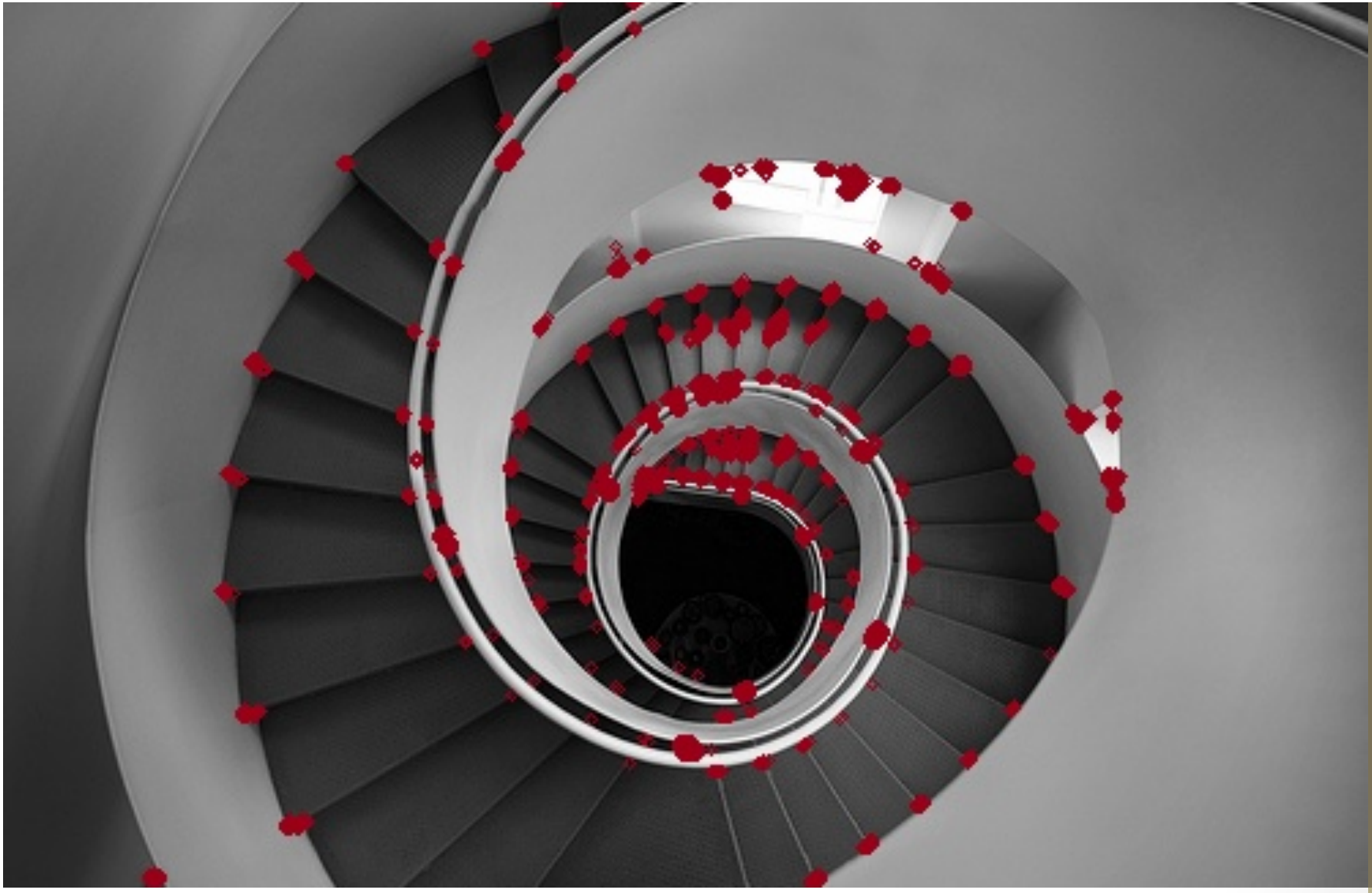
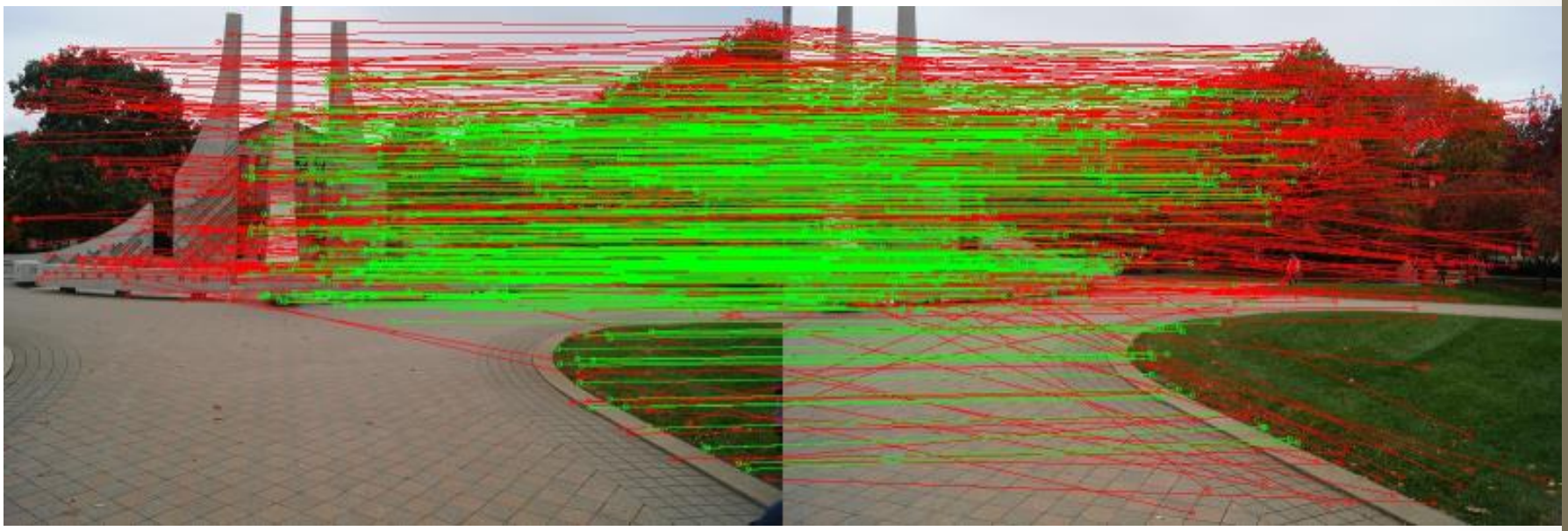
Overview

- Introduction into Image Mosaicing
- Discussion of the Algorithm
- Methodology
- Results
- Future Work



Detection of Interest Points

Locates points of interest (defined shapes, positions, etc.) that exists in adjacent photos



RANSAC (Random Sample Consensus)

Large numbers of iterations to maximize numbers of “inliners” to compute homography

Image Mosaicing

Stitches together images with respect to the center image using the the homography

Algorithm

- 8 major tasks
  - Read Images – 0.55%
  - Detect Points of Interest – 6.22%
  - Compute Descriptors – 8.81%
  - Match Interest Points – 3.84%
  - Identify True Matches (RANSAC) and Compute Homography– 63.87%
  - Create Matching Image Pairs – 0.25%
  - Manipulate and Apply Homography – 12.62%
  - Generate Final Image – 3.80%

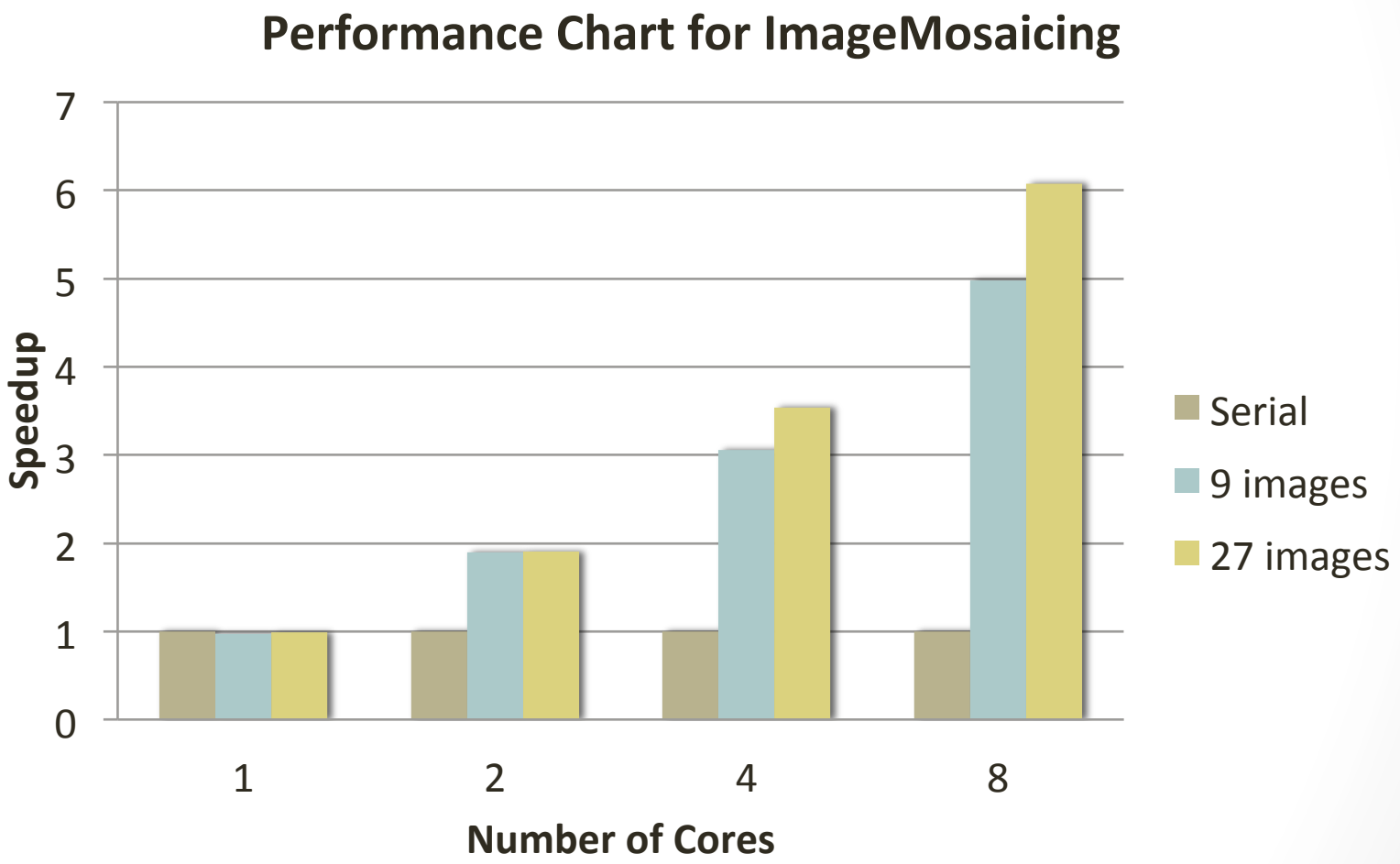
Methodology

- Focused on the computation of homography and other sections that took more than 5% of runtime
- Running on system with 64 Intel Xeon processors with 8 cores per processor.

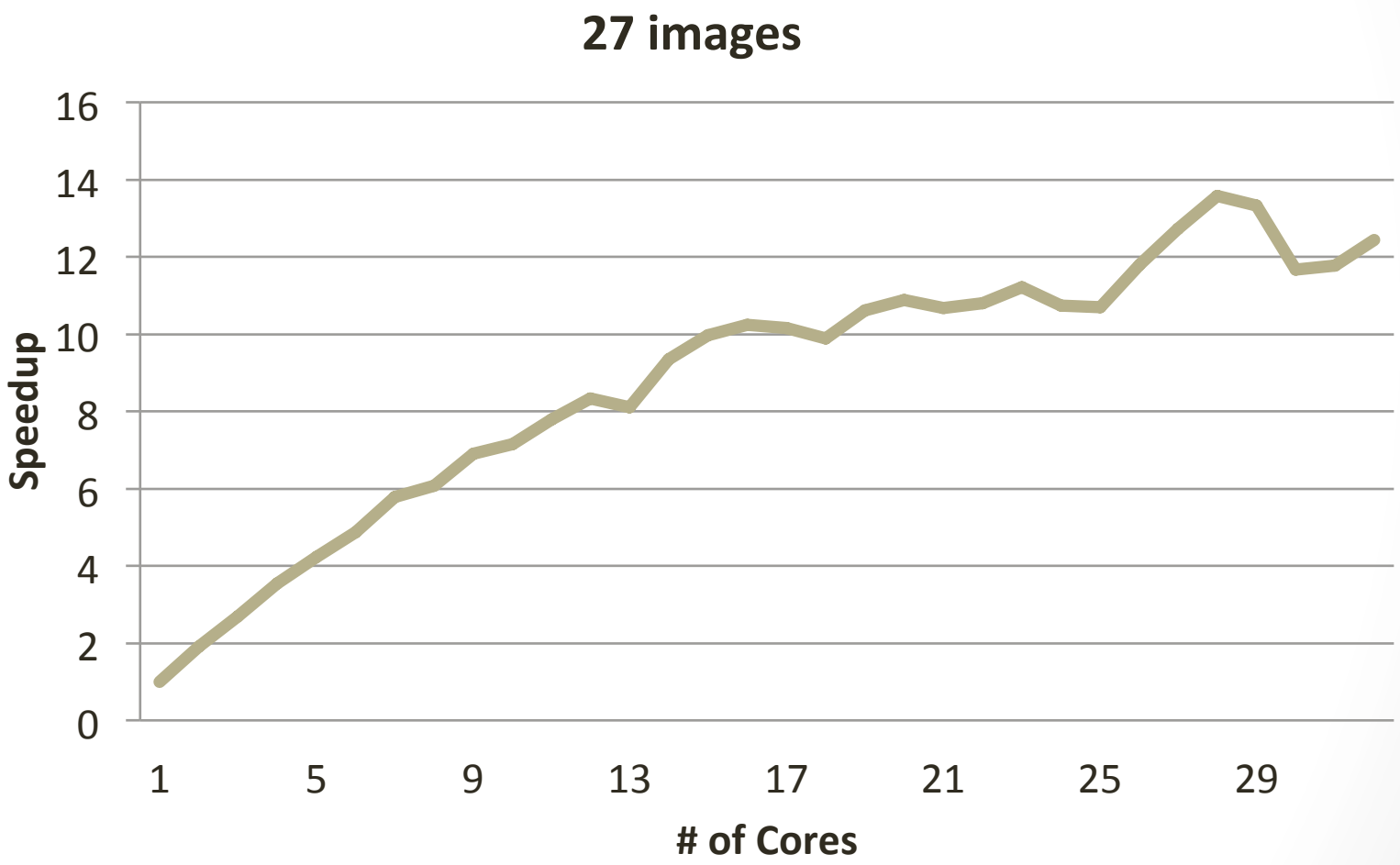
Parallelization Example

```
#pragma omp parallel for private(srcP, destP, y_x, y_y, distance)
for (i = 0; i < sampleSize; i++) {
        srcP = srcPoints->at(i);
        destP = destPoints->at(i);
        y_x = destP_mat.at<double>(0, i) / destP_mat.at<double>(2, i);
        y_y = destP_mat.at<double>(1, i) / destP_mat.at<double>(2, i);
        distance = sqrt(pow((y_y - destP.y), 2) + pow((y_x - destP.x), 2));
        #pragma omp critical (pickinliners)
        {
                if (distance < decisionThreshold) {
                        src.push_back(srcP);
                        dest.push_back(destP);
                }
        }
}
```

Results


Performance Chart for ImageMosaicing
Speedup
0
1
2
3
4
5
6
7
1
2
4
8
Number of Cores
Serial
9 images
27 images

Results (Cont.)



Future Work

- Examine OpenCV libraries to extract more parallelism
- Run larger data sets to see influence on performance.