

# 15-418/618 Final Project F21: **Milestone Report**

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## 1 Summary

We are going to parallelize the panorama stitching using partially overlapped images on multi-core CPUs using OpenMP and on NVIDIA GPUs. We plan to take advantage of feature extractor like SIFT and SURF to implement this project.

## 2 Progress

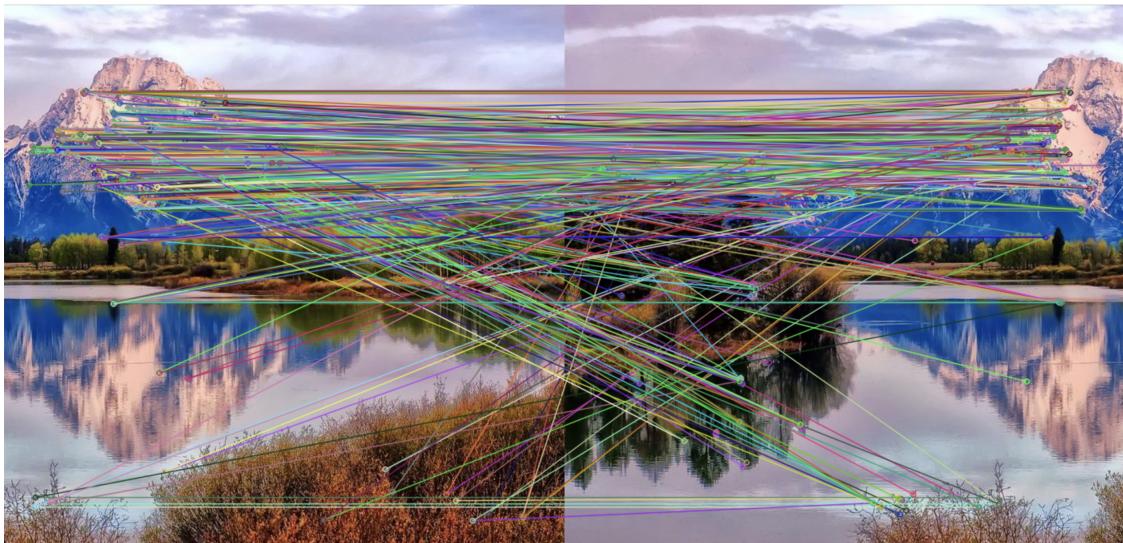
We created a sequential implementation using OpenCV functions. We are in the process of changing the sequential version with our own implementations of the functions. Below are our results:  
Here are the original two images.



Here are the keypoints detected:



Here are the matched descriptors:



Here's the resulting panorama:



### 3 Goal Analysis

We are doing well with respect to our goals. We believe we will still be able to produce our deliverables because we have now determined the specific places that needs to be parallelized and understand the algorithm better to achieve better performance. Some nice to have would be to try out more ways for each step such as implementing both BRIEF and SIFT and comparing their performance. Our updated goals are:

1. Fully implement sequential version
2. Implement parallel version using OpenMP
3. Implement parallel version using CUDA on GPU
4. Create performance graphs and comparisons.

Nice to haves

1. Try different algorithms for keypoint detection.
2. Try different algorithms for extracting descriptors.
3. Try different algorithms for matching descriptors.
4. Create performance graphs comparing these algorithms.

### 4 Poster Session

We will show the separate input images and stitched output images on a poster. Intermediate process images and the performance graph will also be included. Specifically, performance graph may include speedup contrast between sequential version and parallel version, performance contrast between different cores, etc.

### 5 Issues and Concerns

The correctness of sequential version is very important since our parallel version depends on it. The parallel implementation using CUDA may become more challenging than we imagine.

### 6 Schedule

1. 11/22 - 11/28:
  - Submit project milestone report on 11/22.
  - Rewrite sequential implementation of detecting keypoints with DoG. (Ziying)
  - Rewrite sequential implementation of extracting descriptors with SIFT/BRIEF.(Zibo)
  - Rewrite sequential implementation of matching descriptors with Brute Force Matching.(Ziying)
2. 11/29 - 12/2:
  - Implement the OpenMP parallel version of panorama stitching on CPU and evaluate performance (e.g. speedup and correctness) with sequential version. (Ziying and Zibo)

3. 12/3 - 12/9:  
Implement CUDA parallel version of panorama stitching on GPU and evaluate performance with OpenMP and sequential version. (Ziying and Zibo)  
Create poster.  
Submit final project.

## 7 Sources

<http://6.869.csail.mit.edu/fa12/lectures/lecture13ransac/lecture13ransac.pdf>

<https://itzone.com.vn/en/article/image-stitching-the-algorithm-behind-the-panorama-technology/>

[http://vision.stanford.edu/teaching/cs131\\_fall1718/files/07\\_DoG\\_SIFT.pdf](http://vision.stanford.edu/teaching/cs131_fall1718/files/07_DoG_SIFT.pdf)