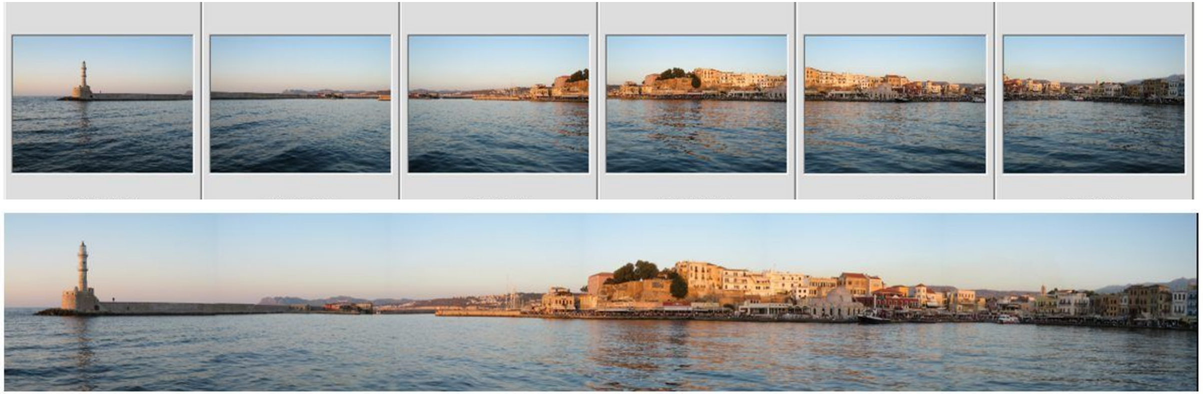
IACS

HARVARD
School of Engineering
and Applied Sciences

CS205 Final Project

Real-time Image Stitching and Stabilization



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Problem and Challenges

- **Real-time Image stitching and stabilization.**
- The key idea of our project is to focus on the word ‘real-time’: although there are existing algorithms for both applications, doing both things in ‘real-time’ can still be challenging.
- Stitching
  - ○ Stitch the views of different cameras together frame by frame to achieve real-time panorama streaming
  - ○ Traditional algorithms can not achieve 30 frames per second, especially when the resolutions of cameras are high
  - ○ Challenge is to parallelize the traditional algorithm so that the speed is high enough to accomplish a real-time streaming panorama view
- Stabilization
  - ○ We can not always expect each of the camera to be perfectly stable, this is why we need stabilization
  - ○ Need to parallelize the stabilization along with stitching to achieve the ‘real-time’ performance.
  - ○ Need to explore the correct and most efficient order of stitching and stabilization

Model and Data

Basic pipeline of model:

1. Extract frames from the camera view
2. Resize frames from cameras
3. Detect and extract features from frames (Can be parallelized)
4. Match features (Can be parallelized)
5. Transform frames onto same plane to generate panorama (Can be parallelized)
6. Stabilization of generated panorama (to be determined: whether to stabilize the panorama or to stabilize individual camera views or both)

Data source:

Images and videos taken on our phone or camera

Tools and Infrastructures

- Computing platform: Amazon Web Services
- EC2 instance or cluster to be determined by what it takes to achieve real-time
- Language: Python (C++)
- GPU computing: OpenACC (CUDA), potentially with MPI
- Compare performance with OpenMP