Parallelize 2D Optical Flow Estimation Algorithm

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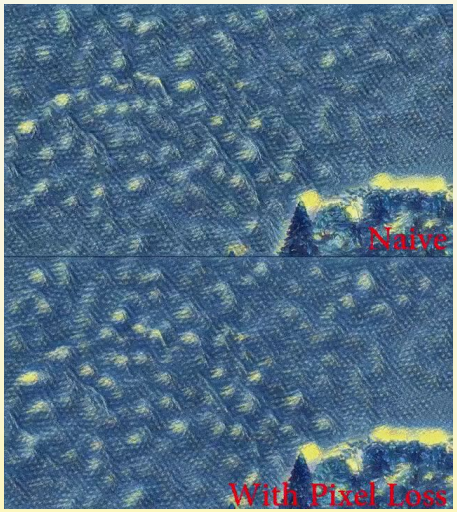
About Optical Flow

Source: https://people.csail.mit.edu/celiu/OpticalFlow/

- Optical flow is important in motion analysis
  - Object tracking and activity recognition
  - Motion based segmentation
  - Video processing
    - Fake slow motion video
    - Stabilize synthesized video
    - Video compression



Model and Data

- The state-of-the-art implementation is *Fast Optical Flow using Dense Inverse Search (ECCV 2016)*
  - Much faster compared to previous algorithms
  - Code available on GitHub
  - Code is not parallelized

We tested the (serial) implementation. It takes around 6 seconds to generate estimated optical flow between two images. Which means 4 days for 2-way optical flows for a 20-minute video (24 fps). Time is longer for high-resolution videos like 8K.

- We will focus on the application for video processing. Test data can be any video online.

How to Parallelize

- For video processing, we can do MapReduce
  - MapReduce + OpenMP
  - MapReduce + OpenACC

- For high-resolution images or high-quality flow (requires more iterations)
  - MPI + OpenMP
  - MPI + OpenACC