Parallelize 2D Optical Flow Estimation Algorithm on Video

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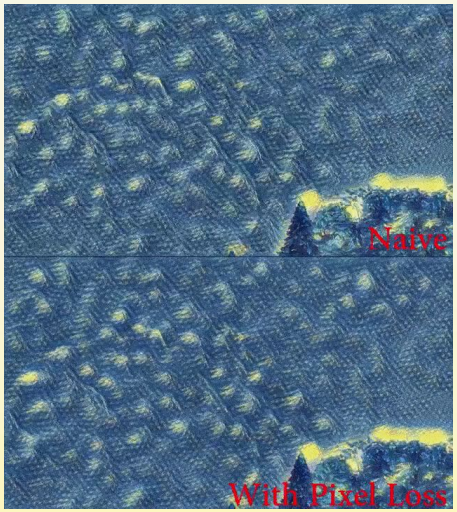
About Optical Flow

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



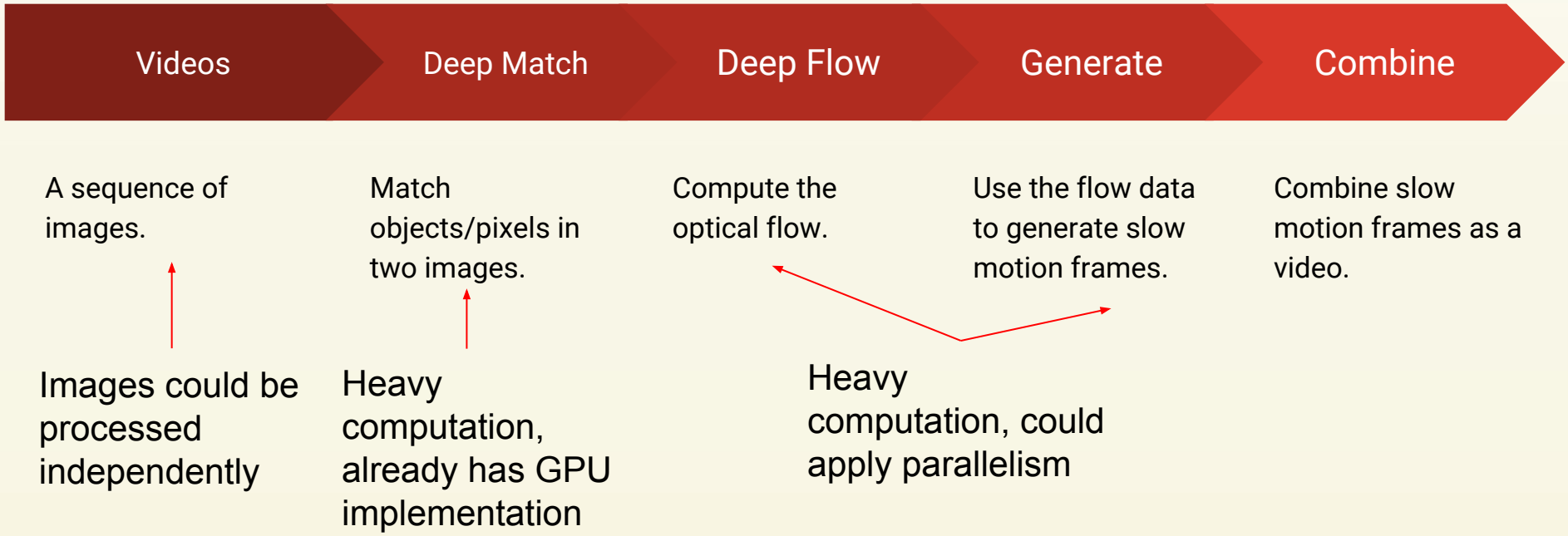
Model and Data

- The state-of-the-art implementation is *DeepFlow: Large displacement optical flow with deep matching (ICCV 2013)*
  - Code made available by authors.
  - Contains two parts
    - Deep Match (match pixels in two images)
      - Has GPU implementation
    - Deep Flow
      - Single-thread CPU based.
      - A pair of 480p images: 5 seconds

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

Where to Parallelize

For example, for slow motion application:

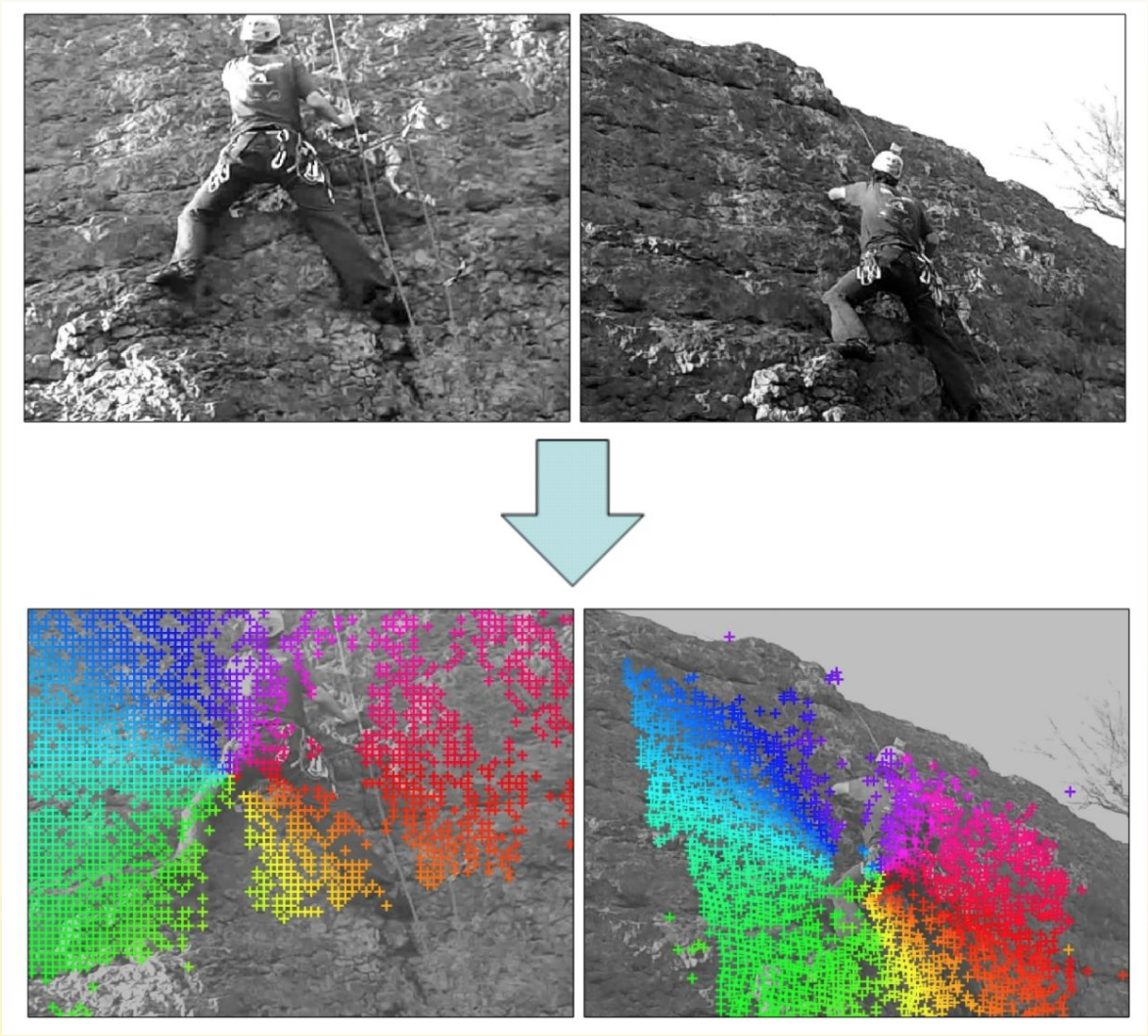


- To processing images in parallel, we can do MapReduce
- To accelerate the computation of deep flow and output generation, we can do either OpenMP or OpenACC/CUDA

Appendix

Algorithm

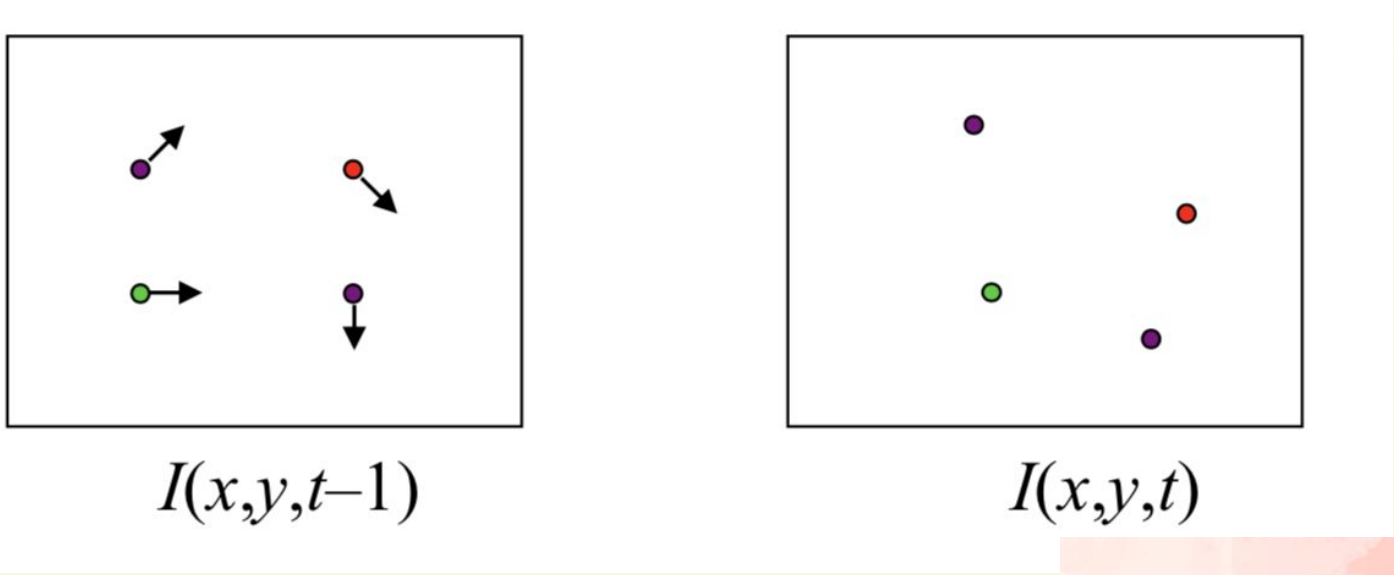
Deep Match:



Source: http://lear.inrialpes.fr/src/deepmatching/

Algorithm

Deep Flow:



Source:

https://sensblogs.wordpress.com/2011/08/23/quick-reviews-on-tracking-motion-features-optical-flow-by-fei-fei-li/