

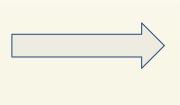
Parallelize 2D Optical Flow Estimation Algorithm on Video

Team: Shiyu Huang, Hongxiang Qiu, Zeyu Zhao, Zongren Zou

About Optical Flow



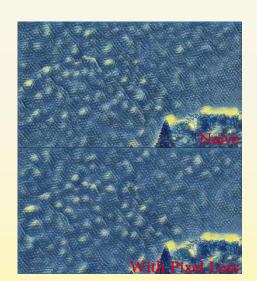






Source: https://people.csail.mit.edu/celiu/OpticalFlow/

- 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:

Videos	Deep Match	Deep Flow	Generate	Combine
A sequence of images.	Match objects/pixels in two images.	Compute the optical flow. Heavy	Use the flow data to generate slow motion frames.	Combine slow motion frames as a video.
Images could be processed	Heavy computation, already has GPU	computa	ation, could arallelism	
independently	implementation	apply po	aranonom	

- 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

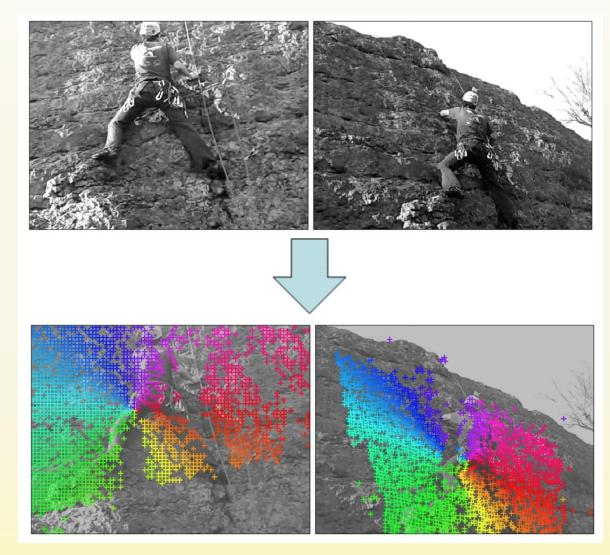


Appendix



Algorithm

Deep Match:

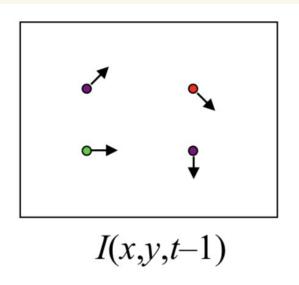


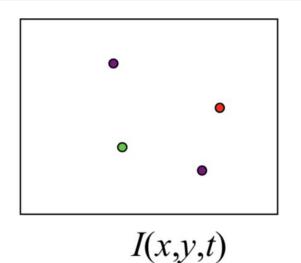
Source: http://lear.inrialpes.fr/src/deepmatching/

Algorithm



Deep Flow:





Source:

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

