Adaptive Depth of Field using Variational Models and Nonlinear Inhomogeneous Isotropic Diffusion

Zorah Lähner, Tobias Gurdan, Nicolai Oswald

April 3, 2014

Project Overview

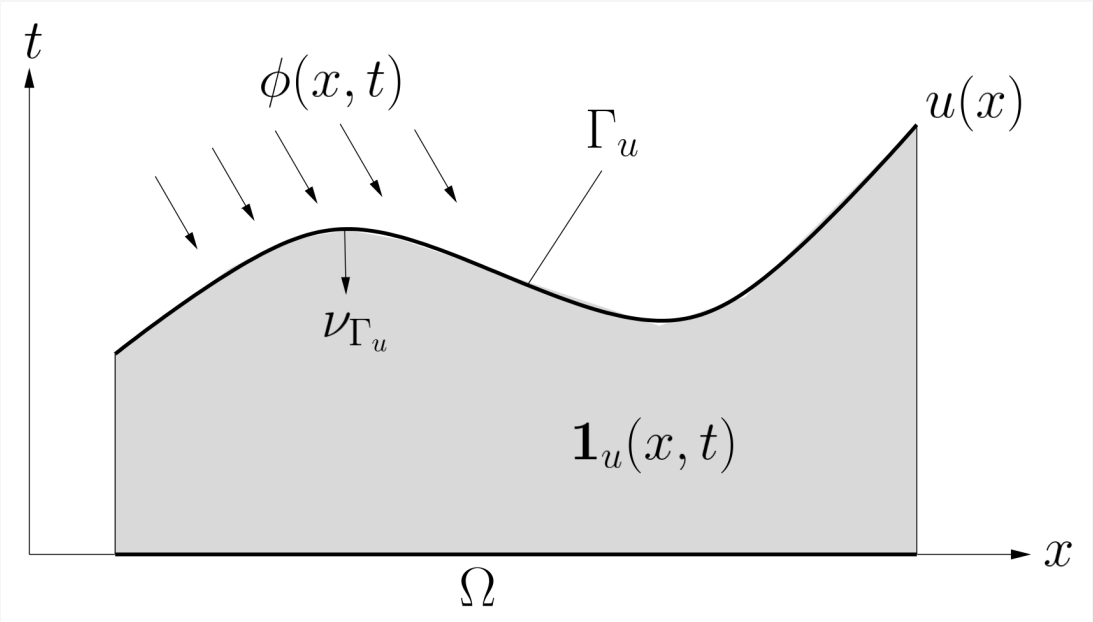
- Stereo depth map computation
  - Convex relaxation and primal dual approach
- Interactively change image focus
  - Nonlinear diffusion using depth map

Stereo Depth Map

- Find best pixel-wise displacement between two images
- Assumes rectified images
- Energy: $\min_u \int |I_1(x) - I_2(x + u(x))| - |\nabla u| \, dx$
  - Other regularizer possible (Quadratic, Huber...)
- Problem: non-convex!

Primal-Dual Algorithm

- Take problem to higher dimension
  - Optimize volume instead of map
- Convex Relaxation
- Solve using primal-dual approach with backprojection



Diffusion

- Dependent on depth map
- Select depth layer to focus on
  - Diffusivity depends on disparity difference
  - Linear and quadratic weighting

Optimization

- Preload necessary data to device
- Precompute data term
- Evaluation of different shared and constant memory configurations
  - No gain by using shared memory
  - Parameters in constant memory
- Overload indices to subroutines
- Avoid unnecessary overhead