Efficient Edge-Awareness Propagation via Single-Map Filtering for Edge-Preserving Stereo Matching

Takuya Matsuo, Shu Fujita, Norishige Fukushima, Yutaka Ishibashi
Nagoya Institute of Technology

Introduction

Background

Stereo matching is studied to obtain accurate depth maps.

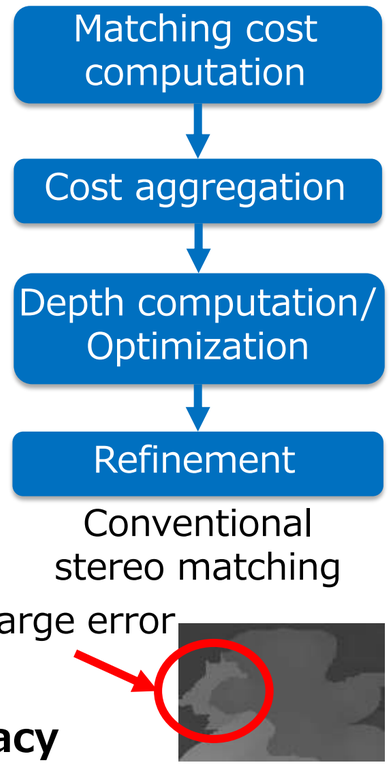
Stereo pairs

Depth map

Problem and Purpose

- Cost aggregation with edge-preserving filtering is inefficient.
- Optimization is also time-consuming.
- Refinement method cannot improve large error region.

Proposing a framework having high-efficiency and high-accuracy



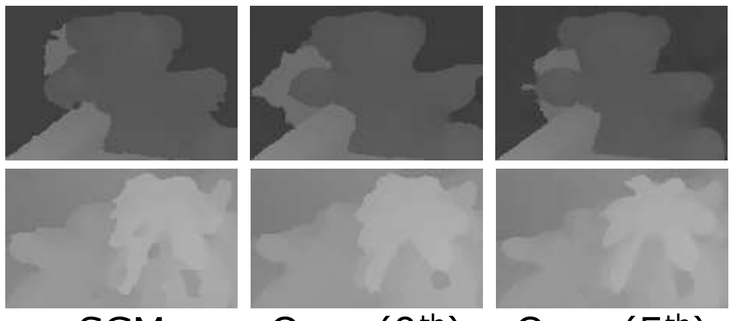
Conventional stereo matching

Large error

Experimental Results

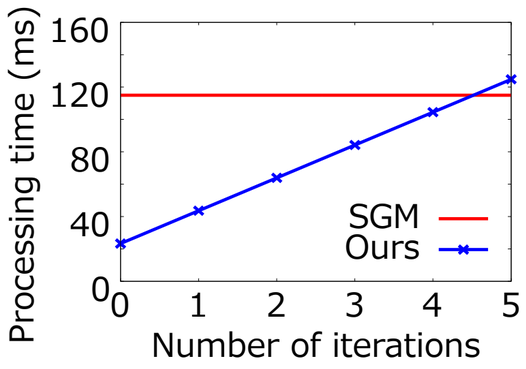
Error rates of each method [%]

Number of iterations	SGM	0	1	2	3	4	5
Tsukuba	3.59	3.14	**2.72**	2.75	2.84	2.86	2.84
Venus	0.19	0.54	**0.08**	0.12	0.12	0.12	0.12
Teddy	7.39	7.10	6.29	4.81	4.15	3.81	**3.56**
Cones	3.63	3.20	2.83	2.75	2.68	**2.64**	2.69



SGM Ours (0^{th}) Ours (5^{th})

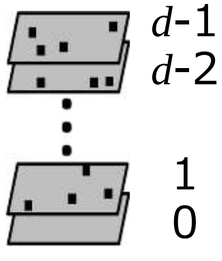
Results of depth map (Teddy)



Processing time (Teddy)

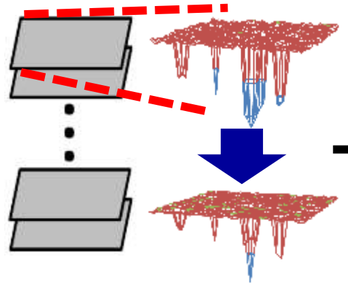
In-Loop Feedback Matching

Stereo pairs

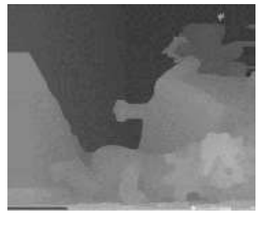


Matching cost computation

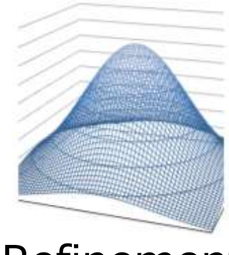
Cost volume blending



Cost aggregation

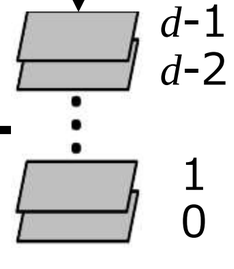


Depth map computation/ Optimization



Refinement

Depth map



Depth cost volume generation

Two additional steps are added to conventional stereo matching.

- **Depth cost volume generation:** converting the refined depth map to a new cost volume
- **Cost volume blending:** propagating edge-awareness of the depth map refinement