Fast Bilateral Space Stereo for Synthetic Defocus

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Reference : Fast Bilateral Space Stereo for Synthetic Defocus : Paper

A General Taxonomy of Stereo Algorithms

Ref: A Taxonomy and Evaluation of Dense Two-Frame Stereo Correspondence Algorithms

A vast majority of stereo algorithms use a subset of following approaches:

- Stereo Matching
- Cost Aggregation
- Disparity Computation / Optimization

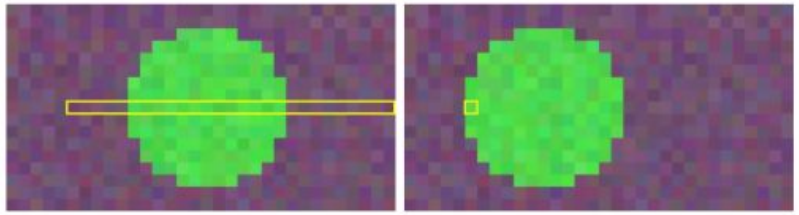
Local Methods:
Stereo Matching + Cost Aggregation + Disparity Computation

Global Methods:
Stereo Matching + Disparity Optimization

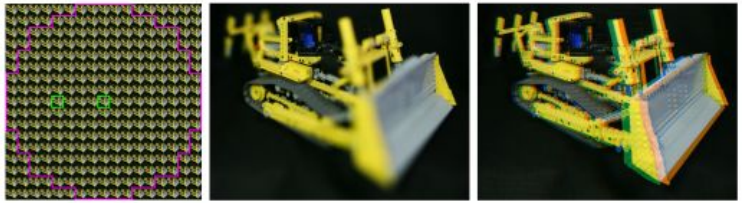
This Paper:
Stereo Matching + Disparity Optimization in Bilateral Space

High Level Project Idea

Stereo Matching → Bilateral Solver

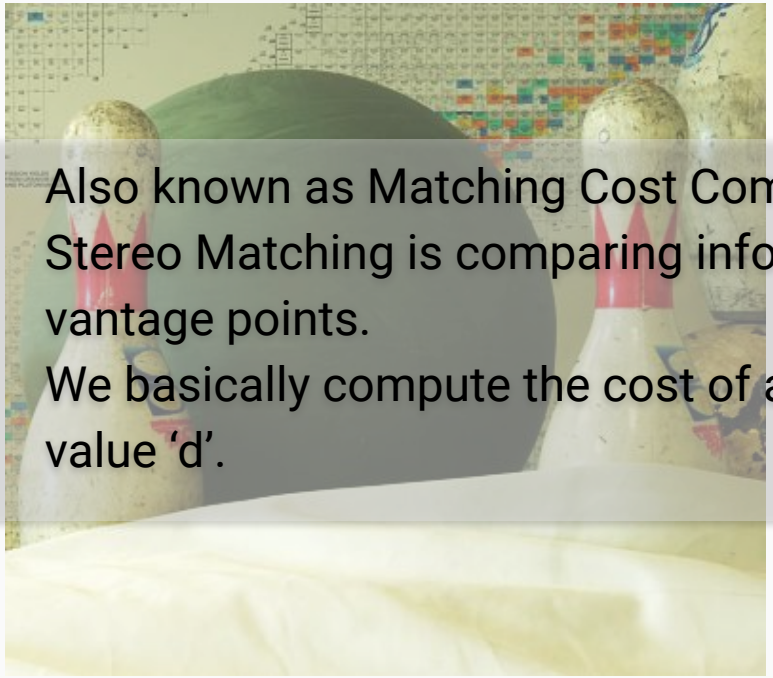


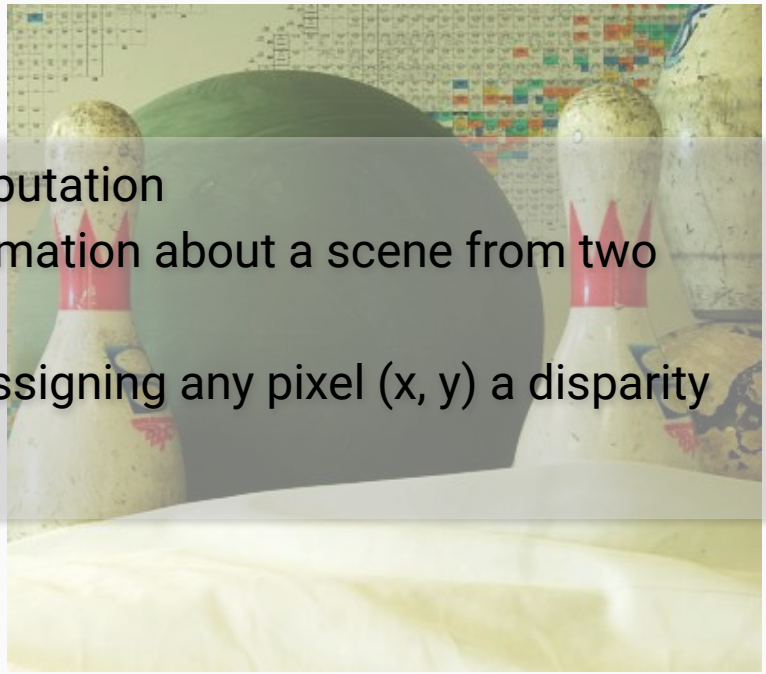
(a) left image (b) right image



(a) light field (b) true defocus (c) stereo pair

Stereo Matching

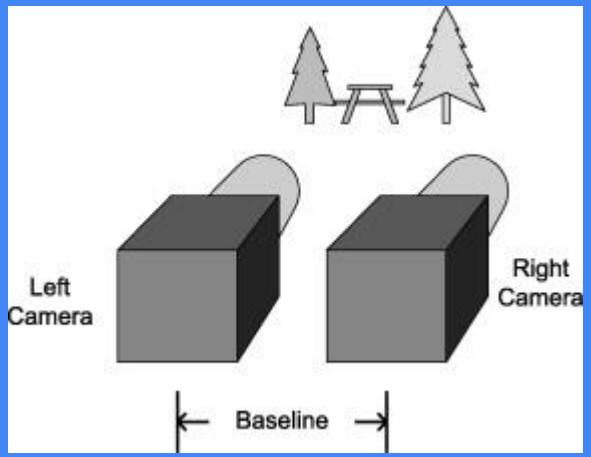


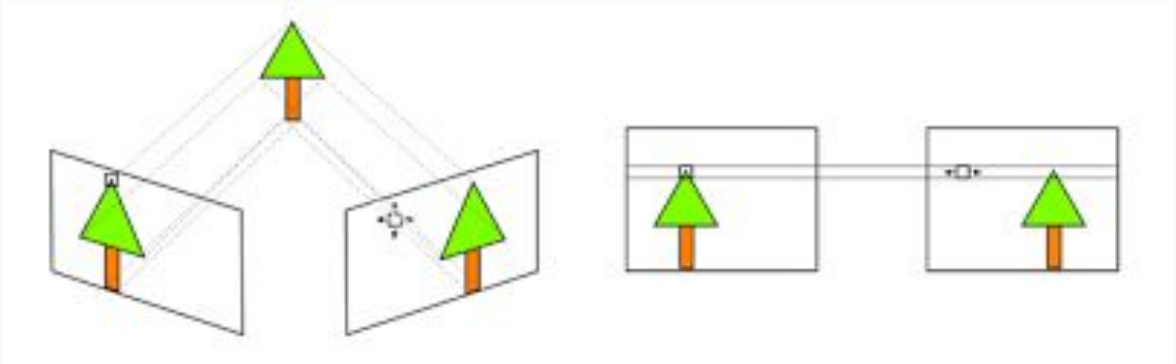


- Also known as Matching Cost Computation
- Stereo Matching is comparing information about a scene from two vantage points.
- We basically compute the cost of assigning any pixel (x, y) a disparity value ‘d’.

Assumption

For the implementation of this paper, it is assumed that the stereo images are rectified.

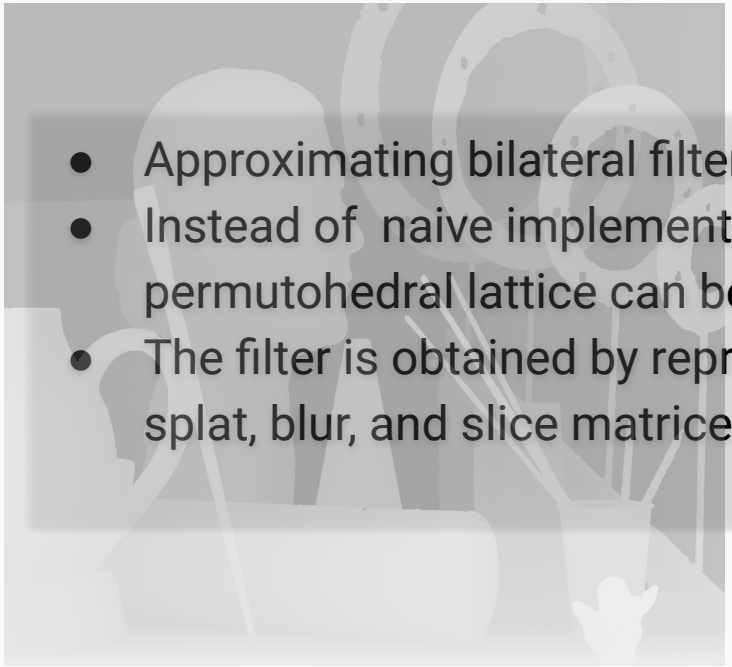




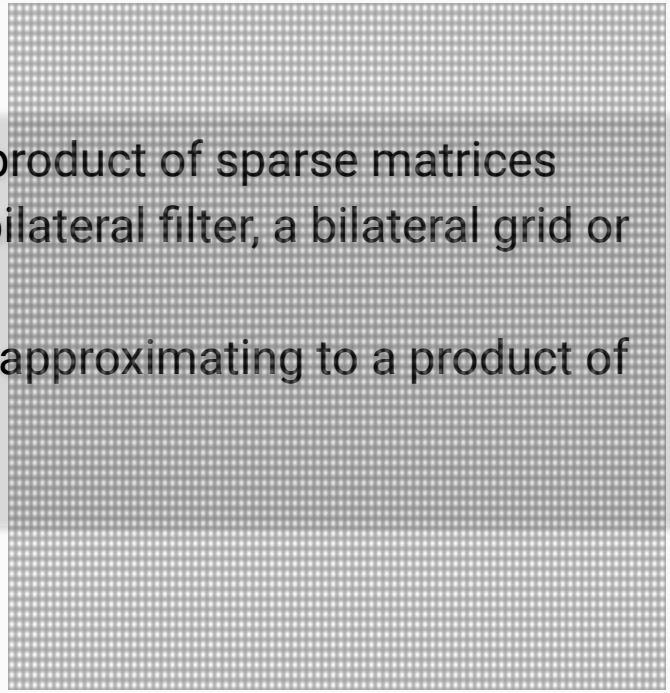
Different Methods To Perform Stereo Matching

- Sum of Absolute Differences
- Sum of Squared Differences
- Birchfield Tomasi Measures

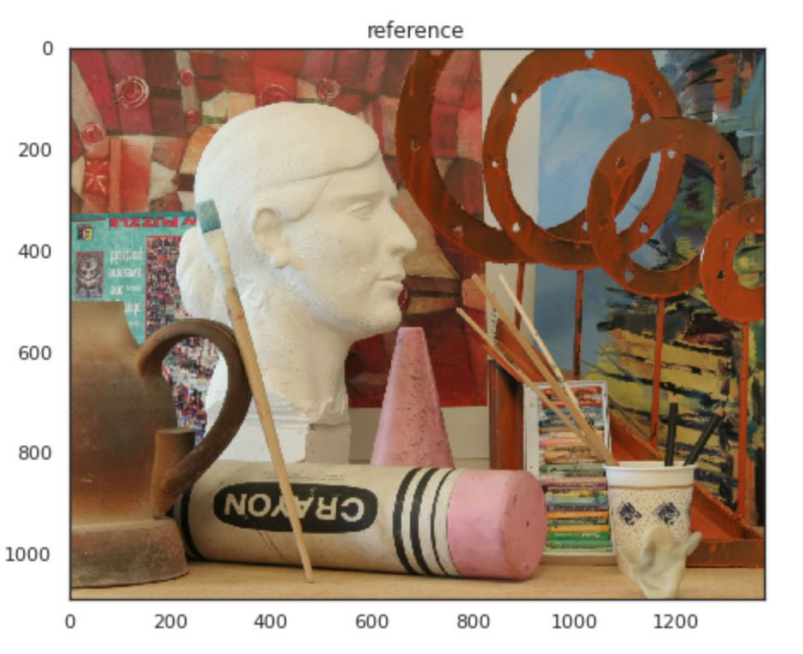
Bilateral Filtering

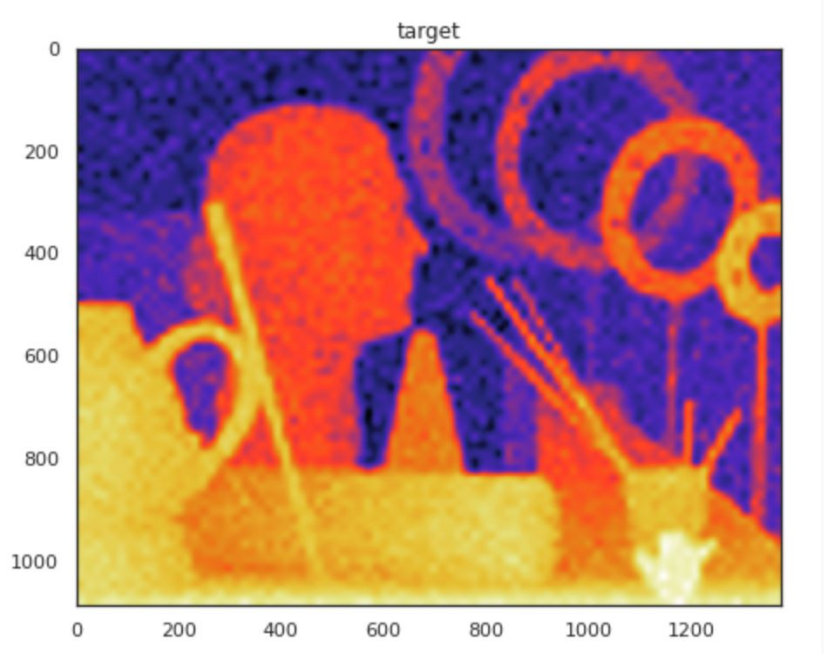


- Approximating bilateral filtering to a product of sparse matrices
- Instead of naive implementation of bilateral filter, a bilateral grid or permutohedral lattice can be used
- The filter is obtained by representing approximating to a product of splat, blur, and slice matrices

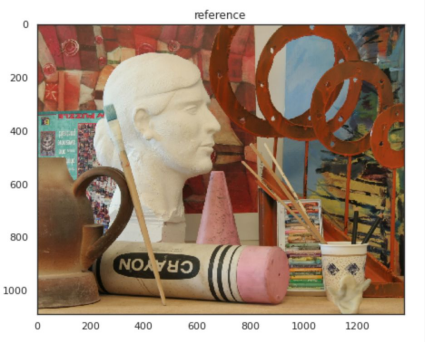


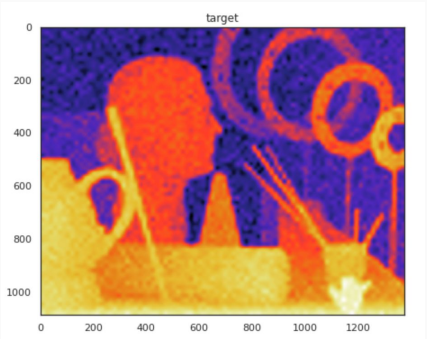
Bilateral Filtering

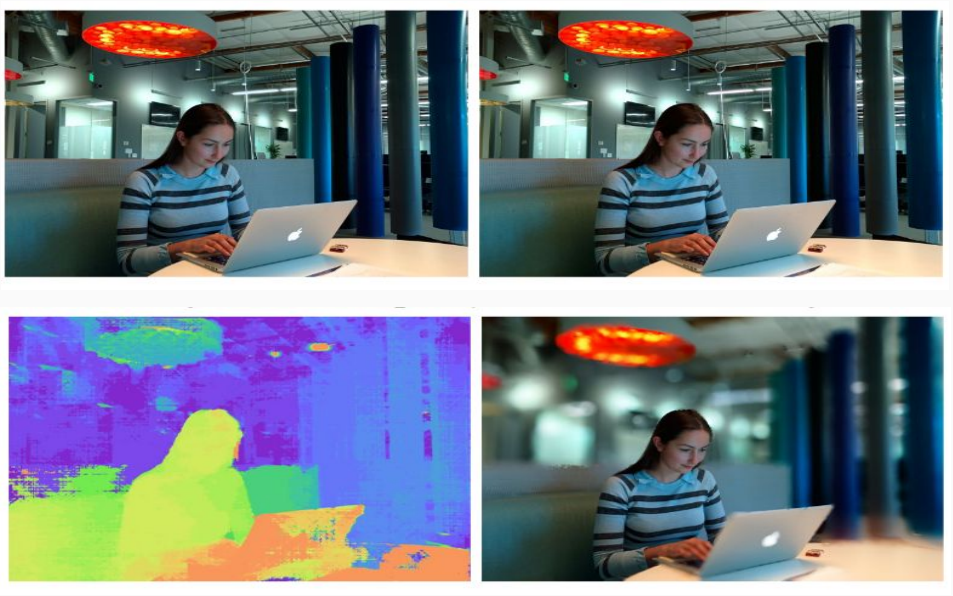




Result comparison:







Thanks!

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