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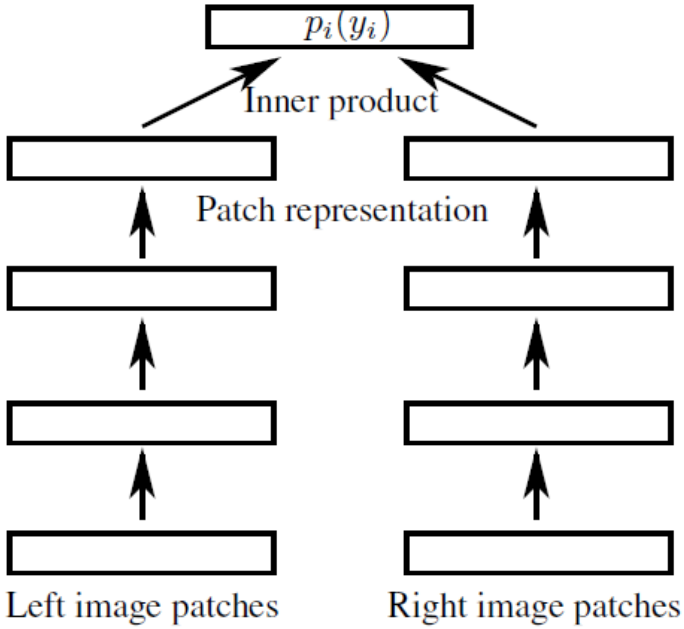
# Existing algorithms

[1] Luo, W., et al. (2016). Efficient deep learning for stereo matching. *In international conference of CVPR.*




Contribution:

- Build a Siamese network to process two images from an image pair simultaneously.
- Each unary structure extracts features from the input image using the same parameters.

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# Existing algorithms

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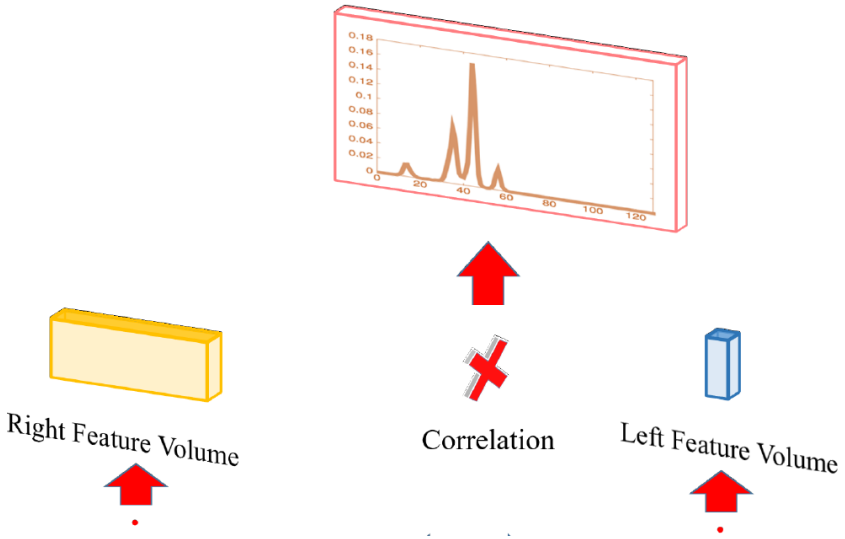


- Exploit a correlation layer which computes inner product between two representations of a siamese architecture.

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# Existing algorithms

Treat the problem as multi-class classification, where the classes are all possible disparities.

Some processing steps like (Semi-Global-Block-Matching), where additional pairwise potentials are introduced to encourage smooth disparities.

SGBM:

$$E(y) = \sum_{i=1}^{N} E_i(y_i) + \sum_{(i,j)\in\mathcal{E}} E_{i,j}(y_i, y_j),$$

Where the energy function can be defined as:

$$E_{i,j}(y_i, y_j) = \begin{cases} 0 & \text{if } y_i = y_j \\ c_1 & \text{if } |y_i - y_j| = 1 \\ c_2 & \text{otherwise} \end{cases}$$

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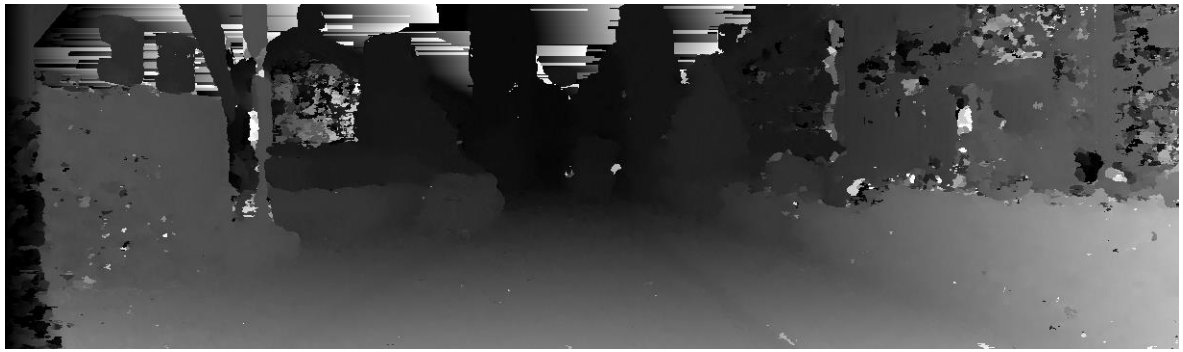
# Existing algorithms

Reimplementing Results:

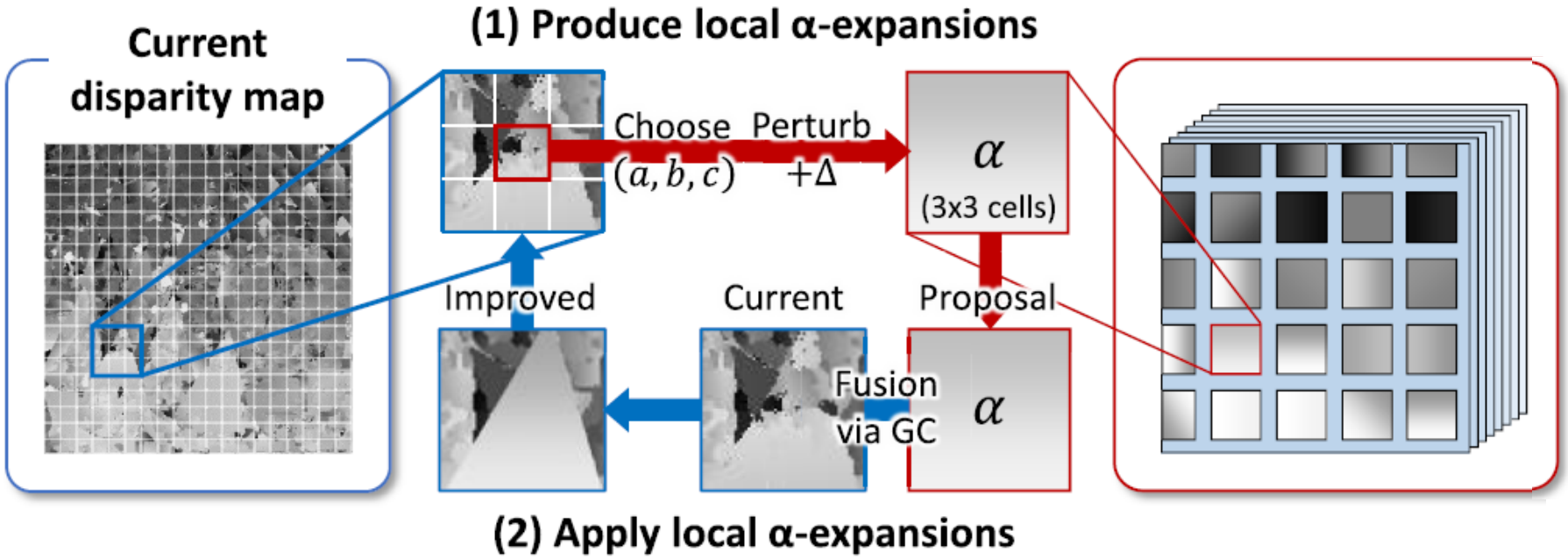
True image



Depth image

# Existing algorithms

[2] Tatsunori Taniai, et al. (2017). Continuous 3D Label Stereo Matching using Local Expansion Moves. *Technical Report 2017*



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# Existing algorithms

Contribution:

1. Disparity of each pixel is over-parameterized by a local disparity plane:

$$d_p = a_p u + b_p v + c_p$$

where $f_p = (a_p, b_p, c_p)$ denotes the disparity plane.

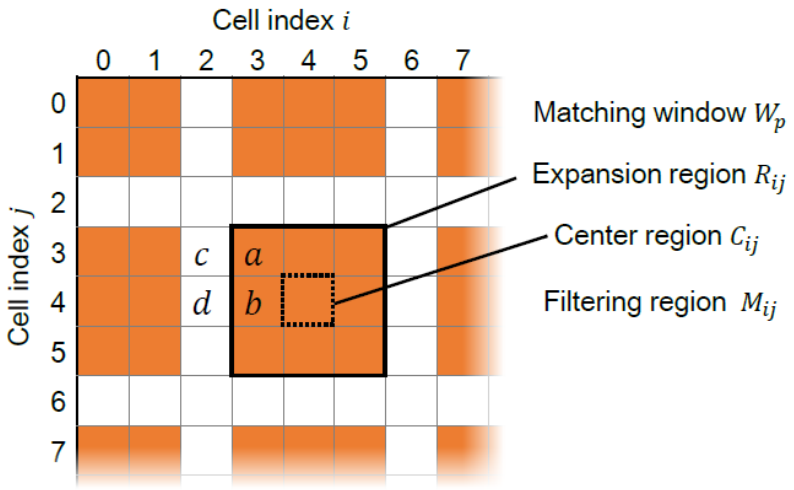
2. We estimate f by minimizing an energy function based on Markov

Random Fields(MRF):

$$E(f) = \sum_{p \in \Omega} \phi_p(f_p) + \lambda \sum_{(p,q) \in \mathcal{N}} \psi_{pq}(f_p, f_q)$$

# Existing algorithms

Post-processing: α - expansion




1. Divide whole image into small cells (5x5), name it as center cell C_ij.
2. Define an expansion region R_ij(3x3 cells).
3. For a random pixel inside C_ij, exert a perturbation to its disparity plane:

$$\alpha_{ij} \leftarrow f_r \text{ with randomly chosen } r \in C_{ij} ;$$
$$\alpha_{ij} \leftarrow \alpha_{ij} + \Delta' ;$$

4. Update f by minimizing E(·), and update perturbation until several times:

$$f \leftarrow \operatorname{argmin} E(f' \mid f'_p \in \{f_p, \alpha_{ij}\}$$
$$|\Delta'| \leftarrow |\Delta'|/2 ;$$

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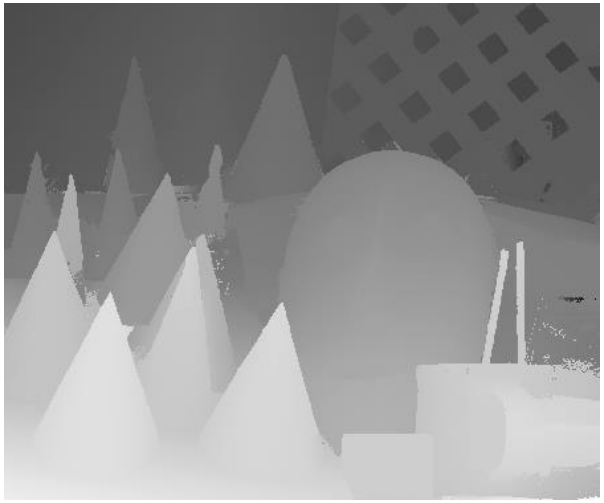
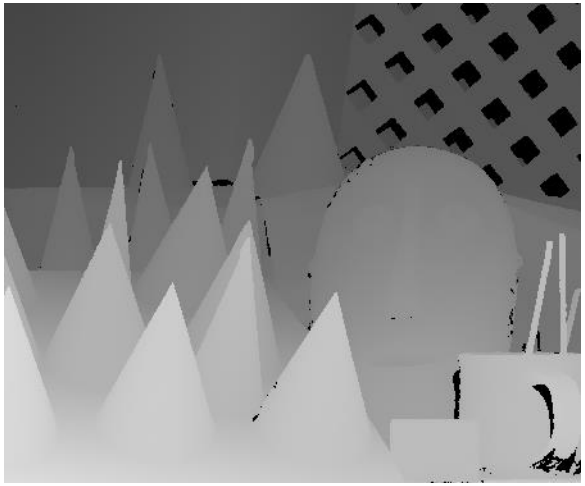
# Existing algorithms

α - expansion : results


Cone2



Cone2 – disparity



Cone2 – ground truth