PatchMatch: A Randomized Correspondence Algorithm for Structural Image Editing

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Need for User Interaction

User Interaction

Roadmap

Problem

Finding nearest neighbor patches is slow
Related Work

- **kd-tree with PCA** [Hertzmann '01]
- **Propagation** [Ashikhmin '01]
- **k-coherence** [Tong '02]

PatchMatch

- **PatchMatch**
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Algorithmic Details

Random Initialization

Propagation

After propagation:
\[ f(x, y) = \text{argmin}_{D} \{ \text{current}, \text{left}, \text{above} \} \]

[Ashikhmin '01]

Random Search
Random Search

Box width: $w$ (image width)

Random Search

Box width: $\alpha w$

Random Search

Box width: $\alpha^2 w$

Random Search

Box width: 1 pixel

Propagation and Search

After propagation and search:

$f(x, y) = \arg\min_{\delta} \{ \text{candidate offsets} \}$

Image Completion

Input

Hole

Output (enlarged)
**Image Completion**

- **Input**
- **Hole + constraints**
- **Output (enlarged)**

**Image Completion (without constraints)**

- **Input**
- **Hole**
- **Output (enlarged)**

**Image Completion (with constraints)**

- **Input**
- **Hole + constraints**
- **Output (enlarged)**

**Retargeting / Reshuffling**

- Image retargeting [Simonov et al.'08]
- 5 minutes per 256x256 input image

**Deformation Constraints**

- Input

**Line Constraints**

- Input
- Improved seam carving [Rubinstein '08]
- Our result
Region Constraints

Reshuffling

Input

[Rubinstein '08] [Wang '08] PatchMatch

Reshuffling

Input

Enlarged Reduced

Summary of Contributions

Local Scale

Boat marked by user

Scaled up, preserving texture

Tree marked by user

Scaled up, preserving texture
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