Review: Image Fusion with Guided Filtering

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Guided Filter Fusion

Basic image fusion

\[ I_A \]

\[ I_B \]
Guided Filter Fusion

Weighted image fusion
Guided Filter Fusion
Multilevel weighted image fusion
Guided Filter Fusion

Weight map construction

- Saliency map
- Guided Filter
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Example 1: Fly

Input image
Example 1: Fly
Saliency maps
Example 1: Fly
Argmax of saliency masks
Example 1: Fly
Filtered masks
Example 1: Fly
Colored output
Example 2: The Crane and the Turtle

Image 1
Example 2: The Crane and the Turtle

Image 2
Example 2: The Crane and the Turtle

Result
Example 3: Bookshelf

Image 1
Example 3: Bookshelf

Image 2
Example 3: Bookshelf

Image 3
Example 3: Bookshelf

Image 4
Example 3: Bookshelf

Image 5
Example 3: Bookshelf

Image 6
Example 3 : Bookshelf

Image 7
Example 3: Bookshelf

Result of $1+2$
Example 3: Bookshelf

Result of full merging
Example 3: Bookshelf

Merging mask
Example 4: Screen reflexion

Image 1
Example 4: Screen reflexion

Image 2
Example 4: Screen reflexion

Image 3
Example 4: Screen reflexion

Image 4
Example 4 : Screen reflexion

Result
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Limitations

Indecision in blurry areas
Limitations

Misalignment
Limitations

Noise highlight
Limitations

Light change
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Implementation

Python implementation

Python 3, using only numpy/scipy:

```python
from fusion import imread, cGFF, imwrite

A = imread("A.jpg")
B = imread("B.jpg")
C = imread("C.jpg")

fused = cGFF([A, B, C])

imwrite("fused.jpg", fused)
```
Implementation

Notebook

```python
from imagerie import *
from scipy.misc import toimage, imsave
from scipy.ndimage.filters import laplace
from scipy.ndimage import uniform_filter, gaussian_filter

plt.rcParams['figure.figsize'] = (14, 8)

flyfront = imread("fly-front.jpg")
flyback = imread("fly-back.jpg")
flyref = imread("fly-reference.jpg")

fig = plt.figure()
fig.add_subplot(1,3,1)
plt.imshow(flyfront)
fig.add_subplot(1,3,2)
plt.imshow(flyback)
fig.add_subplot(1,3,3)
plt.imshow(flyref)
```

```
<matplotlib.image.AxesImage at 0x7f04e2f0e978>
```

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Integration to node-based workflow

Node in Maya
Integration to node-based workflow

Node in Houdini
Integration to node-based workflow

Node in Substance
Integration to node-based workflow

Node-based representation of GFF

A. Two-scale image decomposition

1. Source image $I_1$
2. Source image $I_2$
3. Average filtering
4. Base layer $B_1$
5. Base layer $B_2$
6. Detail layer $D_1$
7. Detail layer $D_2$

B. Weight map construction

1. Saliency map $S_1$
2. Saliency map $S_2$
3. Saliency comparison
4. Weight map $P_1$
5. Weight map $P_2$

C. Two-scale image reconstruction

1. Weighted average
2. Fused base layer $\hat{B}$
3. Fused detail layer $\hat{D}$
4. Fused image $F$
Integration to node-based workflow
Blender compositing nodes
Integration to node-based workflow

Guided Filter for Blender
Integration to node-based workflow

GFF in Blender
Integration to node-based workflow
GFF in Blender
Thank you!
Questions?