

Image Analogies

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Image Analogies



A



A'



B



B'

Image Analogies



Unfiltered source



Filtered source



Unfiltered target

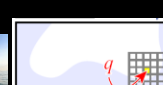
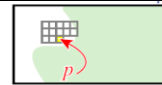
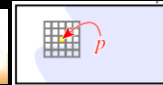


Filtered target

The Approach

Unfiltered source

Filtered source



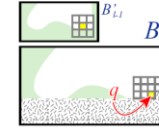
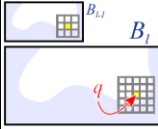
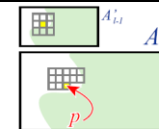
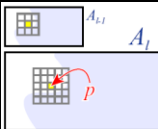
Unfiltered target

Filtered target

The Approach

Unfiltered source

Filtered source



Unfiltered target

Filtered target

The Approach

function CREATEIMAGEANALOGY(A, A', B):

 Compute Gaussian pyramids for $A, A',$ and B

 Compute features for $A, A',$ and B

 Initialize the search structures (e.g., for ANN)

for each level ℓ , from coarsest to finest, **do**:

for each pixel $q \in B'_\ell$, in scan-line order, **do**:

$p \leftarrow \text{BESTMATCH}(A, A', B, B', s, \ell, q)$

$B'_\ell(q) \leftarrow A'_\ell(p)$

$s_\ell(q) \leftarrow p$

return B'_ℓ

function BESTMATCH(A, A', B, B', s, ℓ, q):

$p_{\text{opt}} \leftarrow \text{BESTAPPROXIMATEMATCH}(A, A', B, B', \ell, q)$

$p_{\text{coh}} \leftarrow \text{BESTCOHERENCEMATCH}(A, A', B, B', s, \ell, q)$

$d_{\text{opt}} \leftarrow \|F_\ell(p_{\text{opt}}) - F_\ell(q)\|^2$

$d_{\text{coh}} \leftarrow \|F_\ell(p_{\text{coh}}) - F_\ell(q)\|^2$

if $d_{\text{coh}} \leq d_{\text{opt}}(1 + 2^{L-\ell}\epsilon)$ **then**

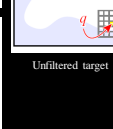
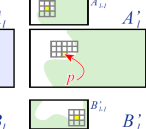
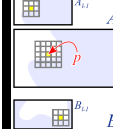
return p_{coh}

else

return p_{opt}

Unfiltered source

Filtered source



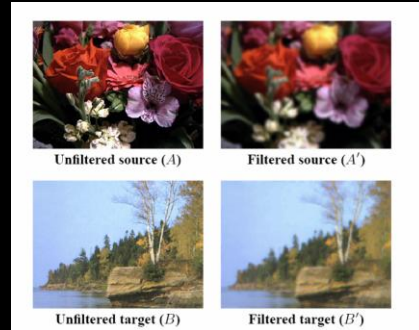
Unfiltered target

Filtered target

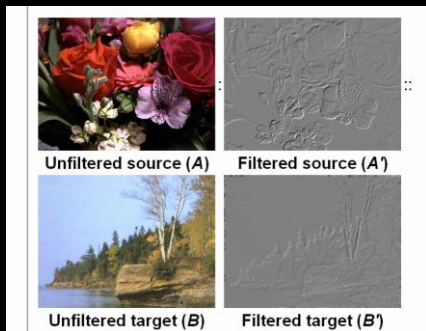
Implementation Details

- Use approximate nearest neighbor search and Ashikhmin's *coherence search* heuristic
- Use *feature vectors* instead of pixel values
 - Feature vector can consist of RGB values plus additional “channels” such as luminance, outputs of derivative filters
- *Luminance remapping* to align color histograms of source and target images

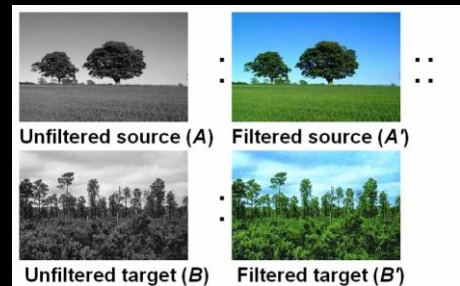
Blur Filter



Edge Filter

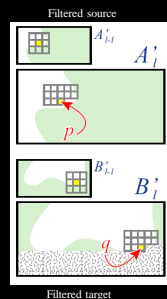


Colorization

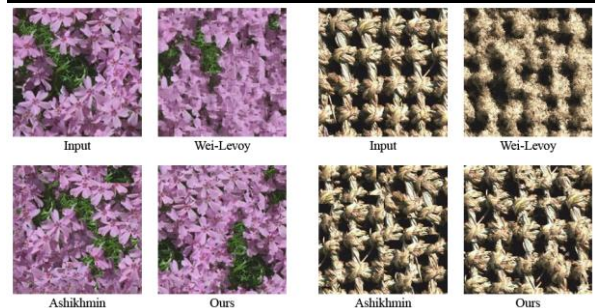


Texture Synthesis

- Source images (A, B) are blank/constant

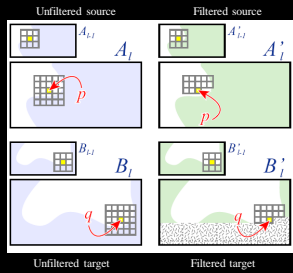


Texture Synthesis

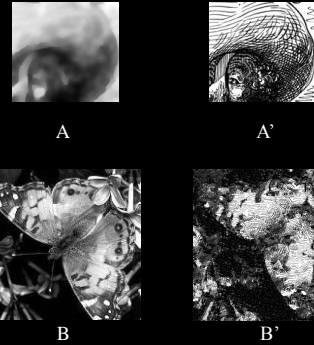


Texture Transfer

- A and A' is the same (or A is a blurred version of A')
- Optional: Tunable weight to control the tradeoff between matching (A, B) and (A', B')



Artistic Filters



Artistic Filters



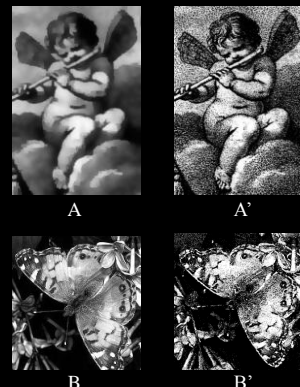
Artistic Filters



Artistic Filters



Artistic Filters



Artistic Filters



Artistic Filters



A

A'



B

B'

Artistic Filters



More Artistic Filters



A

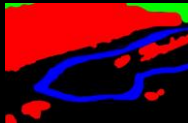
A'



B

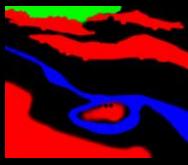
B'

Texture-by-numbers



A

A'

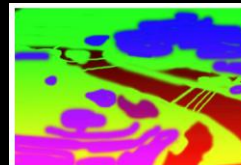


B

B'

- Project idea: inverse “texture by numbers”

Dealing with progressively variant textures



Unfiltered source (A)

Filtered source (A')



Unfiltered (B)

Filtered (B')

Super-resolution



Super-resolution (result!)

