

Image Analogies

SIGGRAPH 2001

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Image Analogies



A



A'



B

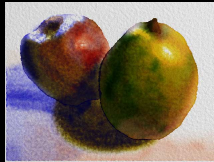


B'

Image Analogies



Unfiltered source



Filtered source



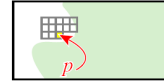
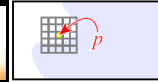
Unfiltered target



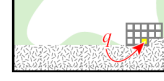
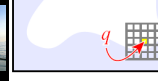
Filtered target

The Approach

Unfiltered source



Filtered source

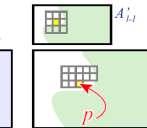
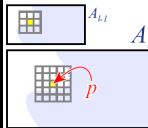


Unfiltered target

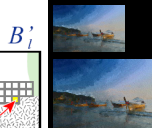
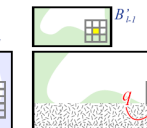
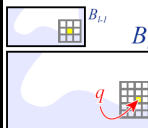
Filtered target

The Approach

Unfiltered source



Filtered source



Unfiltered target

Filtered target

The Approach

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

 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):

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

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

$d_{\text{app}} \leftarrow \|F_\ell(p_{\text{app}}) - F_\ell(q)\|_2^2$

$d_{\text{fin}} \leftarrow \|F_\ell(p_{\text{fin}}) - F_\ell(q)\|_2^2$

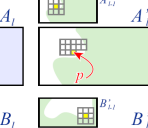
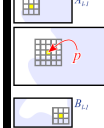
if $d_{\text{fin}} \leq d_{\text{app}}(1 + 2^{2-L}\epsilon)$ **then**

return p_{fin}

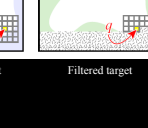
else

return p_{app}

Unfiltered source



Filtered source



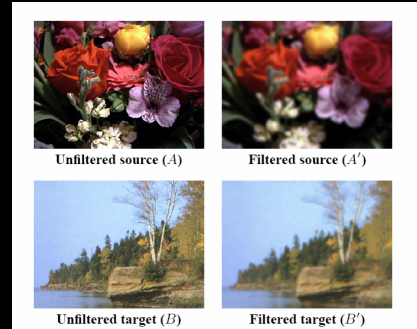
Unfiltered target

Filtered target

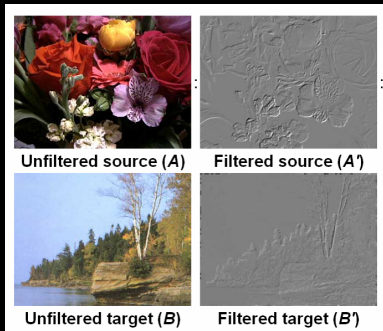
Implementation Details

- Use approximate nearest neighbor search and Ashikhmin's *coherence search* heuristic
- Use *feature vectors* instead of pixel values
 - Feature vector: RGB values & other "channels" luminance, derivative filters, human annotation, ...
- *Luminance remapping* to align color histograms of source and target images

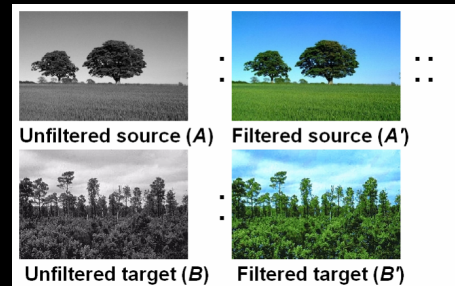
Blur Filter



Edge Filter

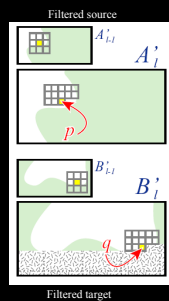


Colorization

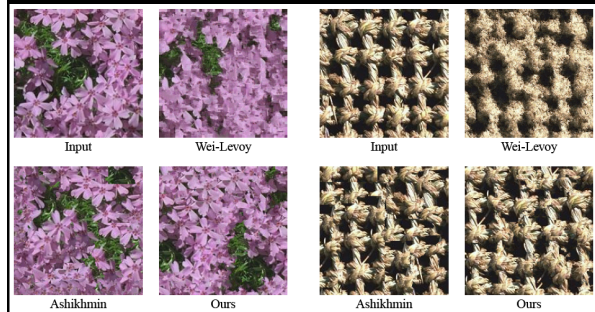


Texture Synthesis

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

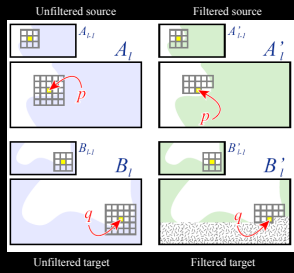


Texture Synthesis

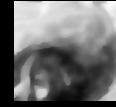


Texture Transfer

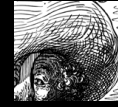
- A and A' is the same (or A is a blurred version of A')
- Option: Weight controls tradeoff between matching (A, B) and (A', B')



Artistic Filters



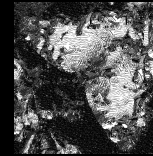
A



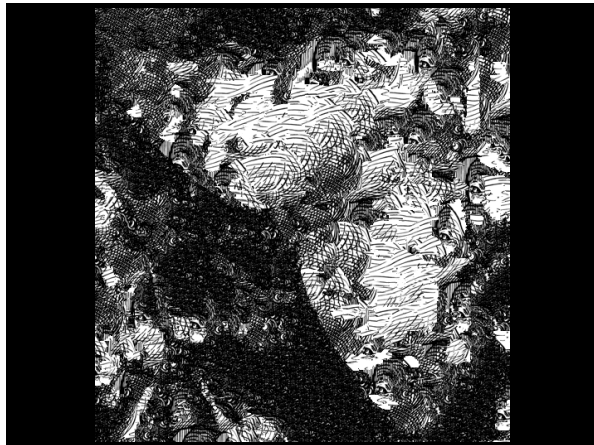
A'



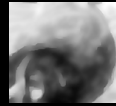
B



B'



Artistic Filters



A



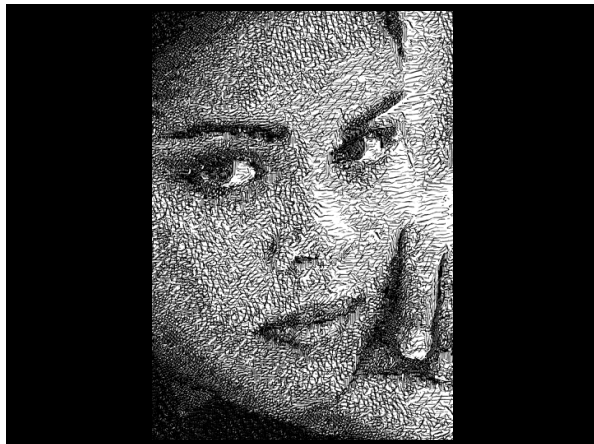
A'



B



B'



Artistic Filters



A



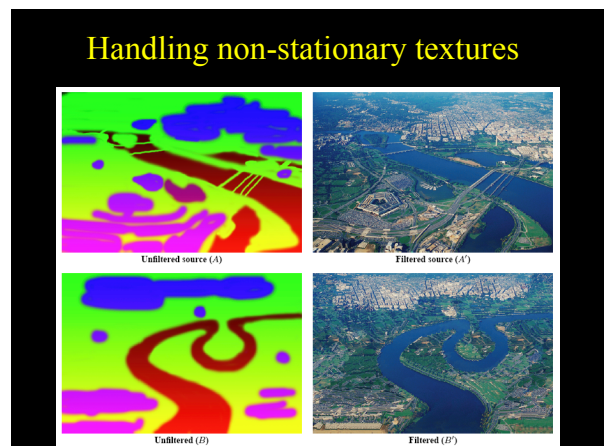
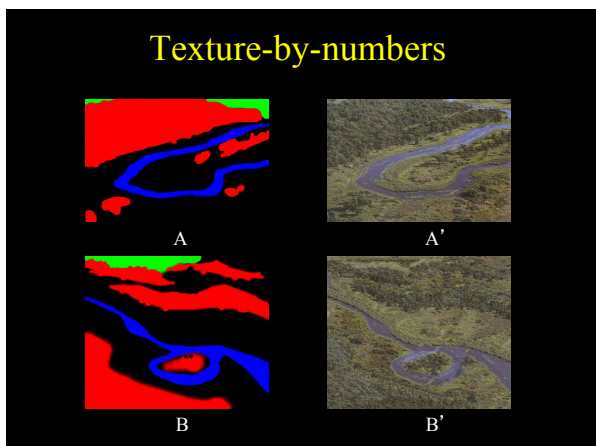
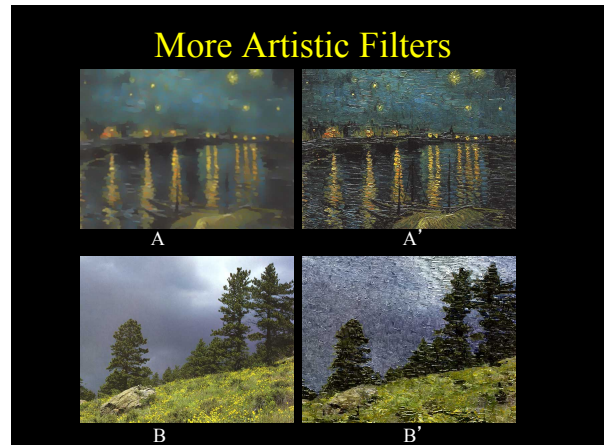
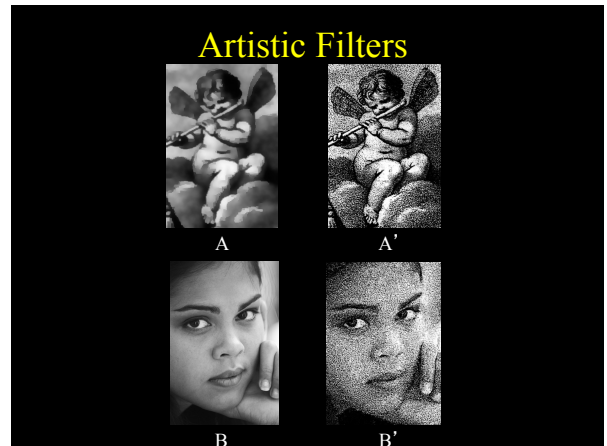
A'



B



B'



Super-resolution

