Image Analogies
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Aaron Hertzmann\textsuperscript{1,2}
Chuck Jacobs\textsuperscript{2}
Nuria Oliver\textsuperscript{2}
Brian Curless\textsuperscript{3}
David Salesin\textsuperscript{2,3}

\textsuperscript{1}New York University
\textsuperscript{2}Microsoft Research
\textsuperscript{3}University of Washington

Image Analogies

The Approach

Unfiltered source
Filtered source

Unfiltered target
Filtered target

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Unfiltered source
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function \textsc{createimageanalog}(A, A', B, B')
\begin{itemize}
  \item Compute Gaussian pyramids for \(A, A', B\), and \(B'\)
  \item Compute features for \(A, A', B\), and \(B'\)
\end{itemize}

for each level \(\ell\), from coarsest to finest, do

for each pixel \(p \in \text{levels}(\ell)\), in scan-line order, do

\(d(p) = \text{match}(A, A', B, B', s, t, q)\)
\(e(p) = \text{match}(A, A', B, B', s, t, q)\)
\(r(p) = \text{match}(A, A', B, B', s, t, q)\)
\(d(p) = d(p)\)
\(e(p) = e(p)\)
\(r(p) = r(p)\)

return \(B\)

function \textsc{match}(A, A', B, B', s, t, q)
\begin{itemize}
  \item Compute approximate match for \(A, A', B, B', s, t, q\)
  \item Compute distance for \(A, A', B, B', s, t, q\)
\end{itemize}

if \(d(p) \leq e(p) + 2 \times r(p)\)
  return \(d(p)\)
else
  return \(e(p)\)
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 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

More Artistic Filters

Texture-by-numbers

Handling non-stationary textures
Super-resolution

A

A'

B

B'