Video based Non-photo realistic Rendering

Kihwan Kim and Irfan Essa

College of Computing, Georgia Institute of Technology
{kihwan23, irfan}@cc.gatech.edu

Samsung STAR/SAIT project 2008

Goal

-To make a non-photorealistic rendering system generating various artistic styles such as oil painting and water-colorization from pictures and videos.

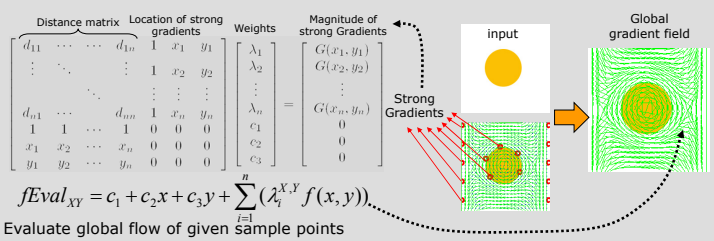
(1) Making global gradient field using Radial Basis function.

(2) Keeping temporal coherence based on optical flow.

(3) Mimic the water-color simulation using morphology based filters and dispersion map from global gradient.

Our Approach

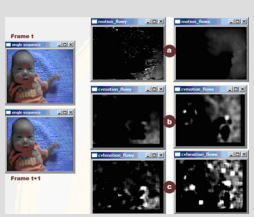
- Global gradient field from Radial Basis function



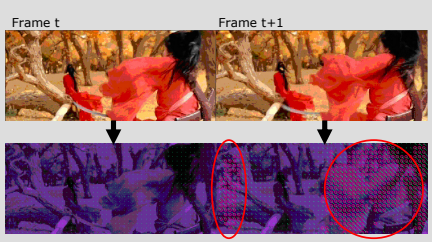
$$fEval_{XY} = c_1 + c_2 x + c_3 y + \sum_{i=1}^{n} (\lambda_i^{X,Y} f(x,y))$$

Evaluate global flow of given sample points

- Updating foreground from motion flow (optical flow) keeps temporal coherence between frames in video.

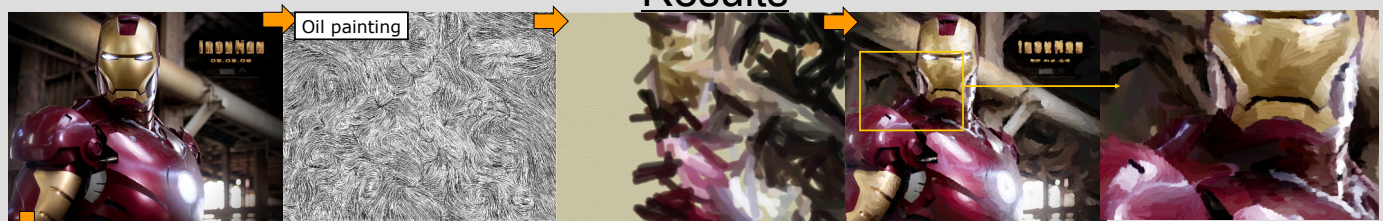


User can choose various optical flow methods:
(a) Black-Anandan (b) Lukas-Kanade (c) Horn-schunck

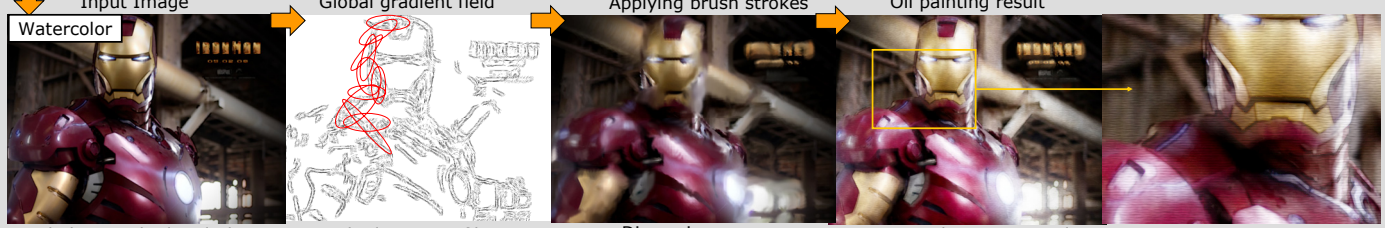


- Water-colorization performed by applying morphology, perlin noise, edge darkening, pigment dispersion and canvas texture synthesis.

Results

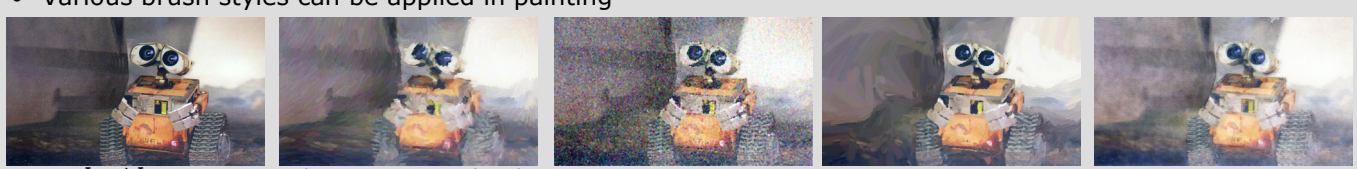


Input Image | Global gradient field | Applying brush strokes | Oil painting result



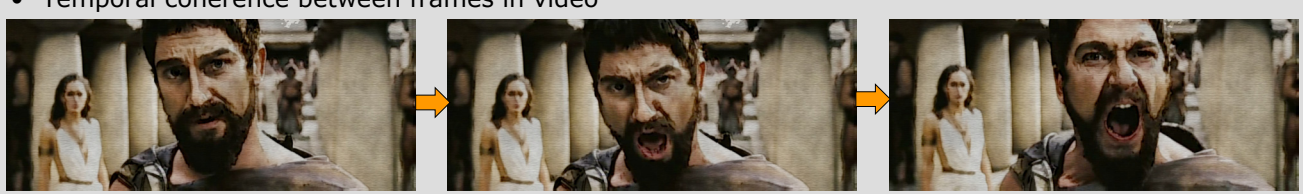
Morphology and edge darkening | Apply dispersion filters | Dispersion map | Water-colorization result

- Various brush styles can be applied in painting

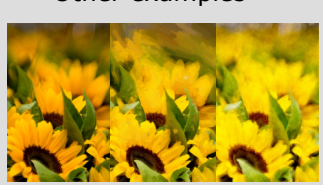


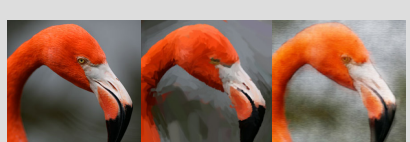
Input Image | Oil painting :Van Gogh style | Oil painting :Pointillism style | Oil painting :Impressionism | Water-colorization

- Temporal coherence between frames in video



- Other examples





Related project : James Hays and Irfan Essa "Image and video based painterly animation" (NPAR 2004)

- For more information : http://www.cc.gatech.edu/~kihwan23 and http://cpl.cc.gatech.edu/projects/painterlyrendering