• The bilateral filter is becoming in computational photography.

• Many applications with high quality results.
Photographic Style Transfer
[Bae 06]
Photographic Style Transfer

[Bae 06]
Tone Mapping

[Durand 02]
Tone Mapping

[Durand 02]
Cartoon Rendition
[Winnemöller 06]
6 papers at SIGGRAPH’07
Goal: Image Smoothing

Split an image into:

- large-scale features, structure
- small-scale features, texture
Naïve Approach: Gaussian Blur

Gaussian Convolution

input

BLUR

(smoothed (structure, large scale))

HALOS

(residual (texture, small scale))
Impact of Blur and Halos

- If the decomposition introduces blur and halos, the final result is corrupted.

Sample manipulation: increasing texture (residual $\times$ 3)
Bilateral Filter: no Blur, no Halos

input

smoothed (structure, large scale)

residual (texture, small scale)

edge-preserving: Bilateral Filter
increasing texture with Gaussian convolution

HALOS
increasing texture with bilateral filter

NO HALOS
Many Other Options

• Bilateral filtering is not the only image smoothing filter
  – Diffusion, wavelets, Bayesian…

• We focus on bilateral filtering
  – Suitable for strong smoothing used in computational photography
  – Conceptually simple
Content of the Course

All you need to know about bilateral filtering:

- Definition of the bilateral filter
- Parameter influence and settings
- Applications
- Relationship to other filters
- Theoretical properties
- Efficient implementation
Course Material

- Course webpage (google “bilateral filter course”):
  http://people.csail.mit.edu/sparis/siggraph07_course/
  - Detailed course notes
  - Slides (soon)
  - C++ and Matlab code
  - Links
A Gentle Introduction to Bilateral Filtering and its Applications

- From Gaussian blur to bilateral filter – S. Paris
- Applications – F. Durand
- Link with other filtering techniques – P. Kornprobst
- Implementation – S. Paris
- Variants – J. Tumblin
- Advanced applications – J. Tumblin
- Limitations and solutions – P. Kornprobst