Overview of Computational Photography Papers
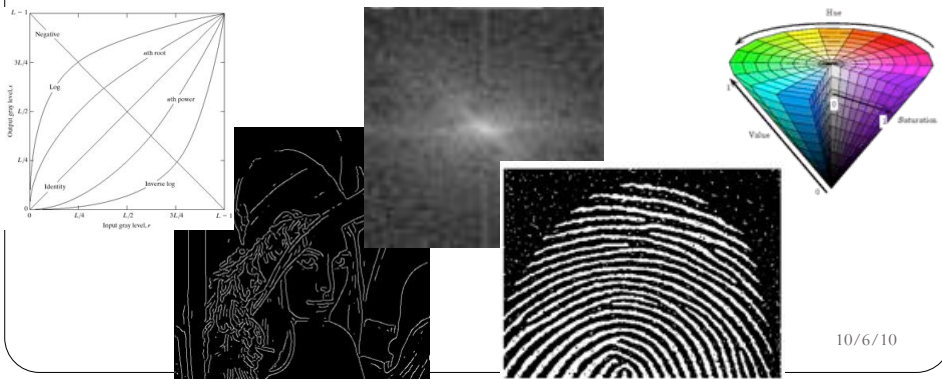
Jesus J Caban 10/6/10

Outline

- Questions about assignment #2?

- Today:
  - Intro to Computational Photography - Topics
  - Image Relighting (E. Baumel)

- Monday:
  - Color Manipulation (J. Shin)
  - Camera Shake(F. Zafar)

- Wednesday:
  - Camera Motion (R. Dighade)
  - Assignment #2 due

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So far...

- We have seen a lot of image processing

- Most of the core concepts of image processing have been covered

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Computational Photography - Topics

1. Image Relighting
2. Image Completion
3. Editing and Pasting
4. Removing Camera Shake and Motion Blur
5. Image Warping and Morphing
6. Large Photo Collections
7. Image and Video Matting

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Computational Photography

- Computational Photography:
  - Image algorithms are applied to one or more photographs to create images that go beyond the capabilities of traditional imaging systems

  - Some of these techniques are now being incorporated into digital still cameras.

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Image Stitching

Goal: *Combine pixels from multiple images to compute a bigger image.*

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Autostitch

[Brown 2003]

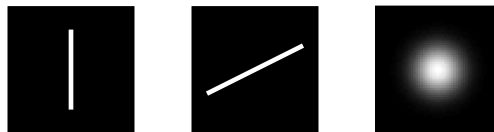

Video Panorama

[Wilburn 2005]

[Agarwala et al, 2005]

Image Deblurring

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Existing work on image deblurring
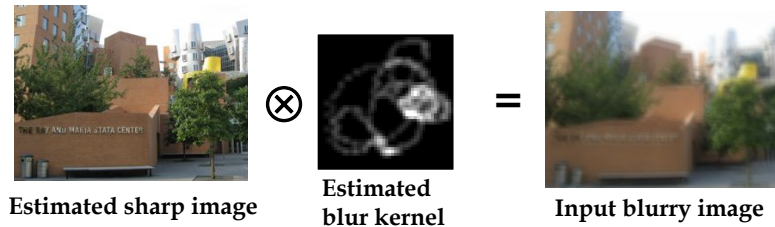
Software algorithms for natural images

– Many require multiple images

– Mainly Fourier and/or Wavelet based

– Strong assumptions about blur

  → These assumptions are not true for camera shake

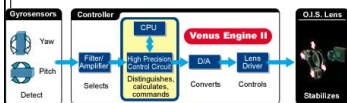**Assumed forms of blur kernels**

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Simple Approach

Estimated sharp image ⊗ **Estimated blur kernel** = **Input blurry image**

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Existing work on image deblurring

Hardware approaches

Ben-Ezra & Nayar　　**Raskar et al. SIGGRAPH 2006**

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Matting

- Object cut and paste
- Create binary / non-binary masks

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Seam Carving

Video

Image Resizing

Shai Avidan
Mitsubishi Electric Research Lab
Ariel Shamir
The interdisciplinary Center & MERL

Motion Magnification

Ce Liu
Antonio Torralba
William T. Freeman
Fredo Durand
Edward H. Adelson

Massachusetts Institute of Technology
Computer Science and Artificial Intelligence Laboratory

SIGGRAPH 2005
The 32nd International Conference on Computer Graphics and Interactive Techniques

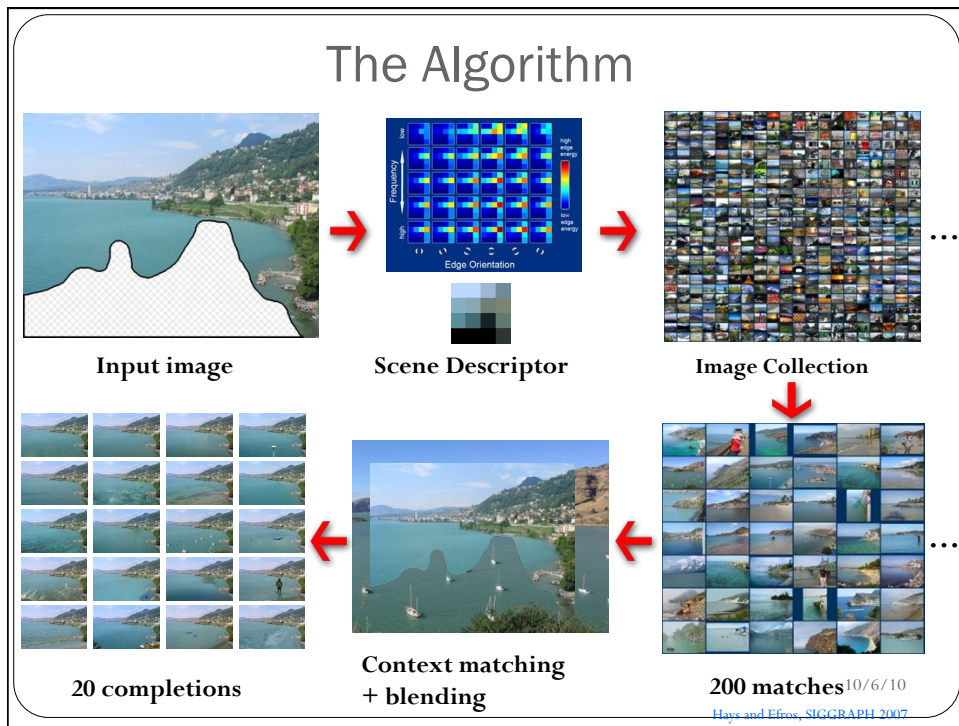Scene Completion using Millions of Photographs
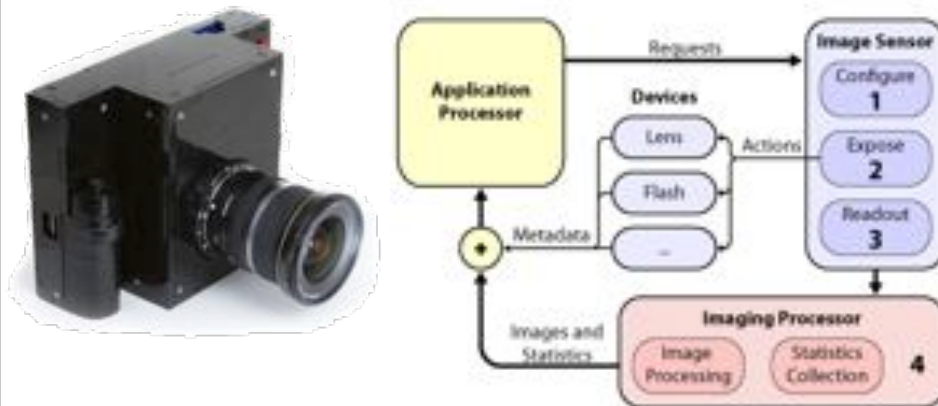
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Hays and Efros, SIGGRAPH 2007

Scene Completion using Millions of Photographs

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The Algorithm

Input image   Scene Descriptor   Image Collection

20 completions   Context matching + blending   200 matches

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Hays and Efros, SIGGRAPH 2007

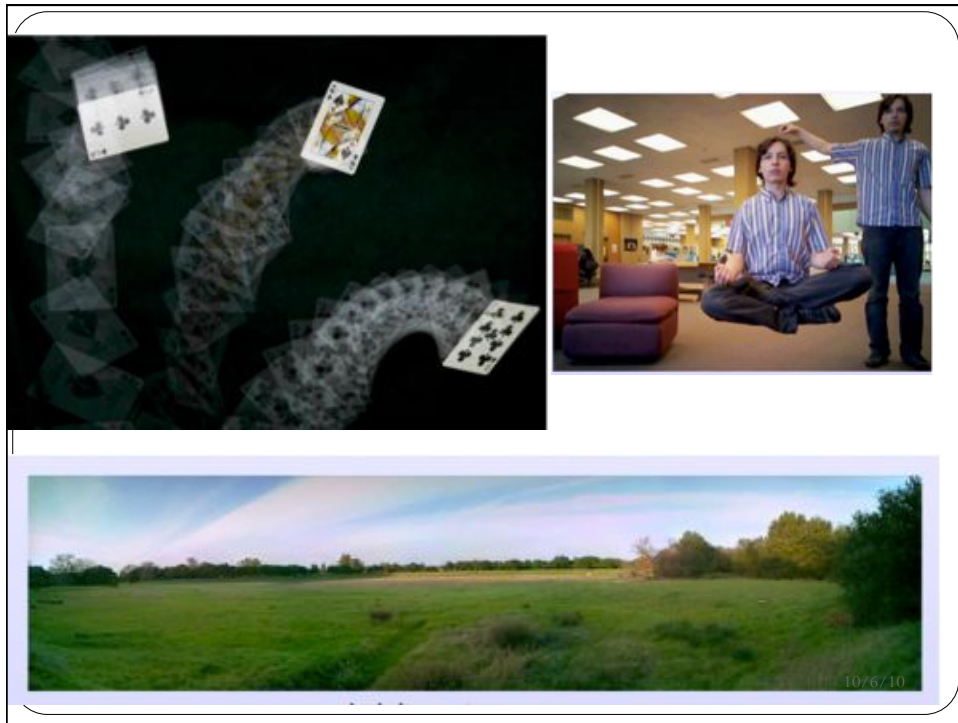10/6/10

Hays and Efros, SIGGRAPH 2007

The FrankenCamera

A programmable Camera Platform

- An API to program for the camera
    - F2 Frankencamera & Nokia N900
    - Example applications

- Programmer has full control over sensor settings and supplemental statistics

F2 Frankencamera   Nokia N900

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Comp. Photography Papers

● Read them!

● Most of them have videos / web pages (take a look at them before class!)

● Get motivated! Come-up with ideas for future project!

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