15-463 (15-862): Computational Photography
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Staff

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Web Page

- http://graphics.cs.cmu.edu/courses/15-463/

Discussion Forum:

- Googlegroups ???
Today

Introductions
Why Computational Photography?
Overview of the course
Administrative stuff
A bit about me

Alexei (Alyosha) Efros
Associate Professor in Robotics and CSD
also work with colleagues in Paris and Oxford

Teaching
The plan is to have fun and learn cool things, both you and me!
Social warning: I don’t see well

Research
PhD Thesis on Texture and Action Synthesis


*Smart Erase* button in **MS Digital Image Pro:**

Antonio’s son cannot walk but he can fly😊
More previous work

Automatic Photo Pop-Up (SIGGRAPH 2005)
Amateur Photographer
What is Computational Photography?

• “computational techniques that enhance or extend photography”

• Another medium for visual expression
Prehistoric Painting, Lascaux Cave, France
~ 13,000 -- 15,000 B.C.
The Empress Theodora with her court.
Ravenna, St. Vitale 6th c.
Nuns in Procession. French ms. ca. 1300.
Depicting Our World: Renaissance

North Doors (1424)  Lorenzo Ghiberti (1378-1455)  East Doors (1452)
Depicting Our World: Renaissance

Piero della Francesca,
The Flagellation (c.1469)
Depicting Our World: Toward Perfection

Jan van Eyck, *The Arnolfini Marriage* (c.1434)
Depicting Our World: Toward Perfection

Lens Based Camera Obscura, 1568
Depicting Our World: Perfection!

Still Life, Louis Jaques Mande Daguerre, 1837
Depicting Our World: Realism?
Paris, according to Flickr
Paris, according to Google StreetView

Knopp, Sivic, Pajdla, ECCV 2010
Paris, according to me
After realism...

Monet,
La rue Montorgueil
Depicting Our World: Ongoing Quest

Pablo Picasso  
David Hockney
Better than realism?

David Hockney, Place Furstenberg, (1985)
Which one is right?

Multiple viewpoints

David Hockney, Place Furstenberg, 1985

Single viewpoint

Alyosha Efros, Place Furstenberg, 2009
Depicting Our World: Ongoing Quest

Enter Computer Graphics...
Traditional Computer Graphics

3D geometry

Simulation

GRAPHICS
State of the Art

• Amazingly real
• But so sterile, lifeless, futuristic (why?)
The richness of our everyday world

Photo by Svetlana Lazebnik
Beauty in complexity

University Parks, Oxford
Which parts are hard to model?
People

From “Final Fantasy”

On the Tube, London
Faces / Hair

From “Final Fantasy”

Photo by Joaquin Rosales Gomez
Hyper-humans
Urban Scenes

Virtual LA (SGI)

Photo of LA
Nature

River Cherwell, Oxford
The Realism Spectrum

**Computer Graphics**
- easy to create new worlds
- easy to manipulate objects/viewpoint
- Very hard to look realistic

**Computational Photography**

**Photography**
- instantly realistic
- easy to acquire
- very hard to manipulate objects/viewpoint
Virtual Real World

Campanile Movie
http://www.debevec.org/Campanile/
Course Outline

• (cool) Image Processing

• Lots of Visual Data

• Cameras and 3D
Project 1

Images of the Russian Empire -- colorizing the Prokudin-Gorskii photo collection
Programming Project 2

TBD
Programming Project 3

Face warping and morphing
Programming Project 4

Photo Mosaics

Full screen panoramas (cubic): http://www.panoramas.dk/
Programming Project 4

Automatic Mosaic Stitching
Programming Project 5

Tour Into the Picture
Final Project

Something cool!!!
Administrative Stuff

Grading
- Written and Programming Assignments (60%)
- Exam (20%)
- Final Project (20%)
- Class Participation: priceless

Late Policy
- Five late days total, to be spent wisely
- 20% off from each extra late day

Cheating
- Let’s not embarrass ourselves

Hardware/Software
- CMU clusters
- MATLAB
Textbook

http://szeliski.org/Book/
Cameras

Really cool
Not too expensive nowadays (<$150)

e.g. Canon A1100
General Comments

Prerequisites

• Linear algebra!!!
• Some computer graphics, vision, or image processing is useful, but not required.

Emphasis on programming projects!
• Building something from scratch

Graduate Version:
• Need to do more on each project, plus a final paper

Misc:
• No laptops, no cell phones, smartphones, etc.
A Fair Warning…

Reasons not to take the class:
• Lots of work
• Need time to think, not just follow instructions
• Not worth it if you don’t enjoy it
• Not for these who care too much about their grade

Reasons to take the class:
• It’s your reward after 3 grueling years 😊
• You get to create pictures, unleash your creative potential
• Interested in grad school?