COMP 6786 — COMPUTATIONAL PHOTOGRAPHY

Winter 2009

Department of Computer Science
Memorial University of Newfoundland

Instructor:
Name: Minglun Gong
Phone: 737-3589
E-mail: gong@cs.mun.ca
Office: ER-3014
Office hour: Tuesday & Thursday 12:00~2:00pm

Lectures:
Time slot: Tuesday & Thursday 10:00~11:30am
Room: EN-2022
Website: http://www.cs.mun.ca/~gong/Courses/comp6786

Course Description:
In recent years, the fields of computer graphics, computer vision and photography have converged into an active research area: computational photography. The goal of this research area is to explore new techniques for capturing real world objects and environments. The output of these techniques is an ordinary photograph, but the one that could not have been taken by a traditional camera.

This course studies recent algorithms in the area of computational photography. Topics include image mosaicing, high dynamic range imaging, matte extraction, flash imaging, coded aperture imaging, coded exposure imaging, light field photography, etc. To learn hands-on, students will be asked to implement and present course projects at the end of the term.

Prerequisites:
This course is offered to all students with knowledge in any of the three core areas: computer vision, computer graphics, or photography. Knowledge in Java programming and basic image handling is required.

Evaluation:
Assignments: 20%
Literature review and presentation: 15%
Project and presentation: 35%
Final exam: 30%
Course Outline:

Introduction:
- Digital Photography
- Image Processing
- Computer Graphics
- Computer Vision

Advanced Photo Editing
- Matte Extraction
- Digital Photomontage
- Image Deburring
- Super-resolution

Multi-Exposure Imaging:
- Image Mosaicing
- High Dynamic Range Imaging
- Flash/No-flash Imaging
- Multi-flash Imaging

Modified Capturing Device:
- Coded Aperture Imaging
- Coded Exposure Imaging
- Lightfield Imaging
- Catadioptric Imaging

Modified Lighting Device:
- Dual Photography
- Image-based Relighting

Reference Books:

Title: Computational Photography (Synthesi s Lectures on Computer Graphics and Animation)
Authors: Ramesh Raskar & Brian Barsky
Publisher: Morgan & Claypool Publishers
ISBN: 1598292064
Published: October 7, 2007

Title: Imaging Beyond the Pinhole Camera (Computational Imaging and Vision)
Authors: Kostas Daniilidis & Reinhard Klette
Publisher: Springer
ISBN: 1402048939
Published: February 13, 2007

Title: High Dynamic Range Imaging: Acquisition, Display, and Image-Based Lighting (The Morgan Kaufmann Series in Computer Graphics)
Authors: Erik Reinhard, Greg Ward, Sumanta Pattanaik, & Paul Debevec
Publisher: Morgan Kaufmann
ISBN: 0125852630
Published: August 24, 2005

Title: Computational Photography: Mastering New Techniques for Lenses, Lighting, and Sensors
Authors: Ramesh Raskar and Jack Tumblin
Publisher: A K Peters
ISBN: 1568813139
Published: March 1, 2009