Visual Computing
CS 211A
The Course

• Introductory Graphics, Vision and Image Processing course
• Prerequisite for Advanced Graphics and Vision courses
• Visual Computing concentration
Course Format

• Lecture Format
  – Text Book: Intro to Visual Computing by Majumder and Gopi

• 4 Programming Assignments (2 people group)
  – IP, Vision, Graphics, Final project

• 2 Midterms and Final

• Use the notebook effectively

• Schedule is online
Grading

• Do not worry about grades
• Learning is the priority
• Tentative Policy
  – Programming Assignment – 30%
  – Midterm – 25%
  – Final – 40%
  – Pop Quiz – 5%
  • Every Monday beginning of class
TA Help

- Teaching assistant
  - Mahdi Abbaspour Tehrani

- Reader
  - Twaha Ibrahim
Office Hours

- Discussion – Wed - 7:00-7:50pm
- TA hours
  - Fri – 3-4pm
  - Tues – 4-5pm
- Instructor hours
  - Thurs – 3-4pm
Course Motivation

• What is Visual Computing?
  – Use of computing to perform the functions of the human visual system

• Traverses within several traditional domains
  – Computer Vision
  – Computer Graphics
  – Image Processing

• Addresses converging domains
Course Organization

- Image-based visual computing
- Geometric visual computing
- Radiometric visual computing
- Visual content synthesis
Course Organization

- **Image-based visual computing**
  - Low level vision in eye

- **Geometric visual computing**
  - Higher level vision
  - Combining information from two eyes

- **Radiometric visual computing**
  - Processing light and object interaction

- **Visual content synthesis**
  - Synthesize realistic 3D worlds
Image Based Visual Computing

- Detecting features
- Background removal
- Image Segmentation
Geometric Visual Computing

- Detecting shapes
  - Binocular cues
  - Shading cues
  - Texture Cues
  - Motion Cues
Radiometric Visual Computing

- High dynamic range imaging

Sky oversaturated
Ground undersaturated
HDR image

- Perceiving reflectances
Visual Content Synthesis

- Can we reverse engineer?
  - Fool the eye? (e.g. Perfect Storm)

- Effects
  - Geometry
  - Lighting
  - Material
  - Motion
  - Trade off between time and quality
Bump and Environment Map
With more time...
With more time...
Materials: Subsurface Scattering
Materials: Transluscency

Different levels of subsurface scattering (increasing from left to right) on Venus
Merge real and synthetic

Show Fiat Lux
Simulation
Non Photorealistic Rendering

Photorealistic

Illustrations

Painterly Rendering

Dithering

Pen and Ink

Engraving

Fur and Grass
This class

- We will NOT learn ALL of these
- Provide you with the fundamentals so that you can learn all of these