Introduction Image Analysis & Computer Vision

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CS/BIOEN 6640 FALL 2012

SCI INSTITUTE

Courses and Seminars related to Research in Image Analysis

SoC Image Analysis Track (Director Tom Fletcher) (click)

Fall 2012:

- Image Processing CS 6640/ BIOEN 6640

Spring 2011:

- 3D Computer Vision CS 6320
- Advanced Image Processing CS 7960
- Mathematics of Imaging BIOEN 6500

Fall 2011:

- Image Processing Basics CS 4961
- Image Processing CS 6640

On demand:

- Special Topics Courses: Non-Euclidean Geometry, Non-Param. Stats, ..

Seminars:

- Seminar Imaging “ImageLunch” CS 7938: weekly Mondays 12 to 1.15, WEB 3670

CS/BIOEN 6640 F2012

For class:

- 1) Go to the web-site: http://www.sci.utah.edu/~gerig/CS6640-F20102/CS6640-F2012.html and get familiar with the contents.
- 2) Look over the instructions w.r.t. honor code and CADE lab.
- 3) Look at the midterm exam and final project due dates and mark those on your calendar.
- 5) Purchase the book using your preferred method.
- 6) Do the first reading assignments.
- 7) Participate in the discussion on familiarity with Matlab (novice, medium, proficient).

CS/BIOEN 6640 F2010

For class:

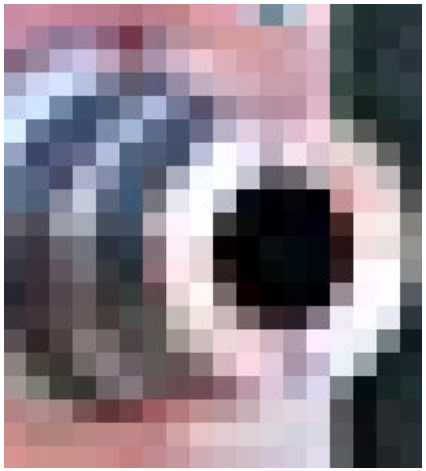
- We will not use email for communication, but all materials and deadlines are announced on the web-page.
- The web-site provides downloads for additional materials and handouts.
- The syllabus is not completely rigid and fixed, and some topics will develop as the class continues.
- We will primarily use MATLAB (no extensions and additional libraries) for the projects. You can use CADE lab licenses or purchase a personal student license. C++ is an option (see web-page).
- Etc.

Goals

- to tell you what you can do with digital images
- to show you that doing research in computer vision and image analysis is fun and exciting
- to demonstrate that image processing is based on strong mathematical principles, applied to digital images via numerical schemes
- to show you that you can solve typical image processing tasks on your own

Image Sensors

Digital Image

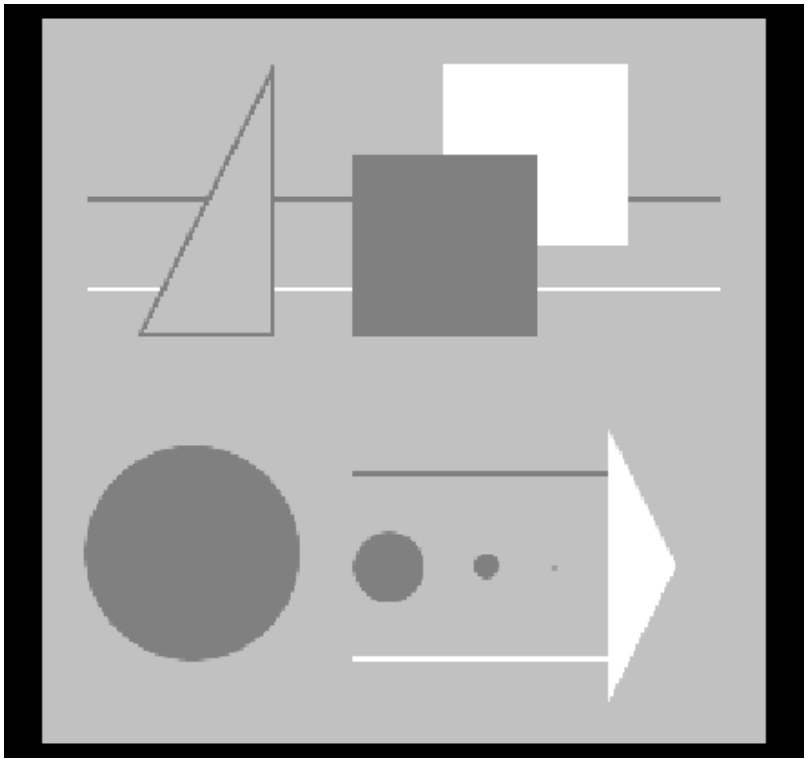


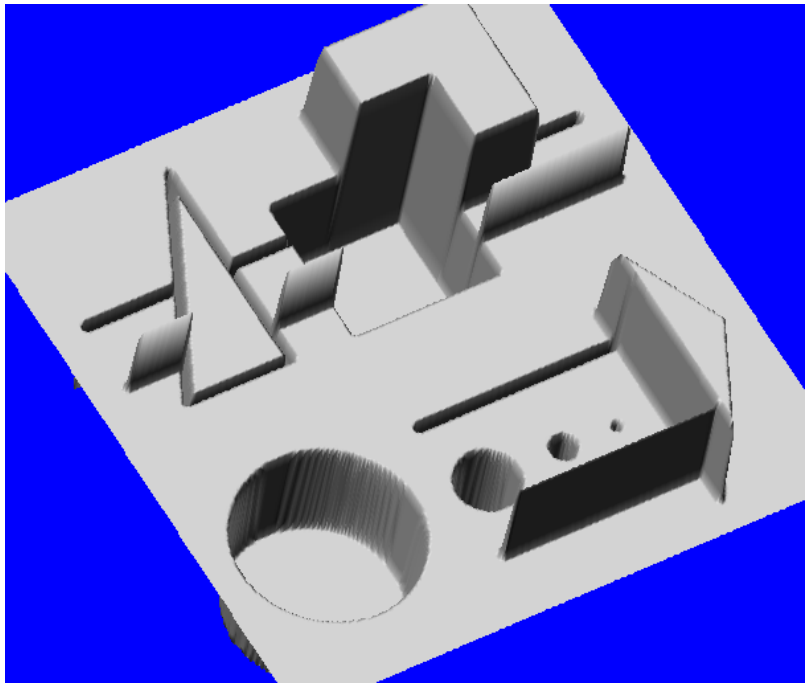
Digital Image

Each cell has number, either a scalar (black and white) or a vector (color).

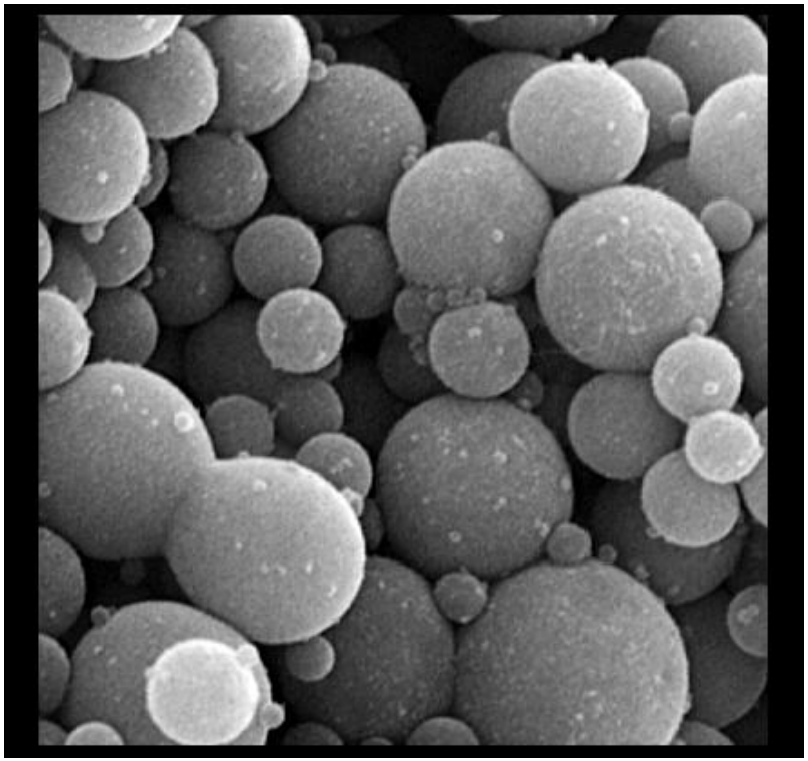
Discrete representation of continuous world (sampling with aperture).

Digital Images





Digital Images



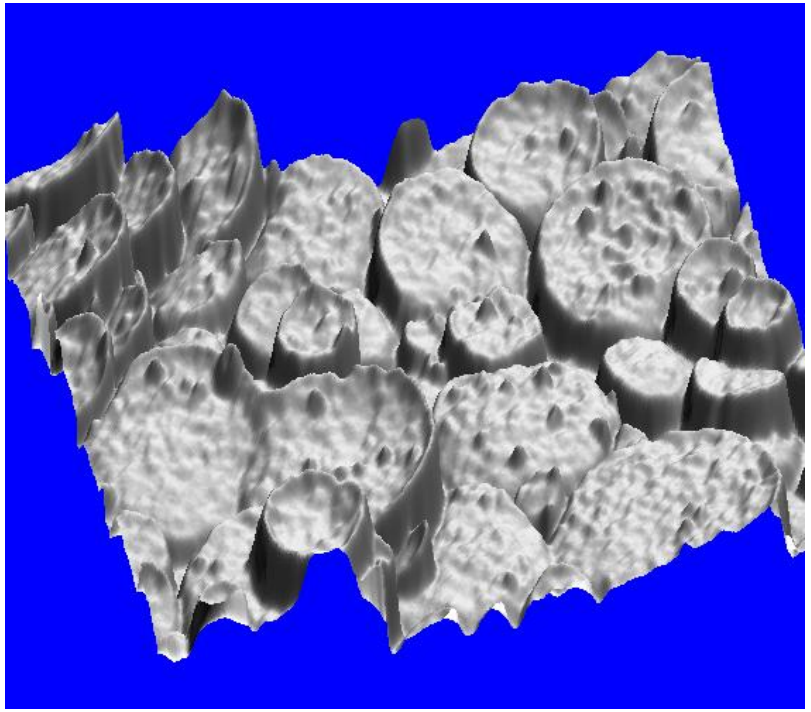


Image Processing

- Input: Digital images
- Output: set of measurements, models, morphometric measurements, objects in abstract representation
- Key procedures:
  - Preprocessing, filtering, correction for artefacts
  - Geometric transformations (image registration)
  - Feature detection (edges, lines, homogeneous patches, texture)
  - Grouping of features to objects
  - Model-based versus data-driven segmentation
- Needs:
  - Math, Algorithms
  - Numerical implementations
- Excellent material: http://homepages.inf.ed.ac.uk/rbf/CVonline/

Why Image Analysis?

- Image Analysis and Computer Vision offer exciting research projects.
- Ideal area for CS (algorithms, math, coding, visualization, data structures …), ECE (robotics, pattern recognition, signal processing), BioEng ((bio)medical image analysis, and ME (robotics)
- Faculty at SCI from SoC, ECE, BioEng:
  - Ross Whitaker, Sarang Joshi, Guido Gerig, Tolga Tasdizen, Tom Fletcher, Marcel Prastawa, Rob MacCleod

Next Lecture Wed Aug 22

- Read Preface and Chap 1 of the G&W book (pdf's on web-page).
- Get familiar with class web-page.
- Purchase class book.
- others