CSE 554

Course Projects

Fall 2016
Basic Requirement

• Using geometric algorithms to solve real-world problems in biomedicine
  – Not limited to algorithms in the Modules
  – Not necessary to completely solve the problem, but need to show sufficient progress towards a solution

• Distributable tool
  – Implemented in mainstream languages: C/C++, Java, Python, etc., or as plug-ins to existing software (e.g., ImageJ, Chimera)
    • Prototyping in Mathematica is recommended
  – A graphical user interface (GUI) may be required
Guidelines

- Work individually
- Choose any language you prefer
  - OK to use existing packages/libraries, but need to demonstrate sufficient effort (i.e., algorithm design, coding) by yourself
Finding a problem

• Avoid problems that are too simple…
  – E.g., edge detection, image blurring, or anything that can be solved by a few Matlab/Mathematica/Python commands.

• … or too hard
  – E.g., automatic segmentation of X, a complete system for doing Y, etc.

• *If you find a problem by yourself, I expect to have at least one conversation with you before I accept your proposal.*
Finding a problem

• Pick a problem mentioned today
  – Tracking cornea ulcer
  – Measuring sperm cell length
  – Depth measurement on scapula
Finding a problem

• Where to look for your own topic:
  – Your friends who work on image-related research
  – Faculty in Med School, BME, Biology, Chemistry, etc.
    • Many faculty working on imaging can be found through Imaging Science Pathway: http://imagingpathways.wustl.edu/
  – Open problems of current interest
    • Check for research papers in imaging-related conferences (e.g. MICCAI) and journals (e.g., IEEE TMI)
    • Make sure you can find sufficient data to develop and test your tool.
Finding a problem

- Example problems in the past

DNA Gel Electrophoresis Analyzing Tool
(Gabriel Stancu)
Finding a problem

- Example problems in the past

Measuring small bowel length
(Billy Bennett)
Finding a problem

• Example problems in the past

Analyzing 3D cell shape in 2-photon microscopy
(Aron Lurie and Daniel Melzer)
Finding a problem

• Example problems in the past

Registering deforming heart surfaces
(Christopher Gloschat)
Project Proposal

- Due: Nov. 2 (next Wednesday) by email to instructor
- Contents
  - What is the problem
  - What are the required and wish-list features
  - Timeline of development (e.g., milestones)
Final Presentation

- Date: Dec 5 (Monday)
- A short in-class live demo of what you have accomplished
- 80% of course project grade
Project Hand-in

- **Due:** Dec 12 (Monday)
- **Contents**
  - Source code, executable tool (or plug-in), and test data
  - Project report
    - What required/wishlist features you have accomplished
    - Description of core algorithms, significant coding components, GUI development
    - A clearly-written Readme that describes how to use your tool
    - Any known bugs and future work
- **20% of course project grade**
Helpful Materials

• **ImageJ**: Open source image processing toolkit in Java
  - Takes care of basic I/O, display, and interaction.
  - Write your code as a plug-in

• **3D programming**
  - OpenGL: Industrial standard 3D library for C/C++
    - Great tutorial lessons: [http://nehe.gamedev.net/lesson.asp?index=01](http://nehe.gamedev.net/lesson.asp?index=01)

• **GUI programming in C++**