CS164: Computing with Physical Objects

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Basic Representations and Algorithms for 2D/3D Shape and Motion Modeling

- Common core of computational tools for those areas of CS dealing with the physical world:
  - Computer Graphics
  - Computer Vision
  - Robotics
  - Geographical Information Systems
  - Computational Structural Biology
  - …

Course Outline

- 2D/3D transformations
- Parametric curve and surface representations
- Elementary differential geometry
- Sampled shapes and shape acquisition
- Normal and curvature estimation
- Shape registration
- Shape matching
- Voronoi/Delaunay diagrams
- Nearest neighbor search
- Surface reconstruction
  - from density data
  - from point clouds
- Remeshing and smoothing
- Elementary computational topology
- Collision detection
- Motion planning

The Team

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The Course

- Prerequisites:
  - Basic linear algebra
  - Elementary data structures and algorithms (OK not to have taken CS161)
  - Some programming experience
- Requirements:
  - Two paper-and-pencil theoretical homeworks
  - One modest programming project
  - An in-class midterm (Monday, May 19)
  - No final

Course Materials

- Everything will be at
  - http://graphics.stanford.edu/courses/cs164-10-spring
  - equivalently, http://cs164.stanford.edu
- Private part
  - log in with user = “CS164”, password = “Euler”