Computational Design + Fabrication: Course Info

Jonathan Bachrach
EECS UC Berkeley
August 27, 2015
- seminar
- cutting edge
- early stage and kind of rough
- workshop for fab toolkit
- lots of hands on and class discussion
Goals

- competent with basic 1-3d fabrication
- proficient in algorithmic design
- basic understanding of manufacturing constraints
- research directed – projects seed research ideas
- flush out examples for digifab toolkit
- raise level of design to be as productive as fab machines
Non Goals

- teach standard tools
- teach programming
Prerequisites

- cs61a
- cs61b
- cs164*
- cs184*
- python programming
- algorithms
- geometry
- computer graphics
- linear algebra
adjunct assistant professor in eecs
algorithmic art for 35 years
cofounded otherlab
advise phd students and teach cs250
lead chisel hardware design project

http://www.jbot.org
jackbackrack
Who Are TA’S?

Austin Buchan / EECS

Duncan Haldane / MechE

PhD Students in Robotics
Who Are You?

- CS
- EE
- ME
- Art
- other?

- power tools
- fabrication
- arduino?
- python programming
- computer graphics
- first chunk lectures / readings / labs and
- last 1/3 project

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<td>Lecture 01: 3D Intro + Compiler + Organization</td>
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<td>02</td>
<td>Tue Sep 01</td>
<td>Lecture 02: 3D Solid Geometry</td>
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<td>*D</td>
<td>Thu Sep 03</td>
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<td>1D</td>
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<td>2D</td>
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<td>Lecture 12: 4D Digifab</td>
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<td>Lecture 14: 5D Declarative Design + Exploration</td>
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Curriculum
- start from simple geometry and fabrication machines
- work through complexity
- build to articulated mechanisms and
- ultimately design space exploration and optimization
- tools
- programming
- digifab toolkit
- lab questions
- wednesday sometime
- series of readings to learn about fabrication and algorithmic design
- assigned at end of each Tuesday’s class
- question due by start of next Tuesday’s class
- will randomly call on a couple people each Tuesday
- only accessible from Berkeley
- first one up already

**Computational Design of Mechanical Characters**

- Stelian Coros\(^1\)
- Bernhard Thomaszewski\(^1\)
- Gioacchino Noris\(^1\)
- Shinjiro Sueda\(^2\)
- Moira Forberg\(^2\)
- Robert W. Sumner\(^1\)
- Wojciech Matusik\(^3\)
- Bernd Bickel\(^1\)

\(^1\)Disney Research Zurich  \(^2\)Disney Research Boston  \(^3\)MIT CSAIL

**Figure 1:** The interactive design system we introduce allows non-expert users to create complex, animated mechanical characters.
- series of tasks to learn fabrication and algorithmic design
- assigned at end of each Thursday’s class (except today)
- due by start of next Thursday’s class
- 5 late days total
- python
- github
- geometry
- solidpython
- digifab
- openscad
- algorithmic design
- DIWire
- Algorithmic Design
- Validation
Lab Two

- Laser Cutter
- Layouts
- 2D Joinery
Lab Three

- 3D Printer
- 3D Joinery
Lab Four

- Kinematics
- Basic Mechanisms
- Construction from Solid Geometry
- Pantogram
Advanced Mechanisms

Desired Kinematic Output and How to Achieve It

Analysis to Determine Actuator Sizing
- Design Space Exploration
- Optimization
- Topology Optimization

Material Interpolation Schemes in Topology Optimization – Bendsøe + Sigmund
- eight week project
- digifab based projects
- quick pitches
- written project proposals
- live project proposals
- 1-1s
- critiques
Teaming

- ones for lab zero
- twos for remaining and sections
- try to get complementary skills
from eecs grading guidelines

- 5% participation
- 45% labs
- 50% project

A (excellent); B (good); C (fair); D (barely passed); F (failure); P (passed at a minimum level of C- for undergraduate students); NP (not passed); S (satisfactory, passed at a minimum level of B- for graduate students); U (unsatisfactory); I (work incomplete due to circumstances beyond the student’s control, but of passing quality); and IP (work in progress, final grade to be assigned upon completion of entire course sequence).
- cs194-028
- sign up
- send message to instructors with
  - availability for wednesday
  - github username
  - teams
- questions posted and answered there
cs194-028

homework done here

each student gets their own repo

Build software better, together.

Powerful collaboration, code review, and code management for open source and private projects. Public projects are always free. Private plans start at $7/mo.
- virtual box compliant computer
Computer Science 194-028/294-119: Computational Design + Fabrication

Fall 2015

Prof. Jonathan Bachrach

Lectures: Tuesday and Thursday, 3:30-5:00PM, 320 Soda

Course Info and Poster

Course Calendar with Handouts

Subject to Change.

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tue – sep 15th

think its classroom 123
Invention Lab

- meanwhile will be in invention lab
- how to get trained http://invent.citris-uc.org/about/calendar/
• students must purchase materials through jacobs