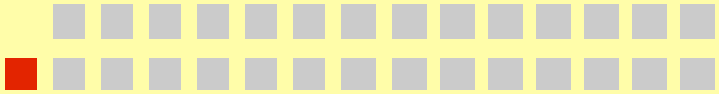
week

01



Theory and Practice of Tangible User Interfaces

Introduction

Welcome!

- Introduction
- Monday and Wednesday curriculum
- Course requirements
- Course survey

Instructors

Kimiko Ryokai

Noura Howell

Kimiko

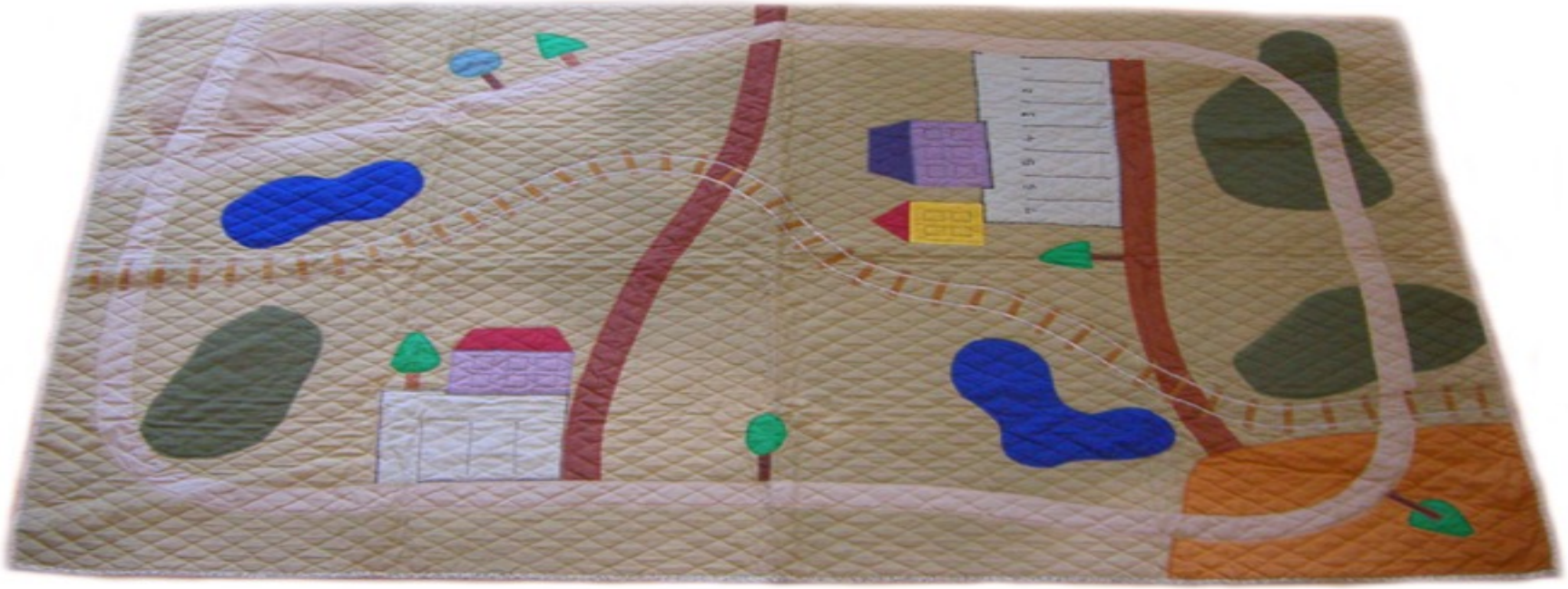
Teaching Assistant

Noura Howell
PhD candidate
School of Information

“Tech, Fab, Design Guru”

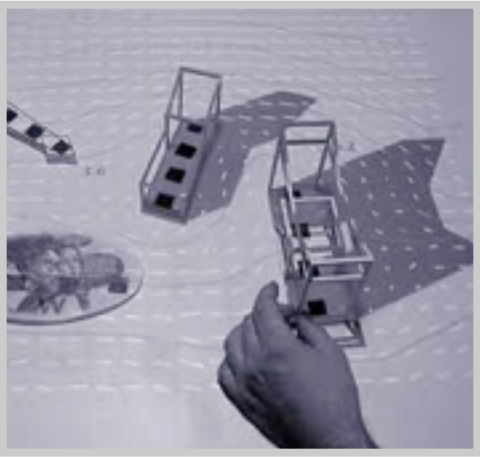
My Childhood Object

If my mat could tell a story…



StoryMat (1999)

The Doll's Head (1997) Ken Hinckley

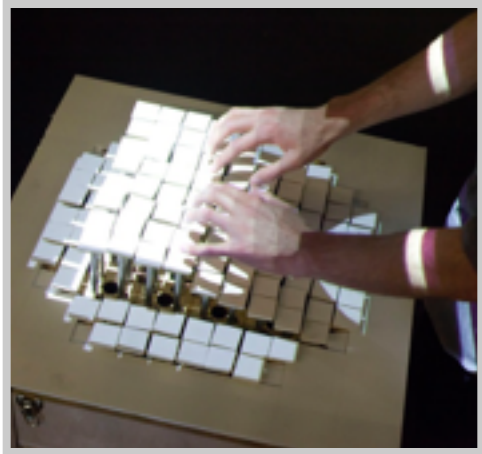


Urp (1998) Underkoffler et al.

Gummi (2001) Sony CSL

Kinect (2010) Microsoft

Necomimi (2012) Neurowear



Sublimate (2013) Leithinger et al.

What are Tangible User Interfaces?

- Taxonomy?
- Design principles?
- Enabling technologies?
- Evaluation?

This Course

We will explore the **theoretical framework** of tangible user interfaces, through a series of **design examples** to compare.

Students will also **design and develop** experimental tangible user interfaces using **physical computing** prototyping tools.

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Week 15	11/28	Evaluating TUIs	11/30	Summary
Week 16	12/05	Final Project Exhibition Day 1	12/07	Final Project Exhibition Day 2

Course Format

Each student will **co-teach 2-3 classes** throughout the semester with the course instructors.

Please indicate your **top 5 topics** in the signup sheet.

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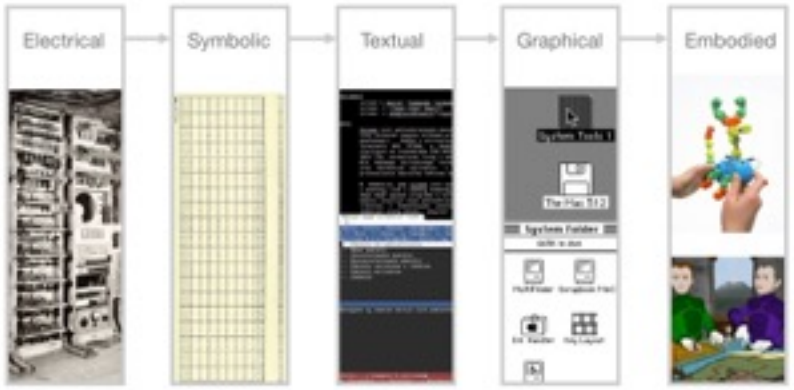

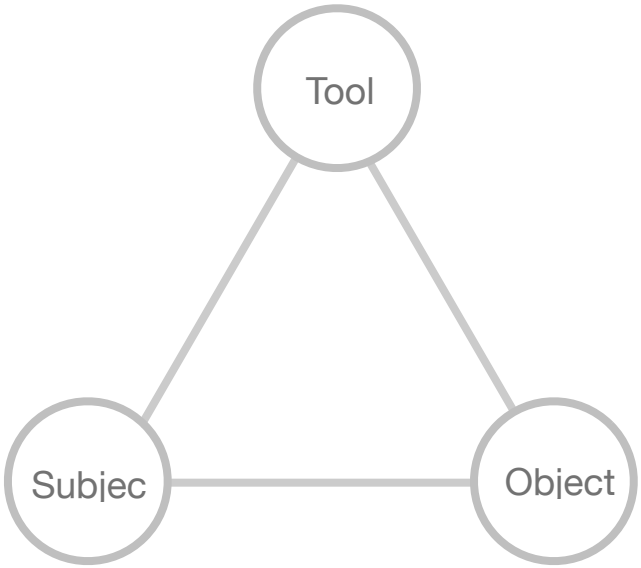

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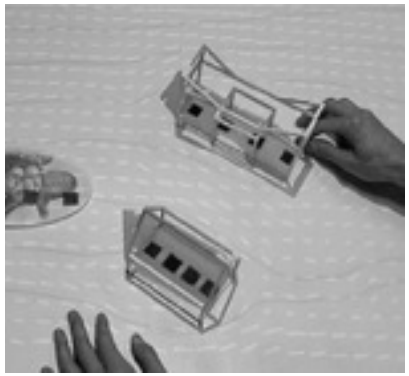

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Empathy Tool from
IDEO Method Cards

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Microsoft Hololens

HTC Vive

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Elizabeth Goodman
Speculative Design

Noura Howell
Experience & Biosensing

David Mellis
Physical Computing

Nik Martelaro
Stanford Center for Design Research

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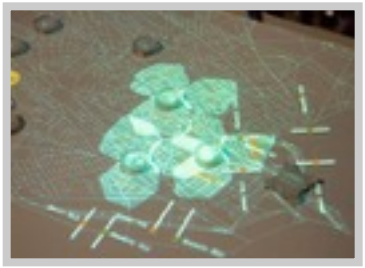

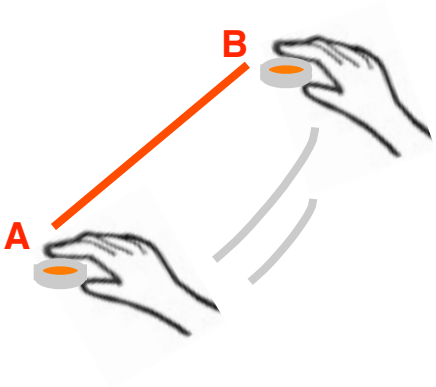

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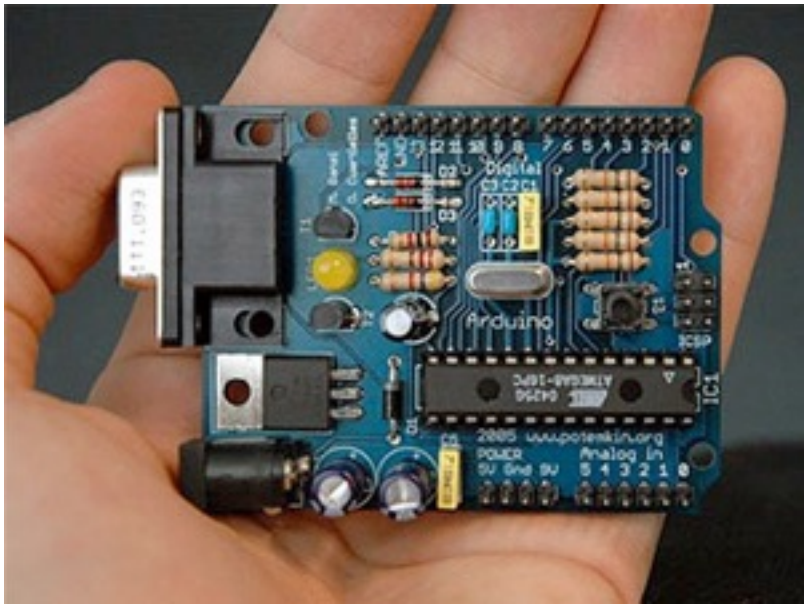

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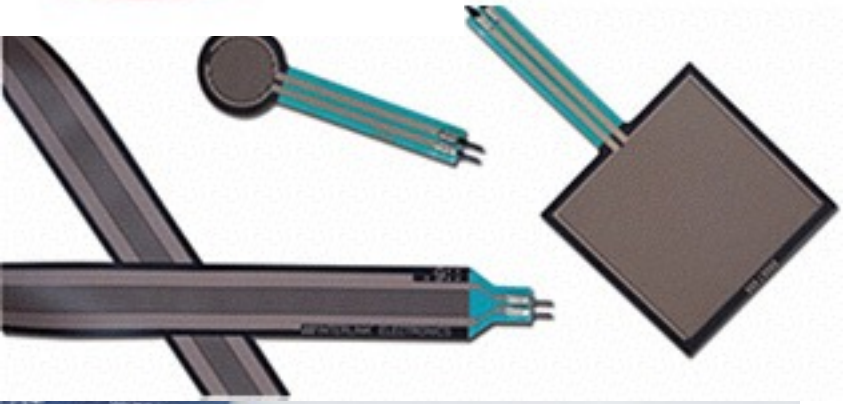

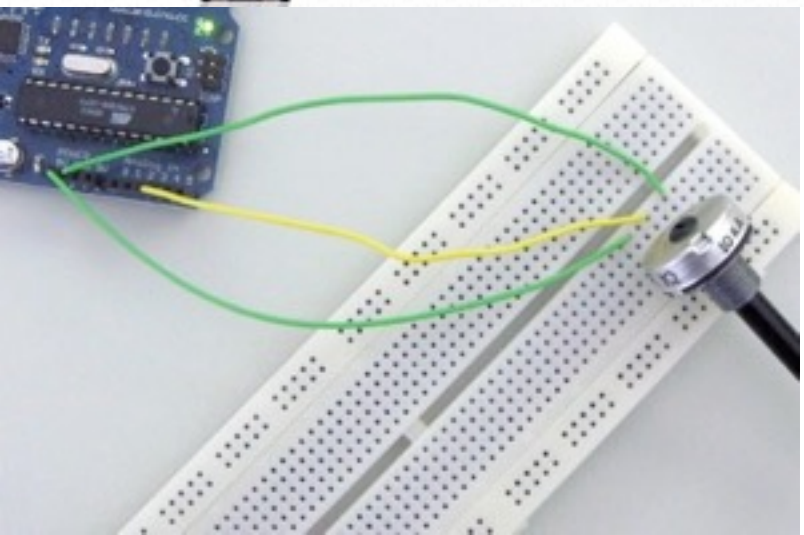

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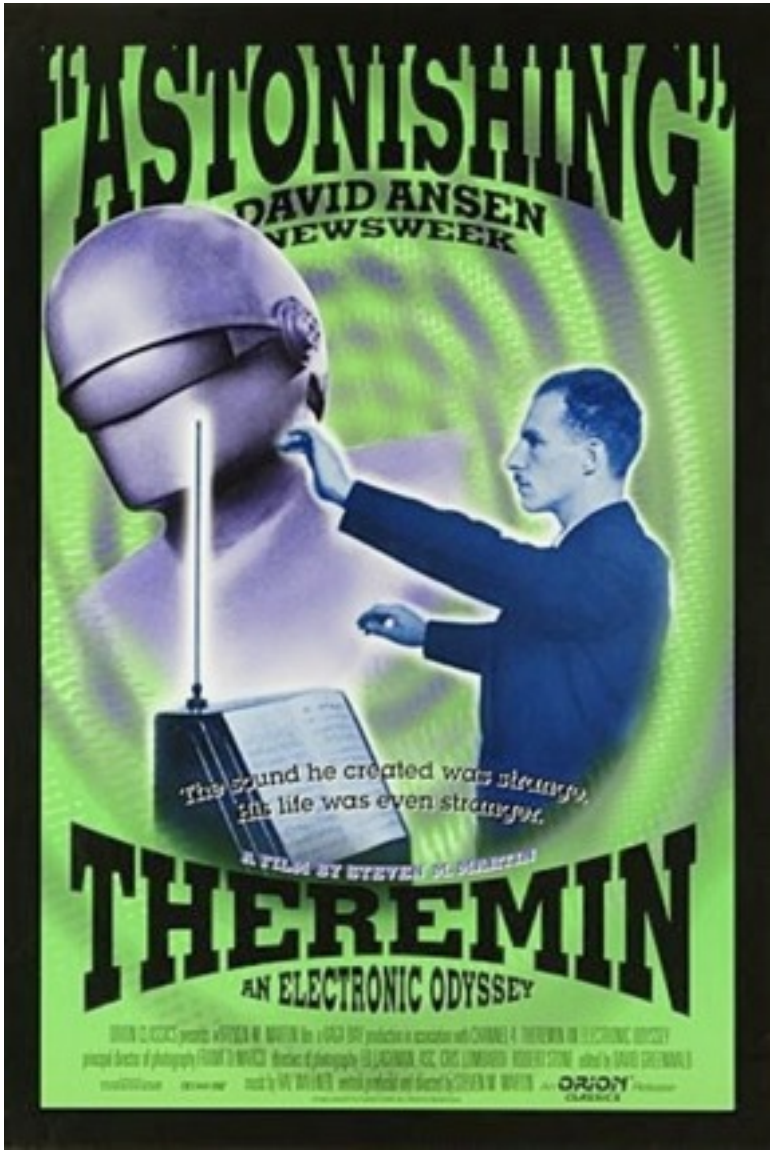

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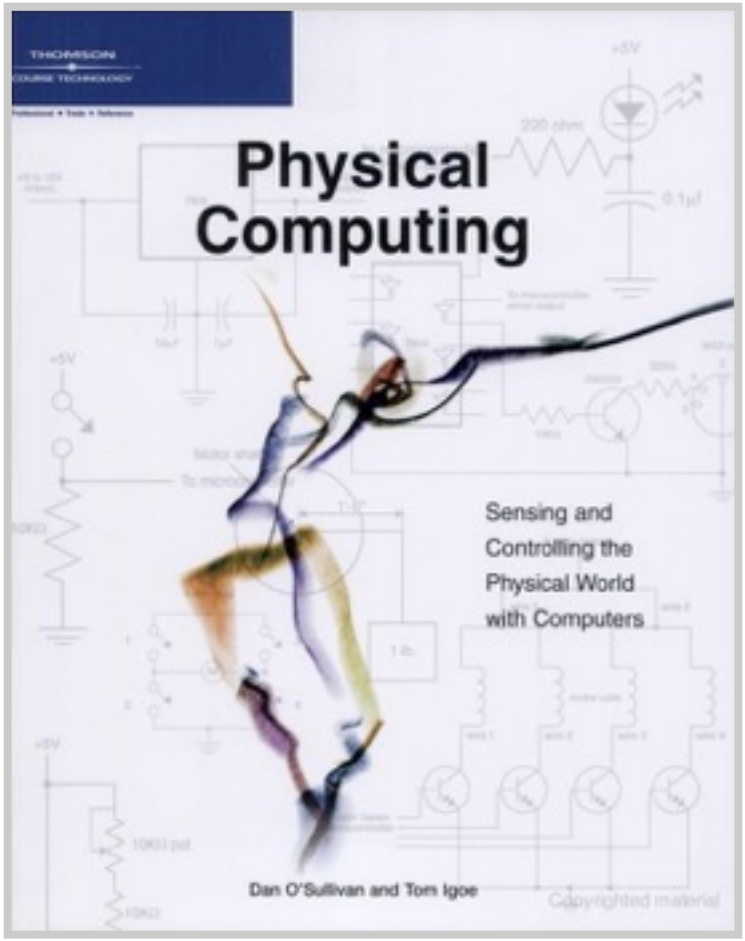
Course Kit

Arduino UNO, SparkFun #Arduino-UNO	$24.95
Solderless breadboard, Digikey #23273-ND	$ 7.37
USB cable (3ft), Jameco #222607	$ 1.39
Blue LED, Jameco #183222	$ 2.95
Green LED, Jameco #334473	$ 1.45
Red LED, Jameco #33481	$ 0.27
Piezo buzzer, Jameco #336314	$ 1.26
5.1V zener diode, Jameco #179047	$ 0.04
220 ohm, 1/8W resistors (bag of 100), Jameco #107941	$ 0.69
10k ohm, 1/8W resistors (bag of 100), Jameco #108126	$ 0.69
1M ohm, 1/8W resistors (bag of 100), Jameco #108265	$ 0.69
1K ohm, 1/4W resistors (bag of 100), Jameco #690865	$ 0.69
10k ohm potentiometers, Jameco #255662	$ 0.95
Photocells - from 100 grab bag, Jameco #169578	$ 0.50
TIP120 Jameco#:32993	$ 0.45
1N4004 diode Jameco#:35991	$ 0.05
AA Batteries	$ 1.00
2-AA battery holder Digikey #BC22AAW-ND	$ 0.51
DC motor, 16K RPM@3V Jameco#:154923	$ 1.01
RC Servo - standard, HobbyPeople #759310	$ 9.99
22 gauge solid hookup wire in red, black, and yellow	$ 6.00
Force sensors	$ 10.00

TOTAL $75.00~

Lab Textbook



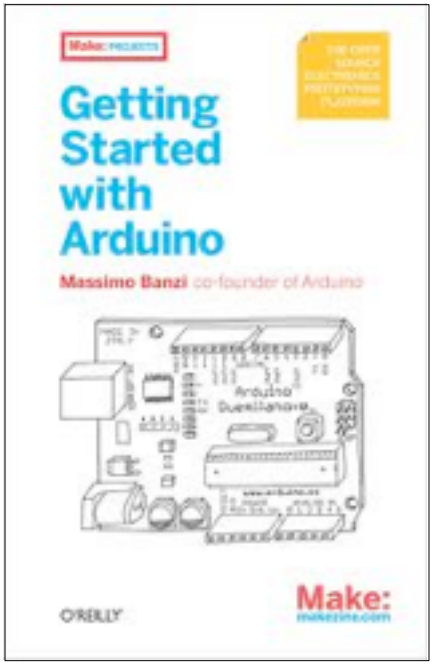
Physical Computing

by O'Sullivan and Igoe

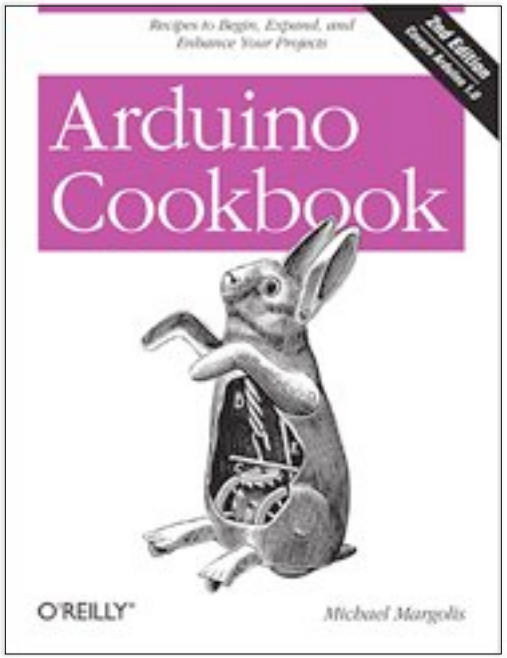
Online library access from OskiCat

OskiCat UCB Library Catalog

Recommended books



Getting Started with Arduino
by Massimo Banzi



Arduino Cookbook
by Michael Margolis

Making Things Talk
by Tom Igoe

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Theories and Approaches

Enabling Technologies

Your original IDEA!

Theories and Approaches

Enabling Technologies

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Midterm Project

Design a Tangible User Interface that takes advantage of your hands and body to manipulate digital information. Apply it to a topic of your research interest (e.g., tool for communication, learning/education, design, etc.). Your project may be based on a completely new design or redesign of familiar everyday objects.

- **9/15** Form a group (max 3 members) for your project and write a 1-page proposal and post it on the course website
- **10/3** Progress sketches due (post your sketches on the course website)
- **10/10 & 10/17** In-class midterm project presentation.
  Present your idea and optional mockups

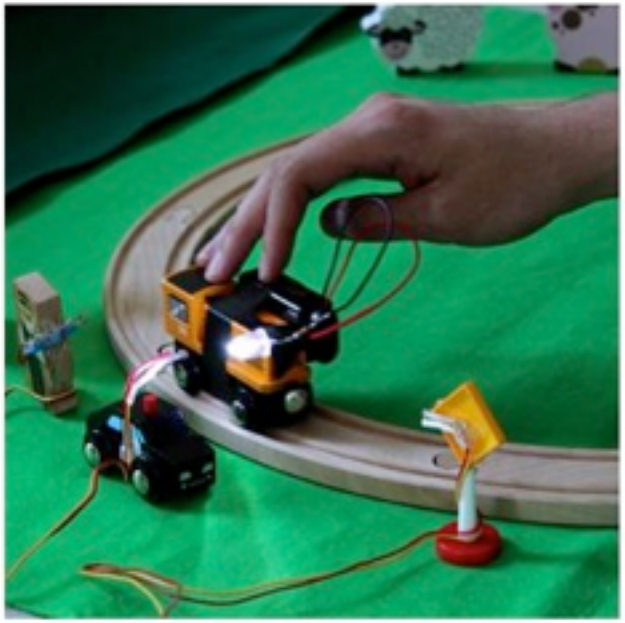
Final Project

You may expand your midterm project, or take a new approach.
You may continue to work as a group (max 3 members) or
as an individual. If you work in a group, be clear about each member's role in the project.

- An interactive prototype to be exhibited at the final course exhibition on **Dec 5th and Dec 7th**. Your prototype is to demonstrate your original idea for a Tangible User Interface to manipulate digital information, and
- A write-up due **Dec 15th, 2016** in the ACM HCI Archive Format (4-6pgs) https://chi2017.acm.org/submission-formats.html

TUI Final Project Exhibitions • December 5 & 7



Past TUI Final Project Example 1

“Bubblegum Sequencer” by Hesse, McDiarmid & Han

Bubblegum Sequencer

Making Music With Candy

Past TUI Final Project Example 2

“Photocation" by Moser & Kiechle

Figure 1a. Diorama is hidden in the box away from external light.

Figure 1b.

Figure 1c.

Figure 1. The Photocation prototype setup: 1. "Preview" display, 2. Diorama box, 3. Mockup DSLR camera, 4. ISO tokens, 5. Aperture rings.

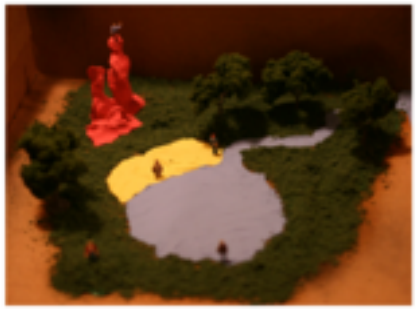


Figure 4a. The diorama from a bird’s eye view.

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Week 3	09/05	[Holiday]	09/07	Digital I/O with Arduino Boards
Week 4	09/12	Tangible Bits	09/14	Sensing 1: Potentiometers
Week 5	09/19	Taxonomy of TUIs	09/21	Sensing 2: Force sensors and photocells
Week 6	09/26	Calm Computing and Ambient Media	09/28	Output 1: Piezo speakers
Week 7	10/03	Human Centered Design & Innovation	10/05	Output 2: DC motors
Week 8	10/10	Midterm Project Review	10/12	Output 3: Servo motors
Week 9	10/17	Midterm Project Review	10/19	Output 4: Simple Mechanics
Week 10	10/24	VR and Mixed Reality	10/26	Synthesis: Invent a music instrument (group work)
Week 11	10/31	Lecture by David Mellis	11/02	Fabrication and Prototyping
Week 12	11/07	Lecture by Nik Martelaro	11/09	Lecture by Elizabeth Goodman (Interaction Design)
Week 13	11/14	Final Project Progress Report and Critique	11/16	Final Project Progress Report and Critique
Week 14	11/21	Lecture by Noura Howell	11/23	[Holiday]
Week 15	11/28	Evaluating TUIs	11/30	Summary
Week 16	12/05	Final Project Exhibition Day 1	12/07	Final Project Exhibition Day 2

Course Website

http://blogs.ischool.berkeley.edu/i262/

Course Requirements

- Midterm Project (10%)
- Final Project (30%)
- Lab (15%)
- Homework (25%)
- Participation (20%)

Grading

Based on both the **quality** and **originality** of your work

Beyond the Course: Possible Venue 1

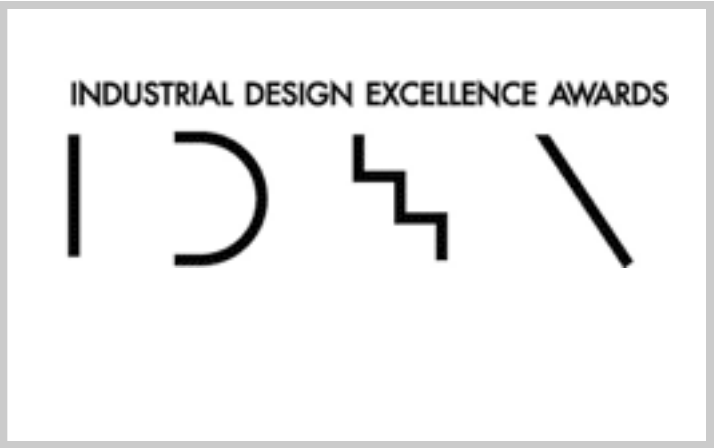
Conference paper submissions

- **CHI 2017** (“Late-Breaking Work” deadline on 11 January 2017)
- **UIST 2018** (full paper around March 2017)
- **Ubicomp 2018** (full paper around March 2017)

Beyond the Course: Possible Venue 2

Student design competitions

SXSW Interactive Innovation Awards
Deadline December 2, 2016



Industrial Design Excellence Awards
Deadline spring 2017

Beyond the Course: Possible Venue 3

Maker Faire

May 3 & 4 San Mateo Expo Center

Jug Hero

Bubblegum Sequencer

Making Music With Candy

What is the Bubblegum Sequencer?

The Bubblegum Sequencer is a physical step sequencer that lets you create drumloops by arranging colored balls on a tangible surface. It generates MIDI events and can be used as an input device to control audio hardware and software. Finally, people can't claim anymore that electronic music isn't handmade.

Here's how it works: A grid of holes, consisting of several rows with 16 holes each is the canvas. On it, you arrange colored gumballs. The 16 columns represent the 16th-notes in a measure. Each color is mapped to a specific sample.

Because the output is generated in the form of MIDI events, the Bubblegum Sequencer can be used to control any kind of audio hardware or software.

If you'd like to know more about the Bubblegum Sequencer, read our course paper.

Demo

Here's a video showing some of the Bubblegum Sequencer's current features:

(Download video as .mov file)

News

New: German electronic music magazine De-Bug covers Bubblegum Sequencer (PDF)

See us at Maker Faire 2008, May 3-4 in San Mateo!

Maker Faire

For Monday, August 29

- Read
  - *Acting with Technology* (chapters 1, 2, & 3) by Victor Kaptelinin and Bonnie A. Nardi
  - *Where the Action Is* (chapters 1 & 2) by Paul Dourish
- Post your response to the reading question on the course website by Sunday 11:59PM.

For Wednesday, August 31

- Access the Physical Computing book
- Read the Intro, Chapters 1, 2, & 3 of Physical Computing book
- On Wednesday August 31, bring $75 for the lab kit (cash or check)

Office Hours

Kimiko Ryokai
Mondays 3:30-4:30pm at 307A South Hall
and by appointment, kimiko@berkeley.edu

Noura Howell
by appointment, noura.howell@gmail.com

Thanks and Q&A