ARTS AND TECHNOLOGY:
Strange Bedfellows or Congenial Colleagues?

THE UNIVERSITY OF UTAH®
Erik Brunvand

Agenda I

- I argue that arts/technology collaboration is a powerful framework for enhancing ideas in both arenas
  - I frame this in the context of "kinetic art" and its connection to "embedded systems"
  - Design Thinking vs. Computational Thinking?

Agenda II

- Start with a definition of Kinetic Art as an example of arts/tech collaboration
  - Embedded computer systems as a building block
- Brief history of Kinetic Art
  - Origins
  - Pioneers
  - Contemporary
- Finish with examples from a collaborative kinetic arts course at the University of Utah

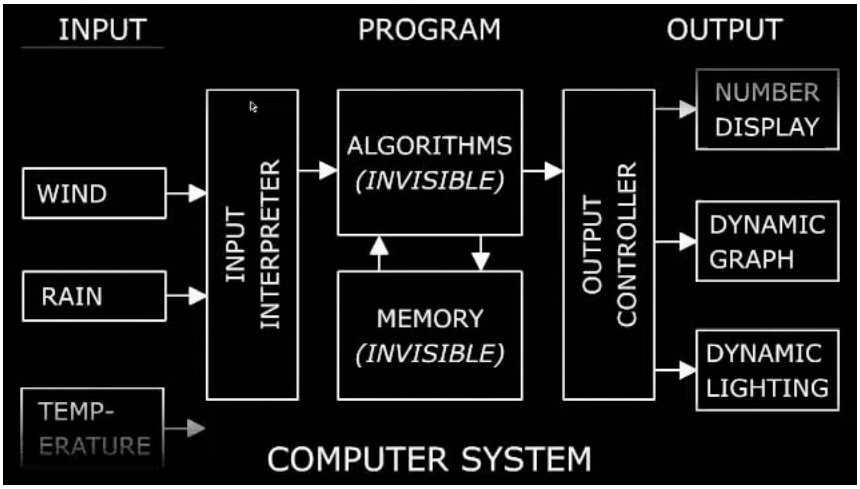
Kinetic Art

- Kinetic art contains moving parts
  - Depends on motion, sound, or light for its effect
- Kinetic aspect often controlled by microcontrollers
  - Using motors, actuators, transducers, sensors
- The artwork can react to its environment
  - Distinct from "computer art"
  - The computer is usually behind the scenes

Embedded Systems

- Computer systems that are embedded into a complete device
  - Often small or special purpose computers or microprocessors
  - Designed to perform one or a few dedicated functions
  - Often reactive to environmental sensors
  - Often designed to directly control output devices

Jim Campbell's "Formula"



Embedded Systems and Kinetic Art

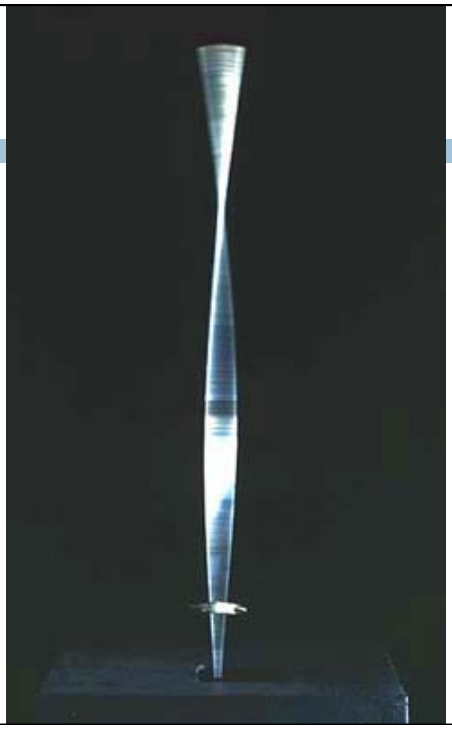
- Cross-college collaborative course
  - Brings Art students and Computer Science students together
  - Design and build embedded-system-controlled kinetic art
  - Goal is that both groups of students benefit
- Fundamental nature of ***Design***
  - Engineering design vs. creative design?
  - Computational thinking vs. design thinking?

Background

- Short survey of kinetic art
  - The avant garde in the 1920's
  - Small steps in the 1950's
  - The computer age
- Outline for a collaborative class
- Examples

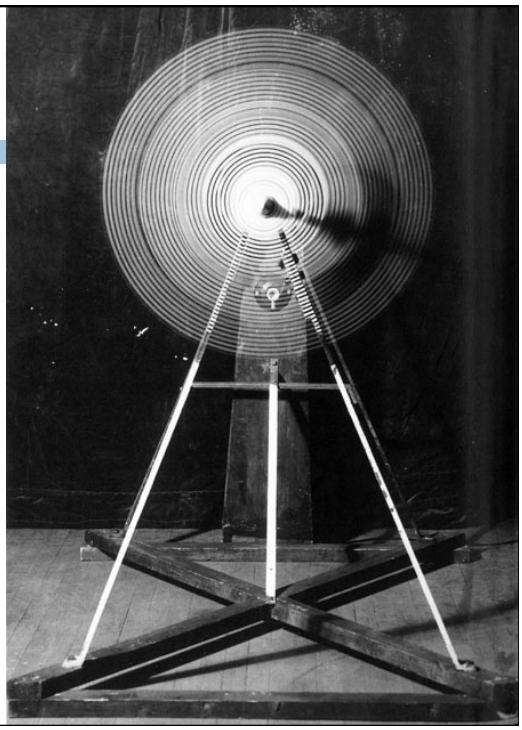
Naum Gabo
(1890-1977)

- Kinetic Construction (Standing Wave) 1919-1920



Marcel Duchamp
(1887 – 1968)

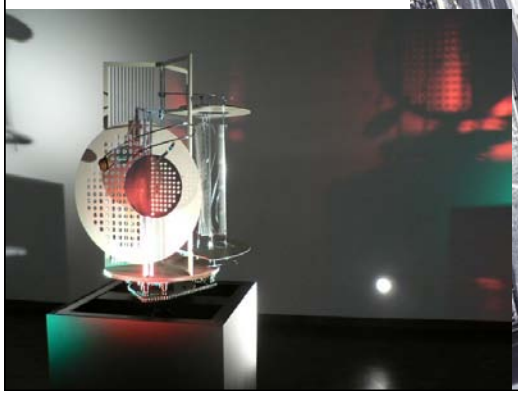
- Rotary Glass Plates (Precision Optics) 1920
- Built with the help of Man Ray



László Moholy-Nagy

(1895-1946)

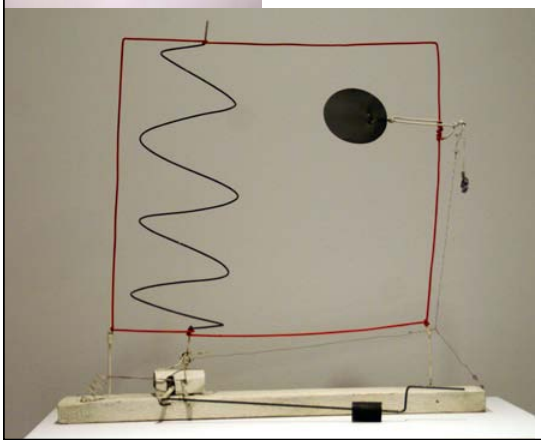
- Light-Space Modulator (1922-30)

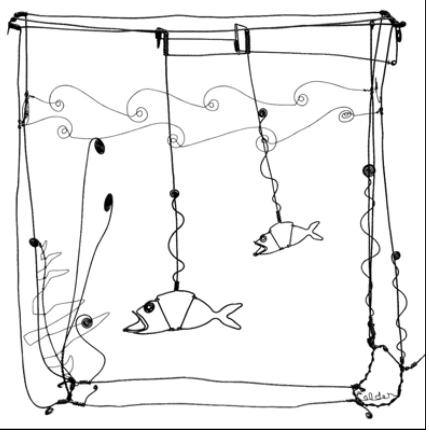


Alexander Calder

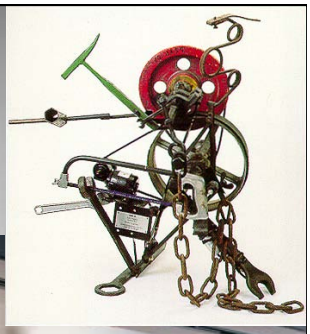
(1898 – 1976)

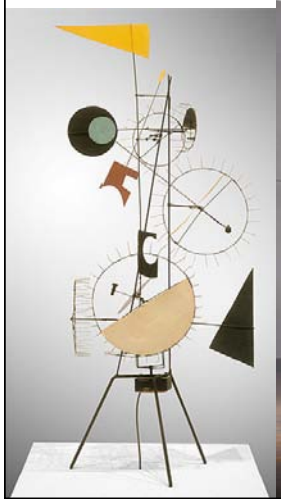
Mobiles and Stabiles
Wire and Circuses





Jean Tinguely
(1925 – 1991)



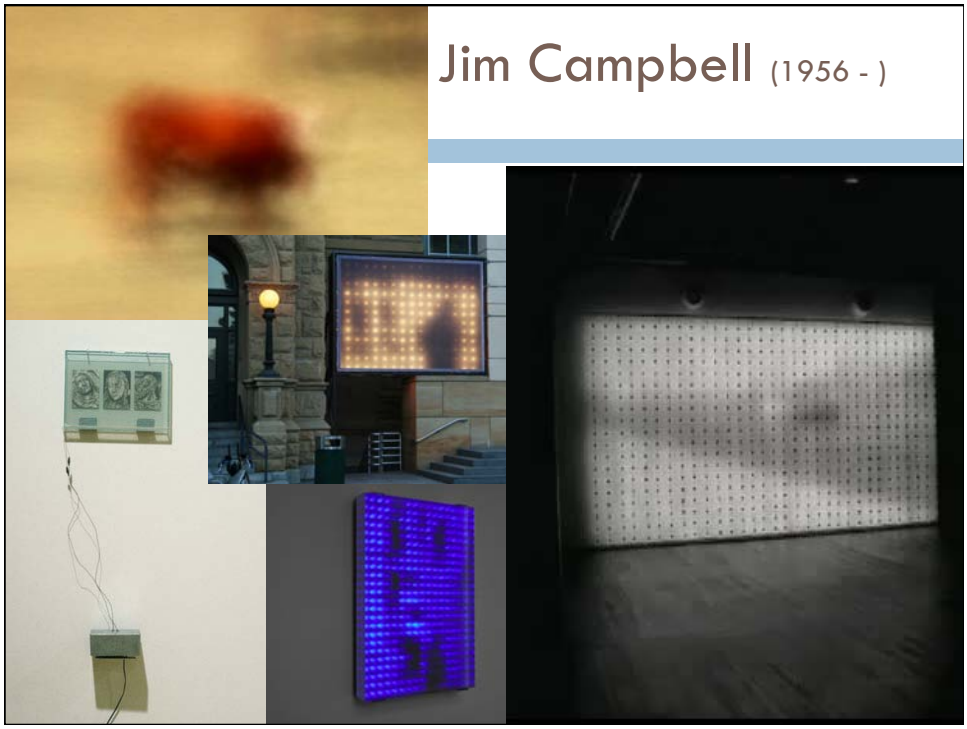


Jean Tinguely (1925 – 1991)

Jump ahead to the Computer Age

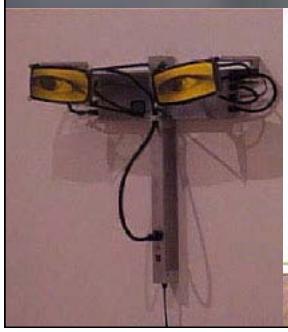
- Electronic control
  - microprocessors or discrete electronics
- Mechanical actuators
  - motors, servos, relays, solenoids, etc.
  - speakers, buzzers, other noise makers
- Lights
  - LEDs, light bulbs, EL wire, etc.
- Sensors to interact with the viewer
  - distance, movement, sound, temperature, vibration, etc.

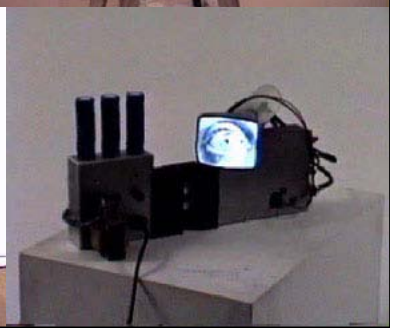
Jim Campbell (1956 -)



Alan Rath (1959 -)

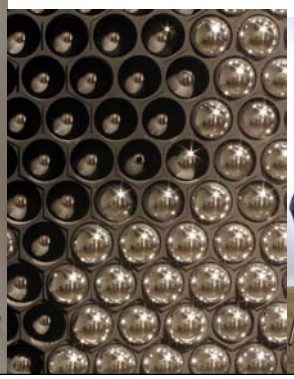






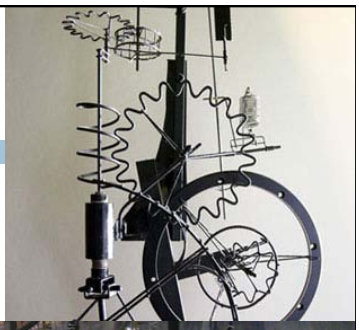
Daniel Rozin (1961 -)

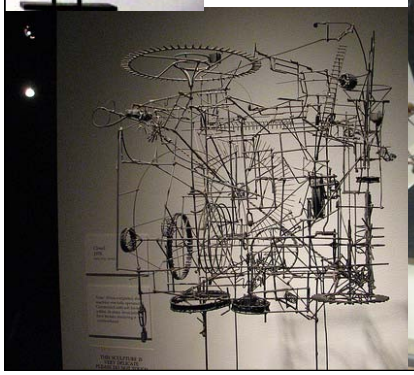


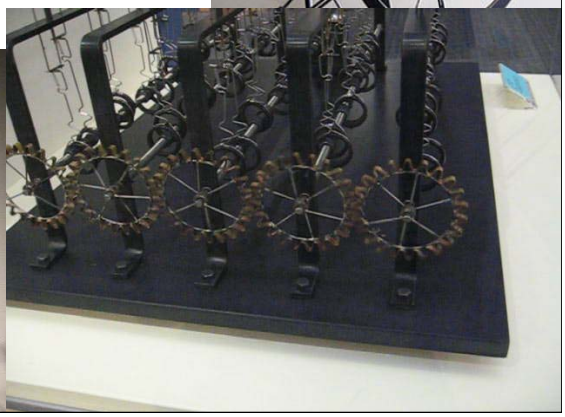




Daniel Rozin (1961 -)

Arthur Ganson
(1955 -)

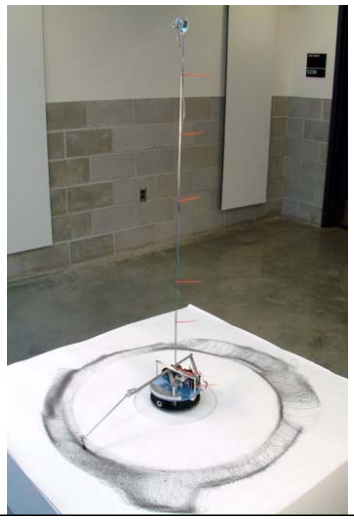






David Bowen

University of Minnesota, Duluth

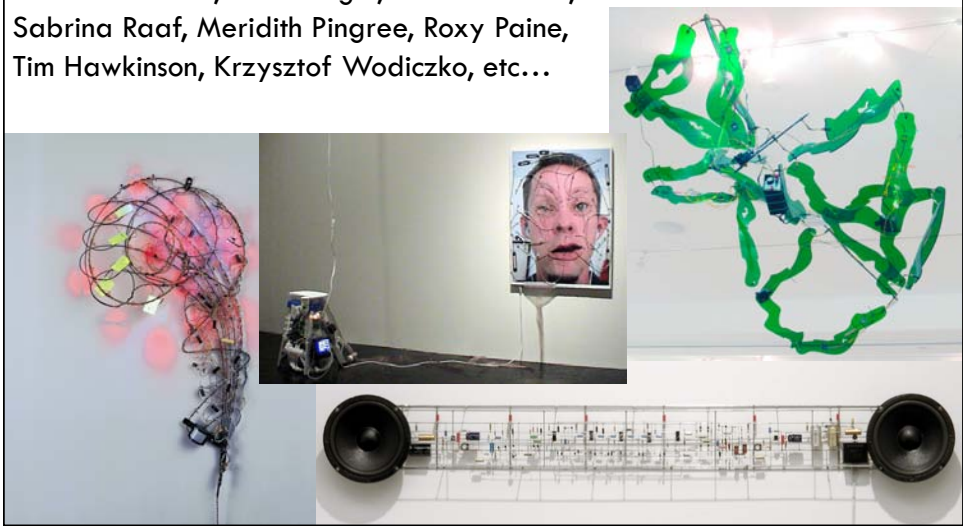


David Bowen

Tele-present wind

Lots of others…

Jack Dollhausen, Peter Vogel, Rebecca Horn, Sabrina Raaf, Meridith Pingree, Roxy Paine, Tim Hawkinson, Krzysztof Wodiczko, etc…



Paul Stout

Kinetic Art / Embedded Systems Class overview

- Basic reactive programming with embedded systems
  - Electronics fundamentals
  - Sensors and actuators as I/O
- Basic 3d art concepts
  - Formal elements: aesthetics, proportion, balance, tension
  - Material studies and mechanical linkages
- Studio-based instruction model

Class overview

- Individual and group projects
  - Everybody tries everything individually
  - Also work in interdisciplinary teams
- Design and build kinetic art
- Finish with a gallery show of results
  - 2009/2010: *Invisible Logic*
  - 2010/2011: *Intersectio*
  - Spring 2012: *Drawing Machines*

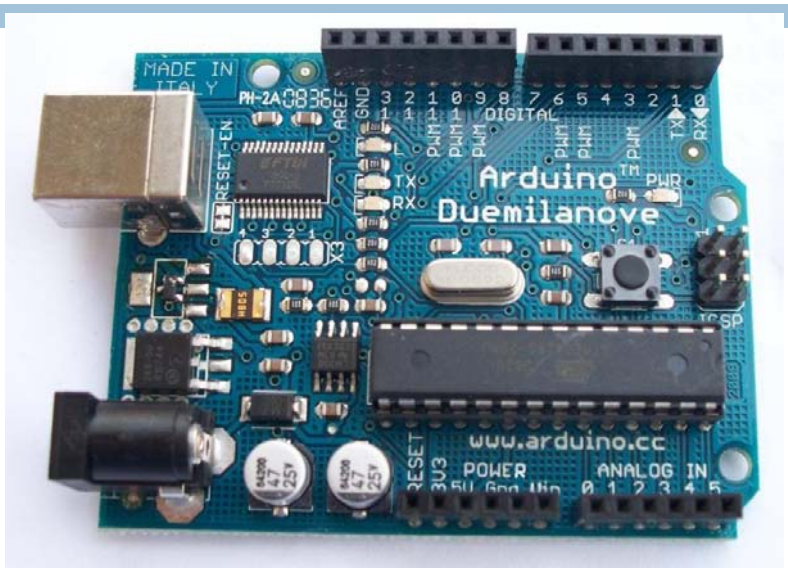
Enhancing Creativity

- Creative design and design-thinking are powerful concepts
  - One definition: enhanced creativity is generating many potential solutions instead of gravitating quickly to one
- Kinetic art is serious stuff…
  - … but not regular CS projects
  - CS students have the freedom to explore without worrying about getting it "right"

Course Infrastructure - HW

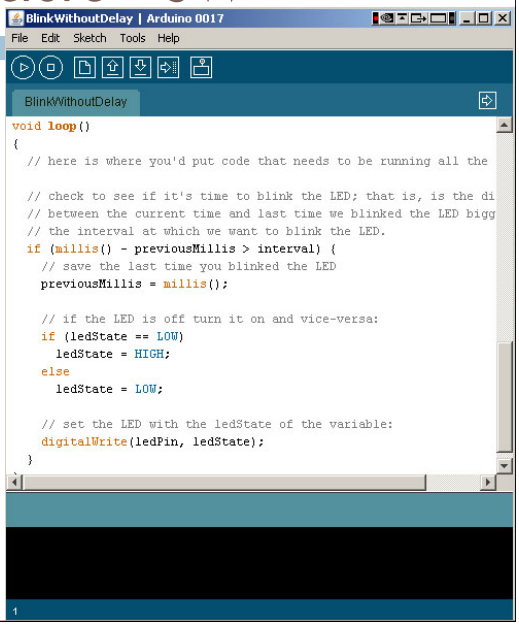
- Controller – Arduino
- Sensors
  - Potentiometers/knobs, light, motion (PIR), distance, vibration (piezo), sound, temperature, etc.
- Actuators and transducers
  - LEDs, servos, DC motors, DC stepper motors, sound, etc.
- Other parts
  - LED drivers, transistors, resistors, diodes
  - LCD displays, SPI/I2C peripherals
  - Power supplies, soldering stations, wire, etc.

Arduino



Course Infrastructure - SW

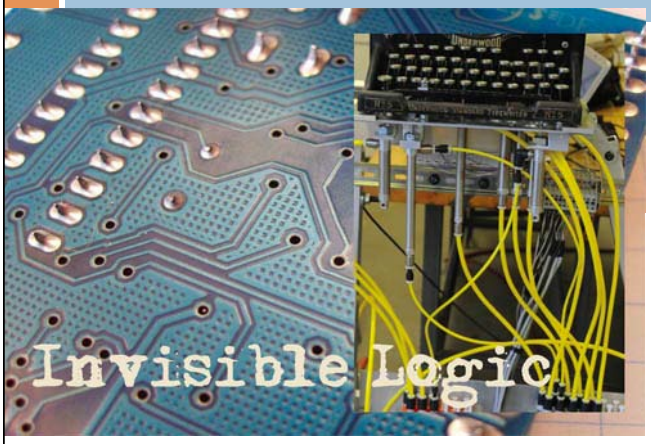
- Arduino open-source integrated development environment (IDE)
  - Good news – basically C
    - gcc is the back-end
  - Bad news – basically C
    - Moderately steep learning curve



INVISIBLE LOGIC

Embedded Systems & Kinetic Art
Fall 2009
CS5968 / FA3800

Invisible Logic



Invisible Logic
Projects from Engineering/Art Collaborations

Alvin L. Gittins Gallery
Jan 14-29, 2010

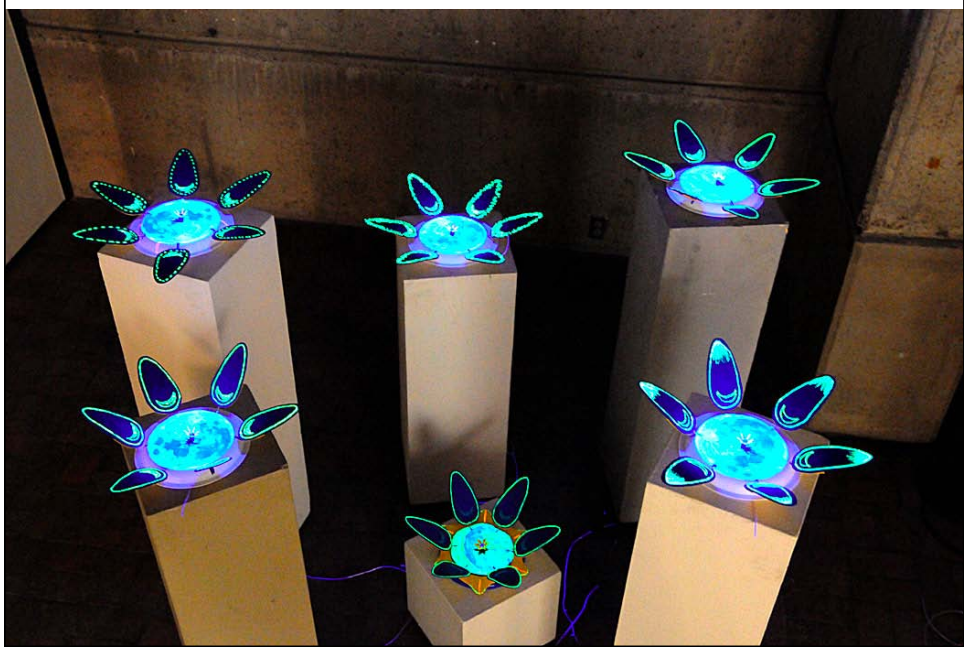
Opening reception Thursday Jan 14, 5-7pm

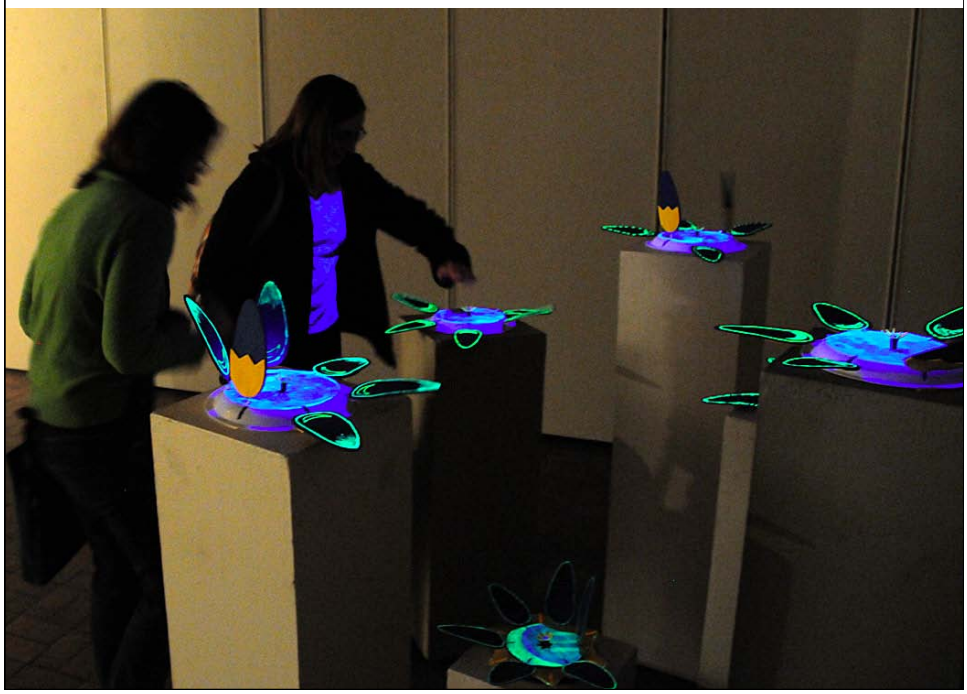
Lawrence Boye · Josh Bross · Kevin Brown
Quinton Christensen · Matt Fisher · Brandt Hammer
Mayuoko Nakamura · Cory Shirts · Jesse Smith

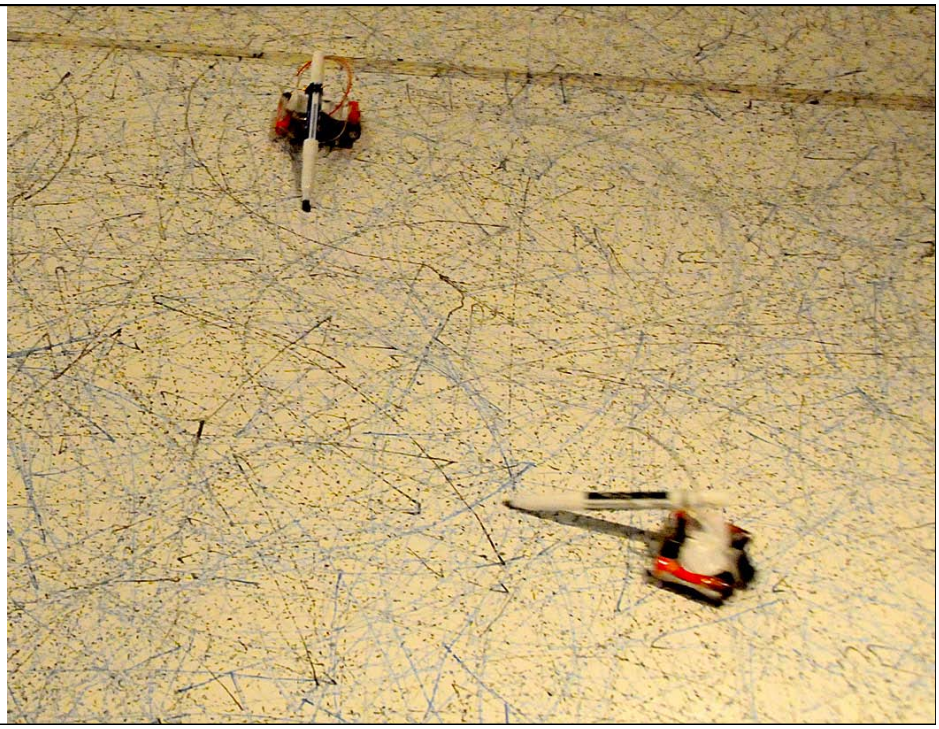
Projects from CS5968/FA3800, Fall 2009
Taught by Profs. Erik Brunvand & Paul Stout

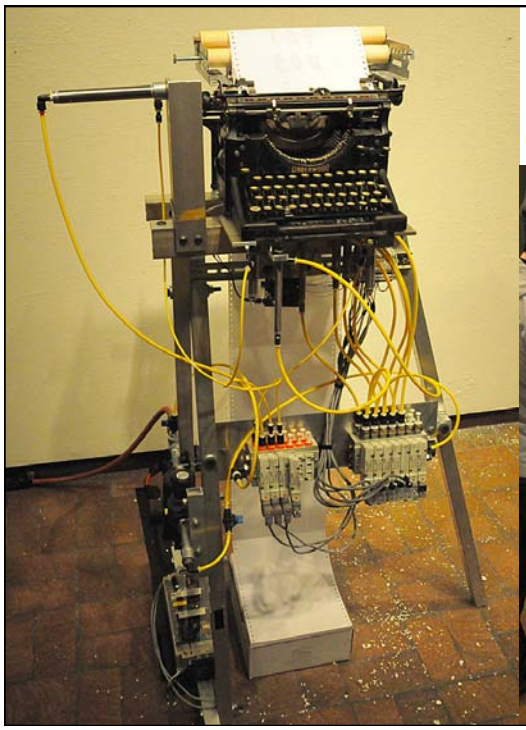
Gallery Hours
M-F 8:00am-5:00pm
Closed Sat and Sun
801·581·8677

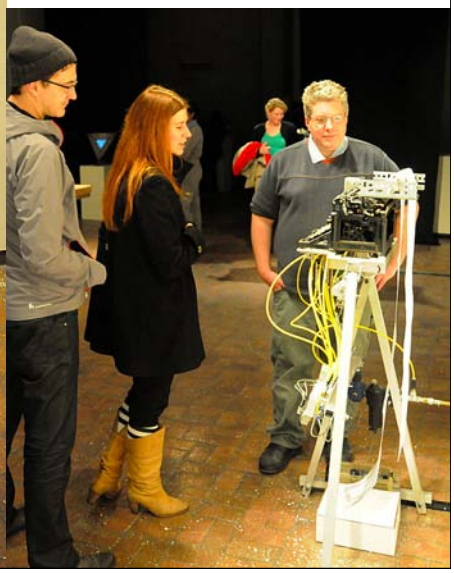
Alvin L. Gittins Gallery
Department of Art and Art History
University of Utah
Salt Lake City, UT 84112











INTERSECTIO

Fall 2010

F2010: Intersectio

F2010: Intersectio

F2010: Intersectio

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F2010: Intersectio

Student Comments

- I now have a much better understanding of how to "think about art" and also saw an entirely different side of computer science.
- Artists have a completely different mindset and it was nice to get a new perspective on things. It really made me learn to appreciate the creative thinking they brought to the table.
- I enjoyed it and already have suggested it to several artists and engineers I know!
- I feel more competent in both [art and computer science] having experienced each side in a new way.

Conclusions

- Embedded systems and kinetic art is a natural collaboration
  - Exploration of fundamental design concepts
    - Design-thinking is a natural complement to computational-thinking
  - Studio instruction model is fascinating
  - Both groups of students benefit from working with each other
  - Cross-college collaboration – just the beginning!

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