



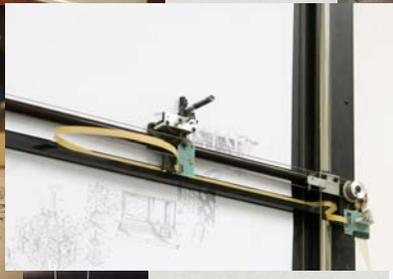
DRAWING MACHINES

AN ARTS AND ENGINEERING COLLABORATION

ERIK BRUNVAND, COMPUTER SCIENCE DEPARTMENT
SANDY BRUNVAND, ART AND ART HISTORY DEPARTMENT



Drawing Machines



Automated Drawing

- * Drawings made with mechanisms

- * Repeatability?

- * Controllable?

- * Editable?

- * Based on data?

- * Or made to be as random as possible?



Mike Lyon, Kansas City, MO

<http://mlyon.com/>

This Talk

- * Start with some images

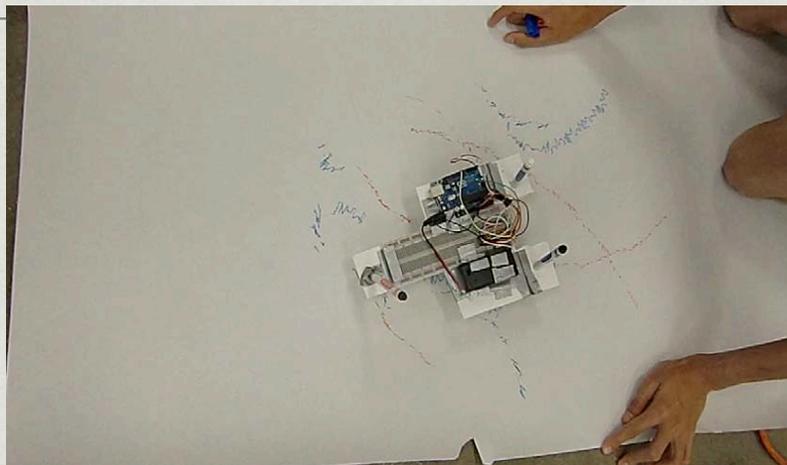
- * to whet your appetite

- * Think about an automated drawing taxonomy

- * Time Line: historical, computer age, and contemporary

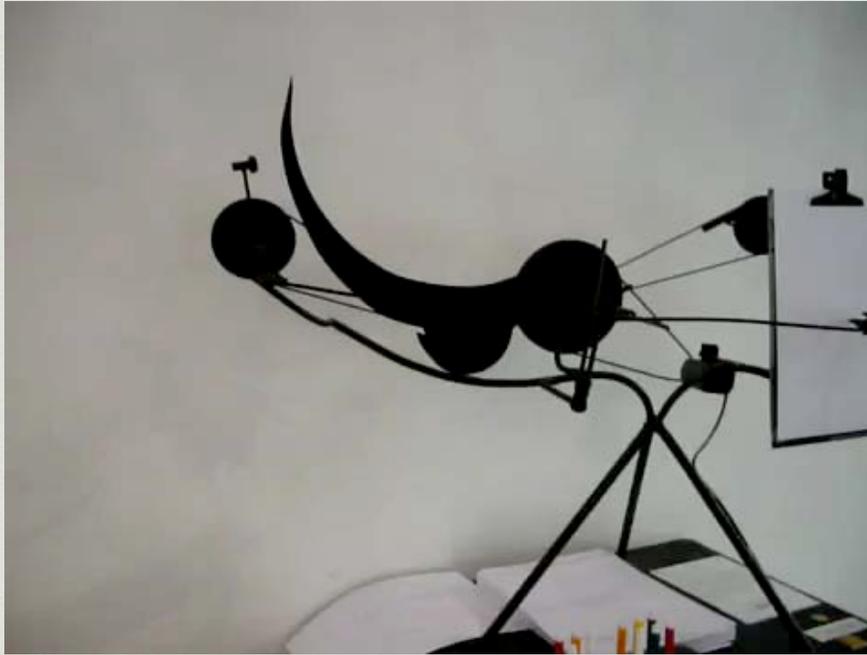
- * Not intended to be comprehensive

- * End with some examples of specific curricula



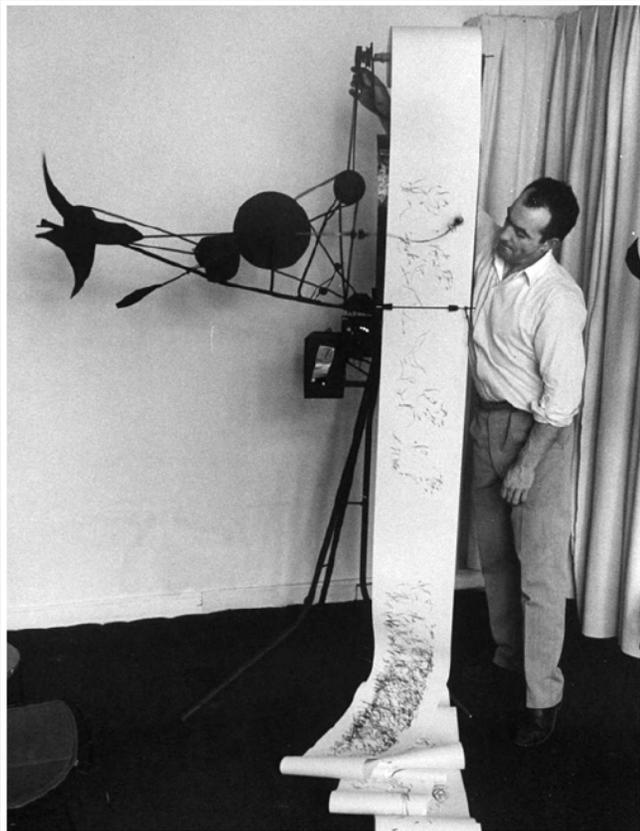
Student from Trinity Valley School workshop

Jean Tinguely - Switzerland, 1959



<http://www.youtube.com/watch?v=G0o5uq2fH6g>

Jean
Tinguely
Metamatics



Eske Rex - Denmark (2011)

Designguide.tv

<http://www.youtube.com/watch?v=5yumD0ezoVE>

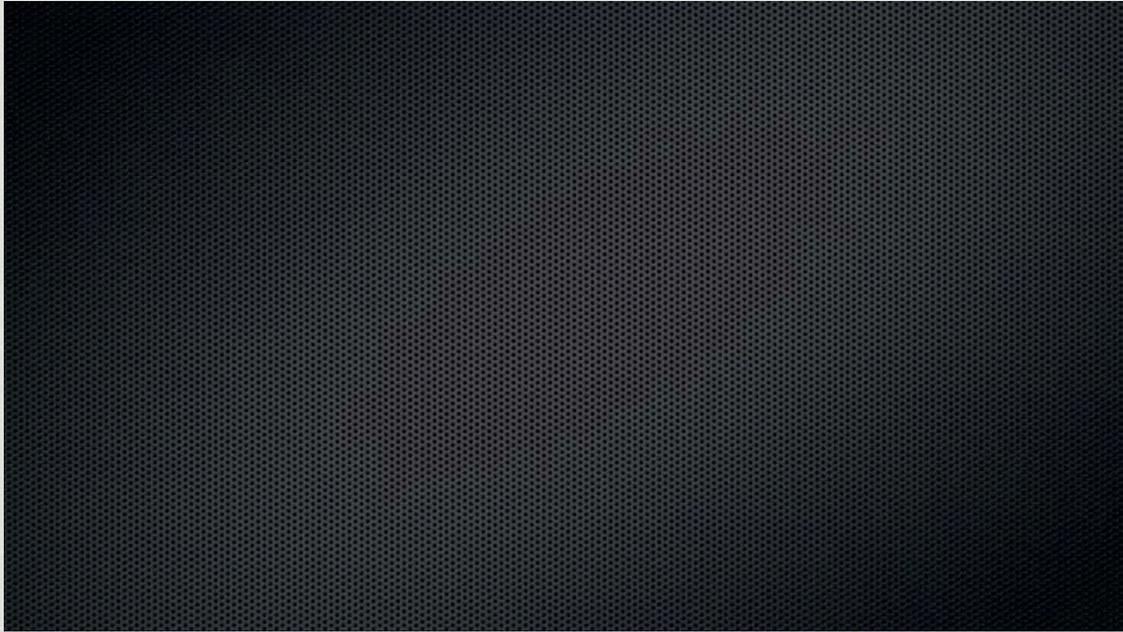
Tim Knowles - England, 2006



www.timknowles.co.uk

<http://www.bitforms.com/tim-knowles-gallery.html>

Erik Brunvand - USA, 2013



A Drawing Machines Taxonomy

<i>Image</i> \ <i>Control</i>	<i>Analog (mechanical)</i>	<i>Digital (electronic)</i>
<i>Random</i>	<i>Random marks with direct control of the drawing tool</i>	<i>Computer control, often using environmental input</i>
<i>Deterministic</i>	<i>Mechanical drive of the drawing tool</i>	<i>Computer programmed control</i>

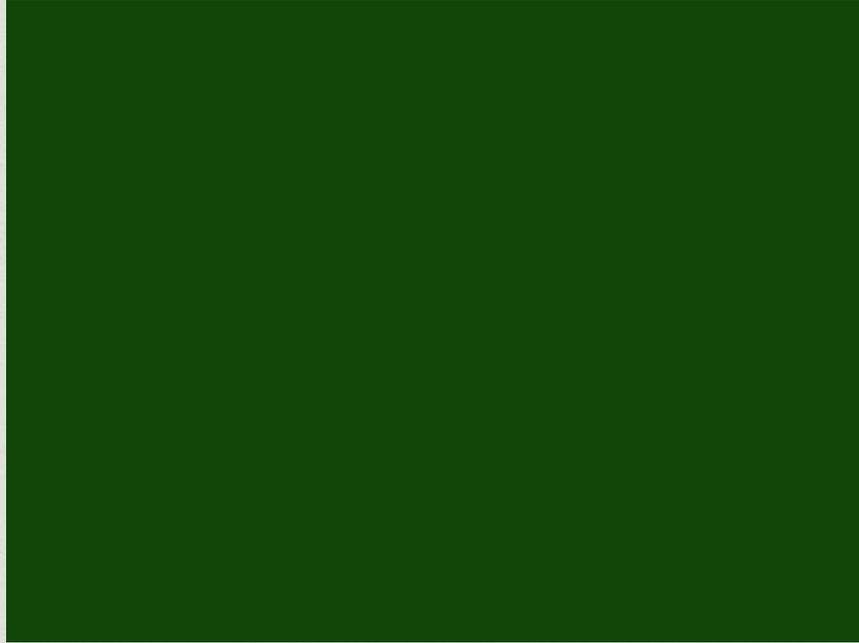
A Drawing Machines Taxonomy

<i>Image</i> \ <i>Control</i>	<i>Analog (mechanical)</i>	<i>Digital (electronic)</i>
<i>Random</i>	<i>Tim Knowles Eske Rex</i>	<i>Student from Trinity Valley School</i>
<i>Deterministic</i>	<i>Erik Brunvand</i>	<i>Mike Lyons</i>

A Time Line

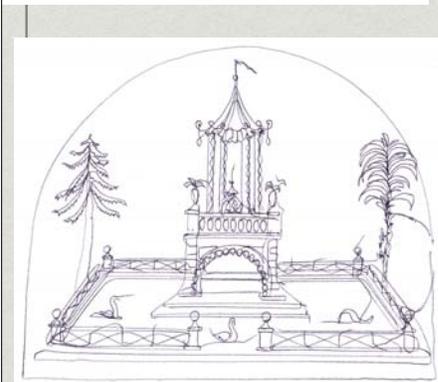
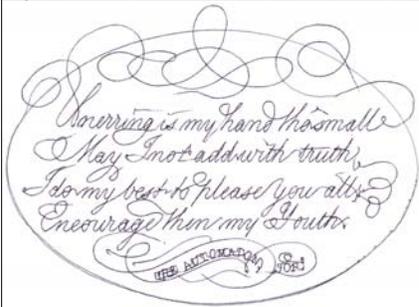
- * Historical: 18th and 19th centuries (automata)
- * Early Modern: 1950's (Metamatics)
- * Computer Age: 1960's – 1970's (printers/plotters)
- * Contemporary: 1990's to Now (lots of artists!)

Maillardet's Automaton, 1810



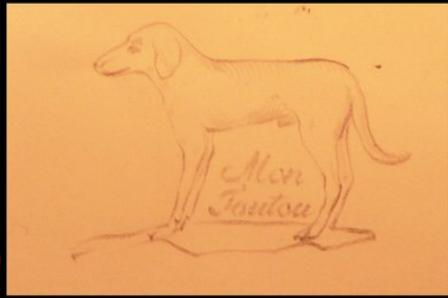
<http://www.fi.edu/learn/sci-tech/automaton/automaton.php?cts=instrumentation>

Maillardet's Automaton, 1810

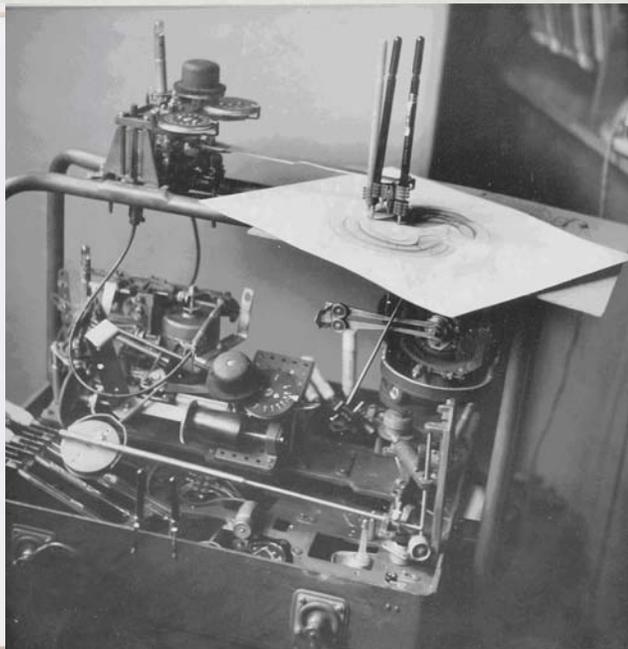


Jaquet-Droz Automata

1768-1774
The
Draughtsman

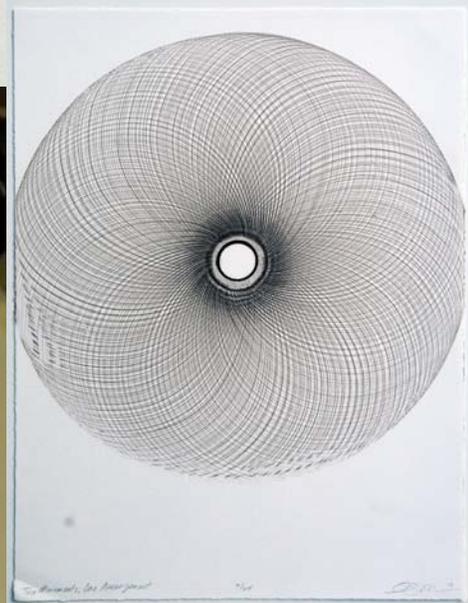
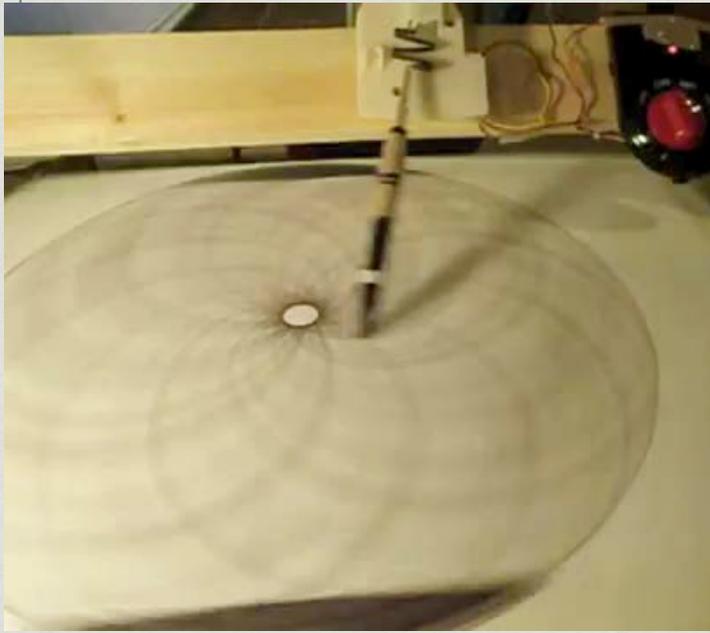


Desmond Paul Henry: 1962

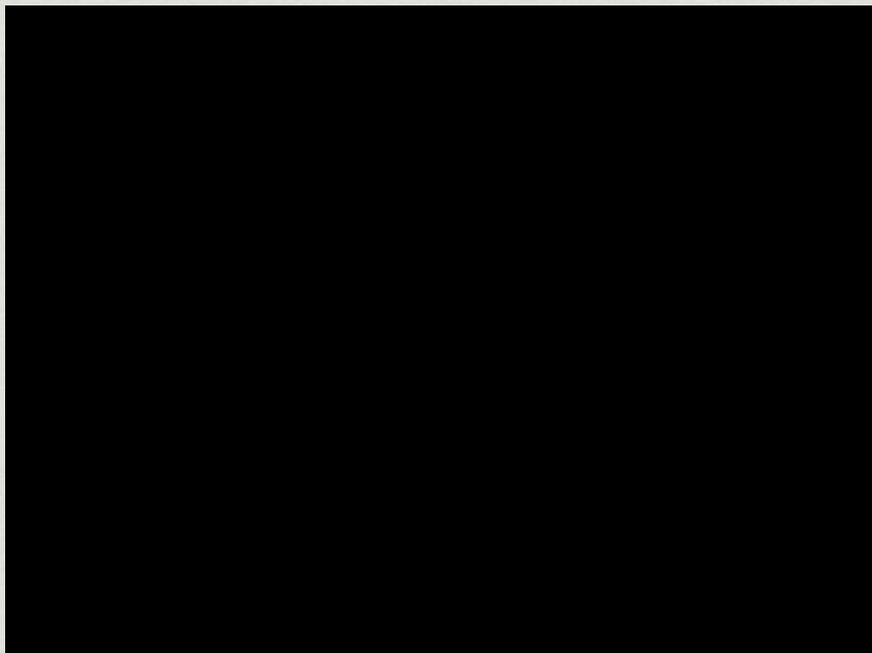


<http://www.desmondhenry.com/index.html>

Leslie A. Grossman, 2012

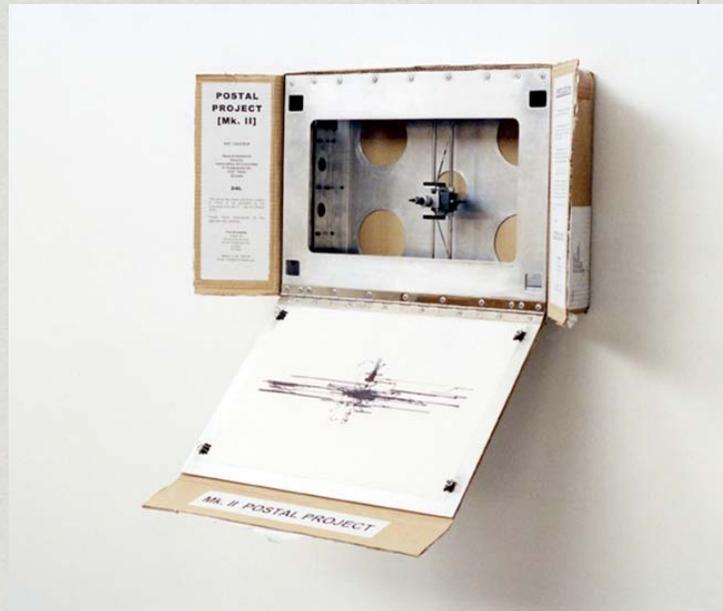


David Bowen, U Minn, 2003



Example High School Curriculum

- * Based on the *Postal Project* by Tim Knowles
- * Katie Campbell
Alta High School
Salt Lake City, UT



Example High School Curriculum

- * **Overview:**
 - * Advanced art students will participate in the Drawing Machines Experiment by creating a work of art that focuses on mark making in a non-traditional format, specifically where the marks are made without thought or planning.

Example High School Curriculum

* Objectives:

- * Each student is given a postal box
- * Each student chooses a drawing medium
- * Each student puts drawing paper as well as their drawing medium inside the postal box
- * Each student seals the postal box
- * Each student is required to carry the postal box for a period of one day, from sun up to sun down, without opening the box

Katie Campbell, Alta High School, Salt Lake City, UT

Example High School Curriculum



Katie Campbell, Alta High School, Salt Lake City, UT

Example High School Curriculum



Katie Campbell, Alta High School, Salt Lake City, UT

Example High School Curriculum



Katie Campbell, Alta High School, Salt Lake City, UT

Example High School Curriculum



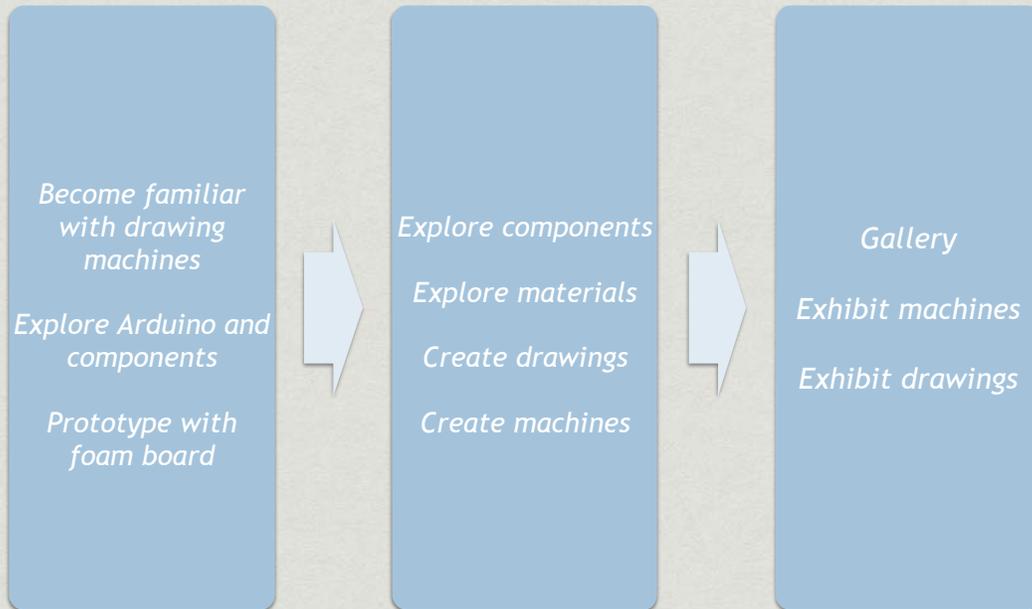
Katie Campbell, Alta High School, Salt Lake City, UT

High School Summer Workshop

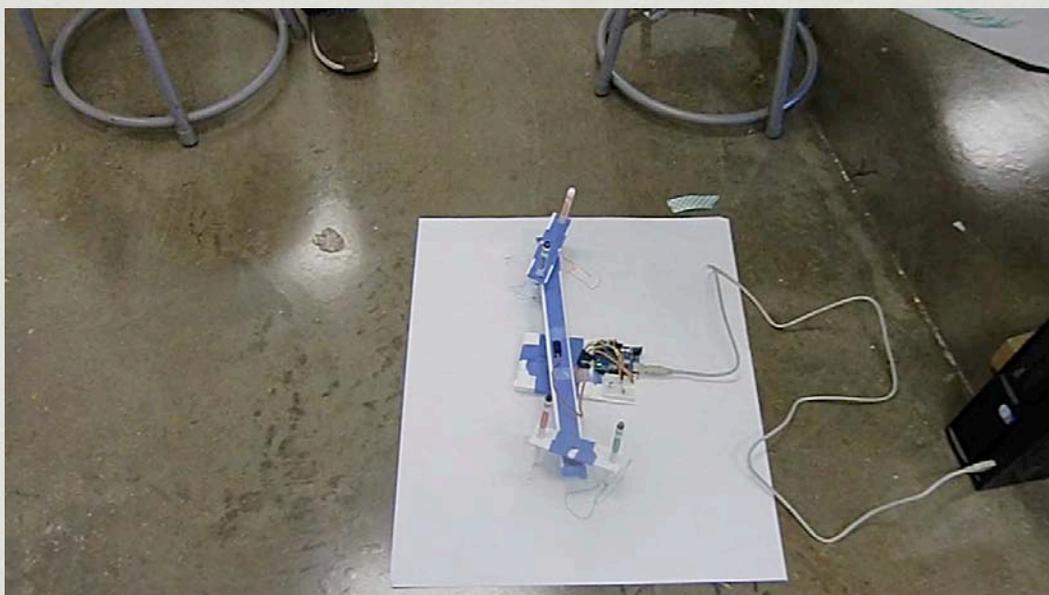
- * Trinity Valley School - Fort Worth, TX, July 2012
- * Erik Brunvand and Ginger Alford
- * 3-day workshop
- * Computer Controlled Drawing Machines
- * Arduino, foam core, masking tape



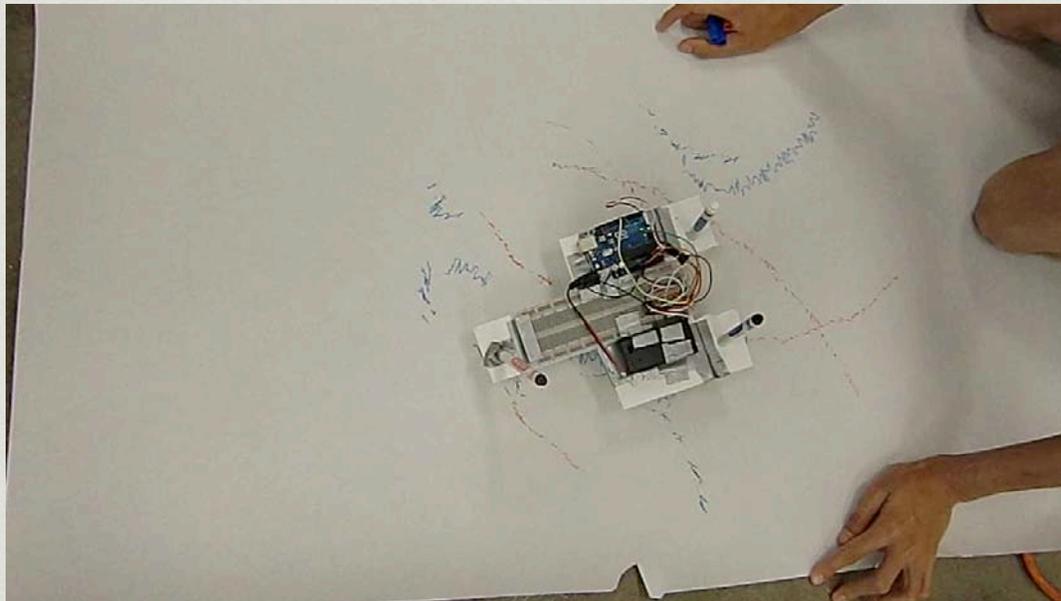
High School Summer Workshop



High School Summer Workshop



High School Summer Workshop



High School Summer Workshop



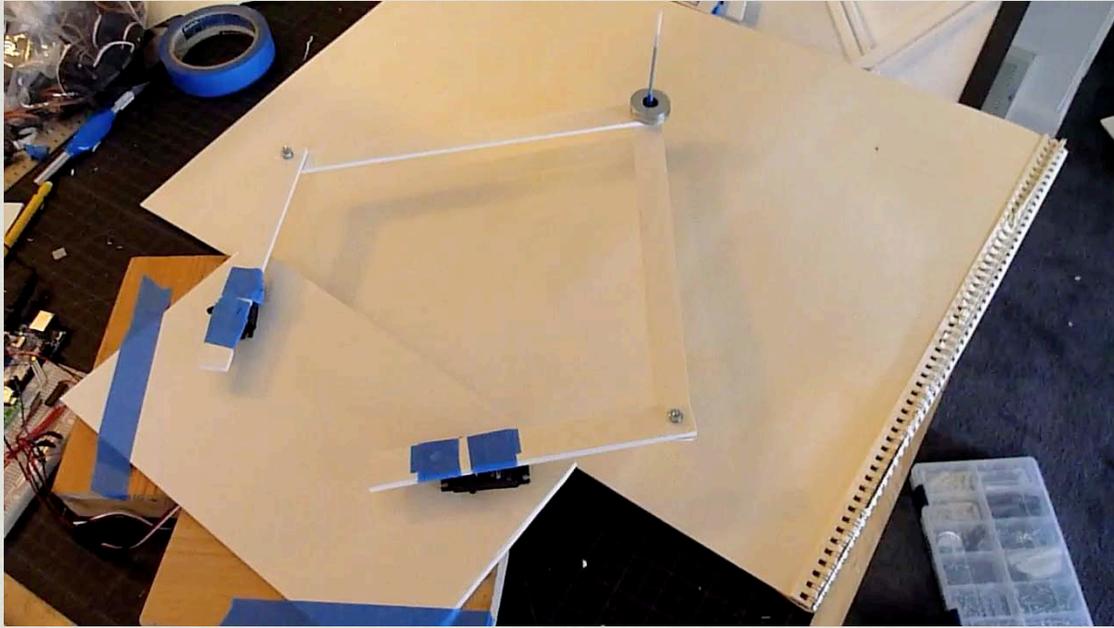
High School Summer Workshop



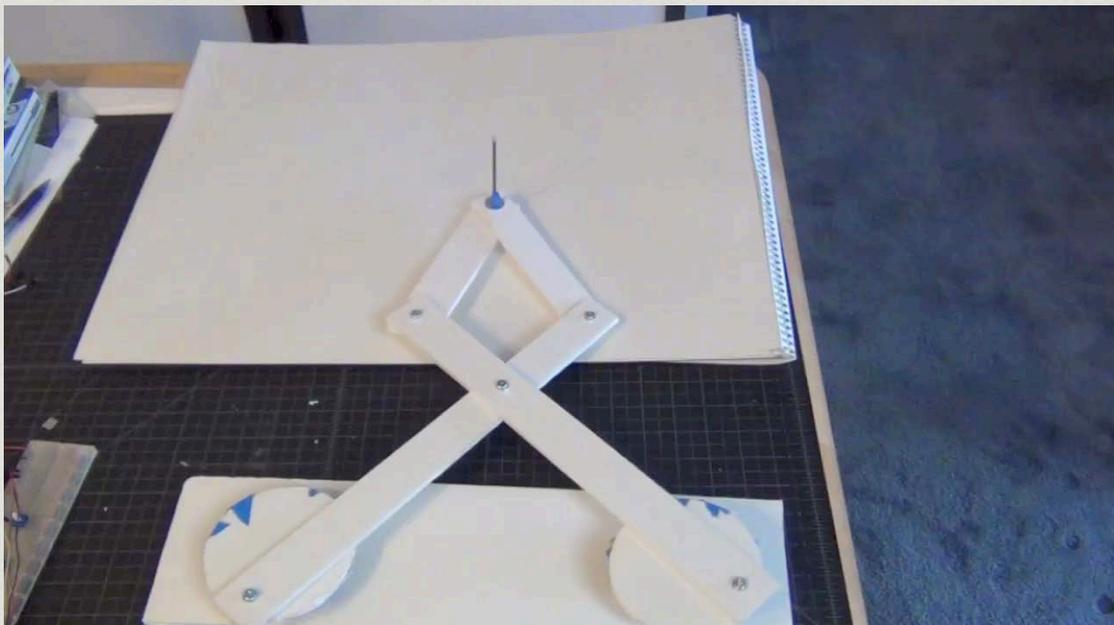
Specific Workshop Projects

- * A couple specific drawing machines that are easily prototyped
 - * Computer control with Arduino
 - * Introduces computing in an arts context
 - * Introduces art in a computing context
 - * Great for interdisciplinary groups
- * Details in handout...
 - * also <http://www.cs.utah.edu/~elb>

The Dancing Arms Drawing Machine



The Harmonograph

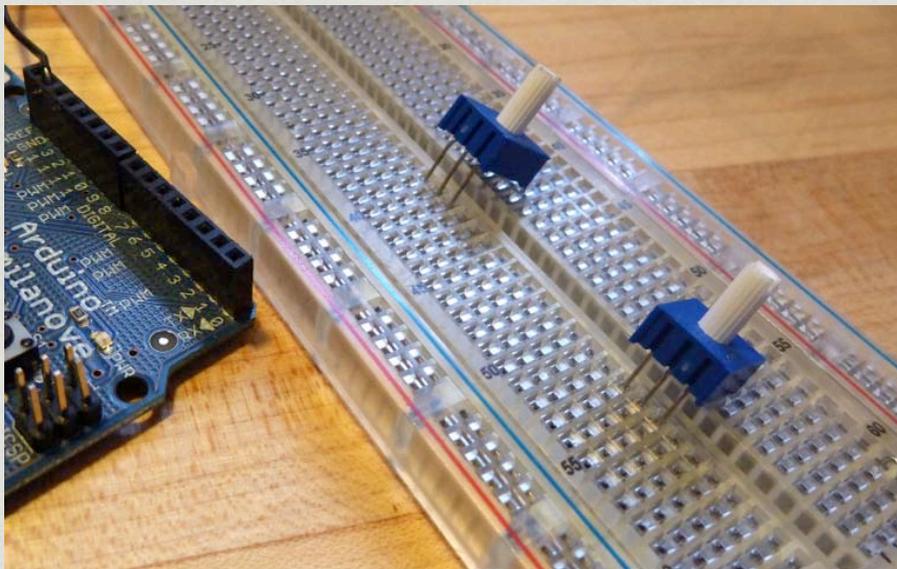


From an Educator Workshop



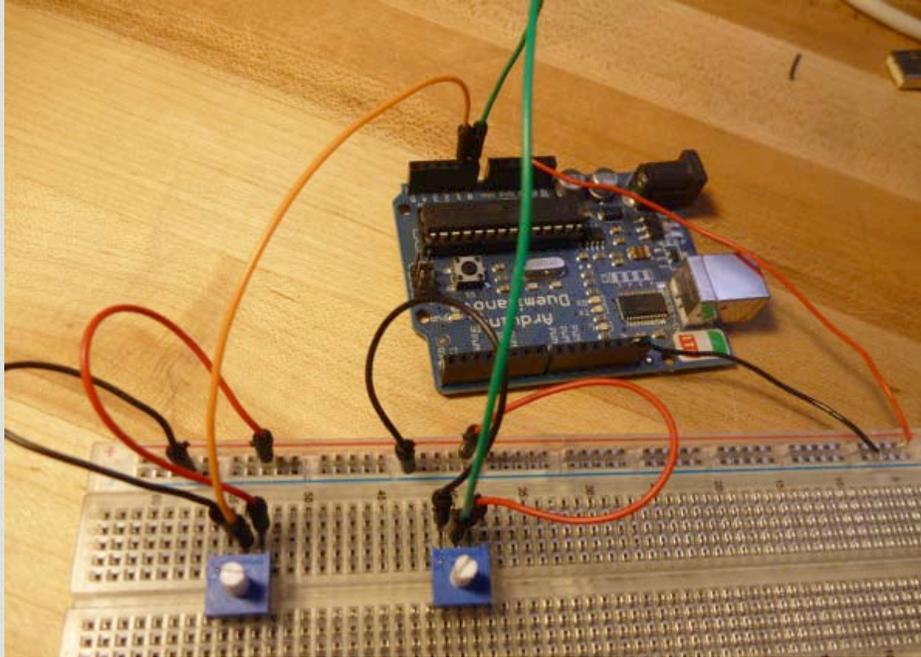
Procedure

Start with potentiometers (knobs)



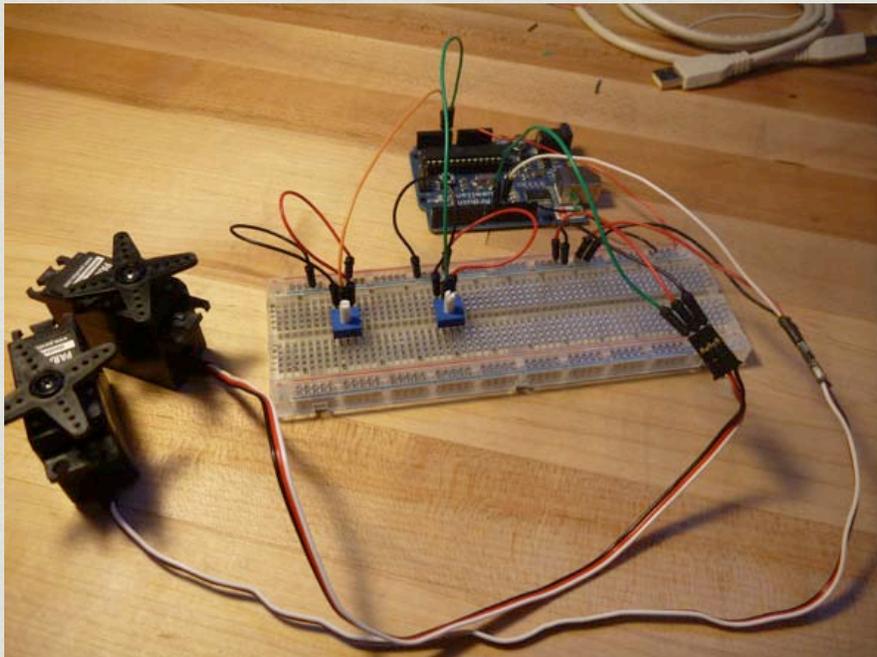
Procedure

Connect them to Arduino



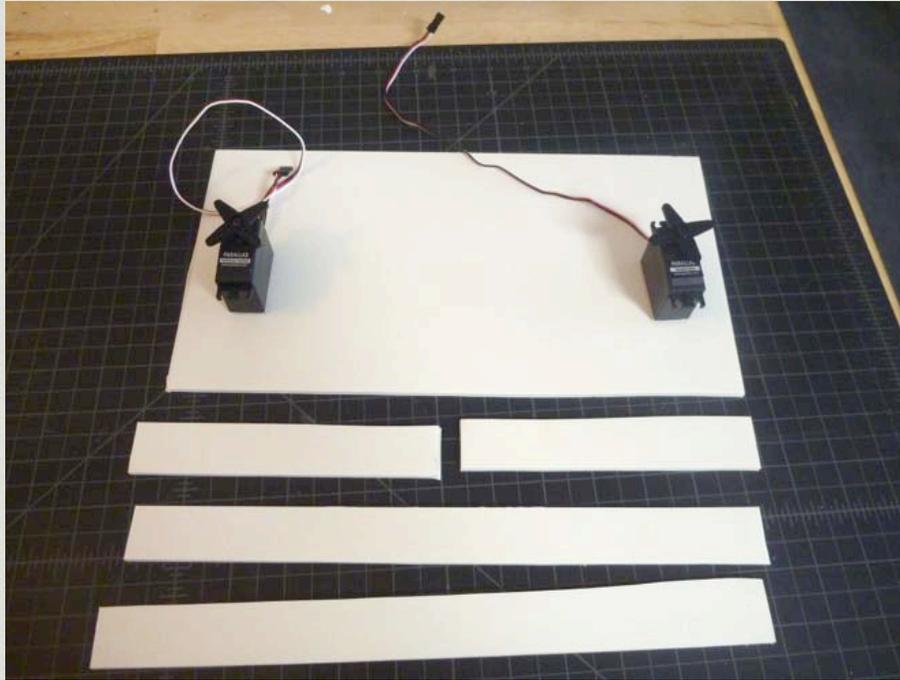
Procedure

Now connect two hobby servos



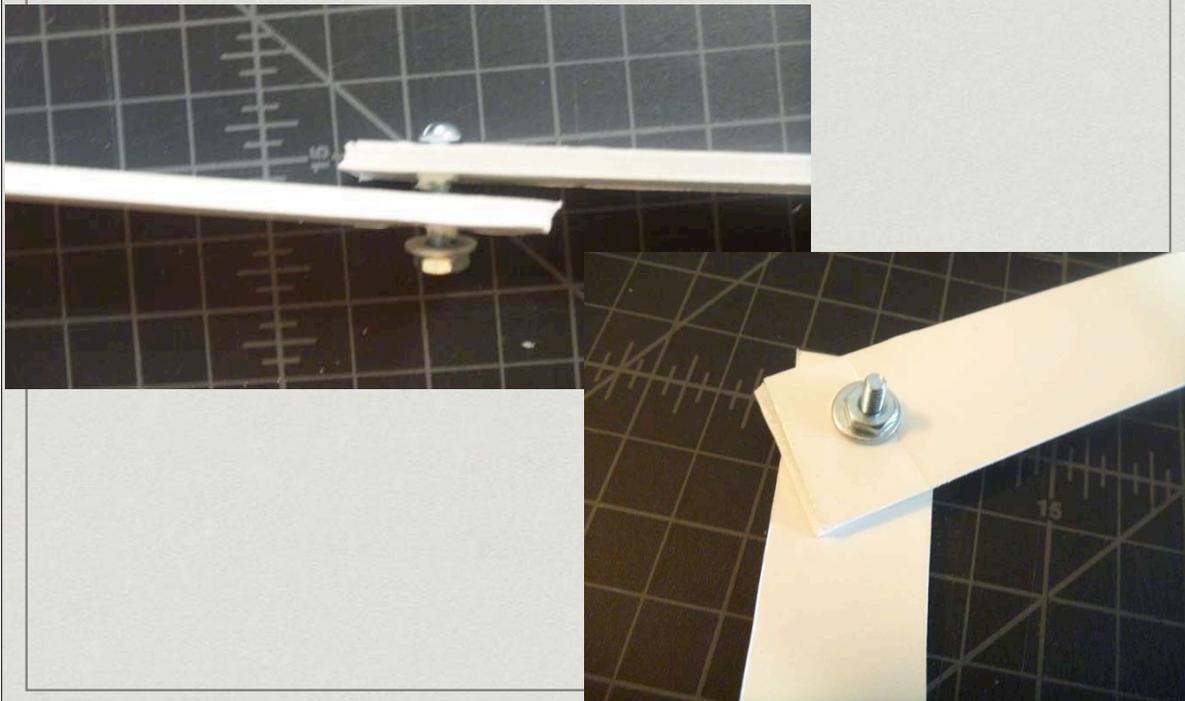
Procedure

Cut some foam core



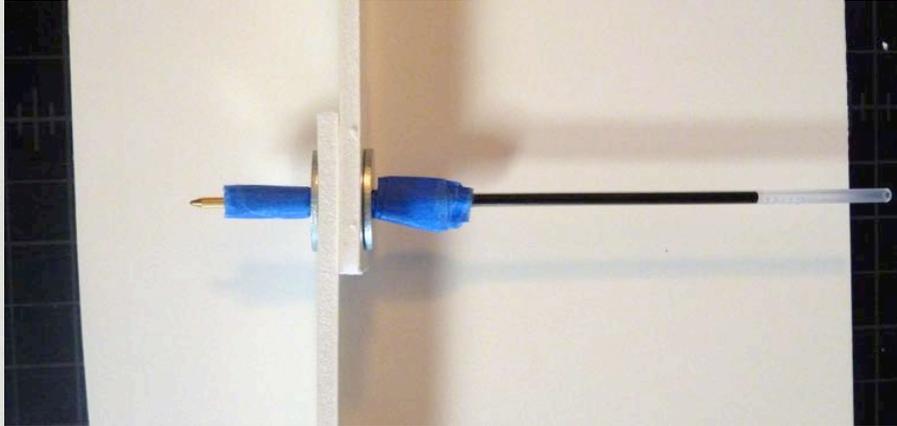
Procedure

Make linkages with nuts/bolts



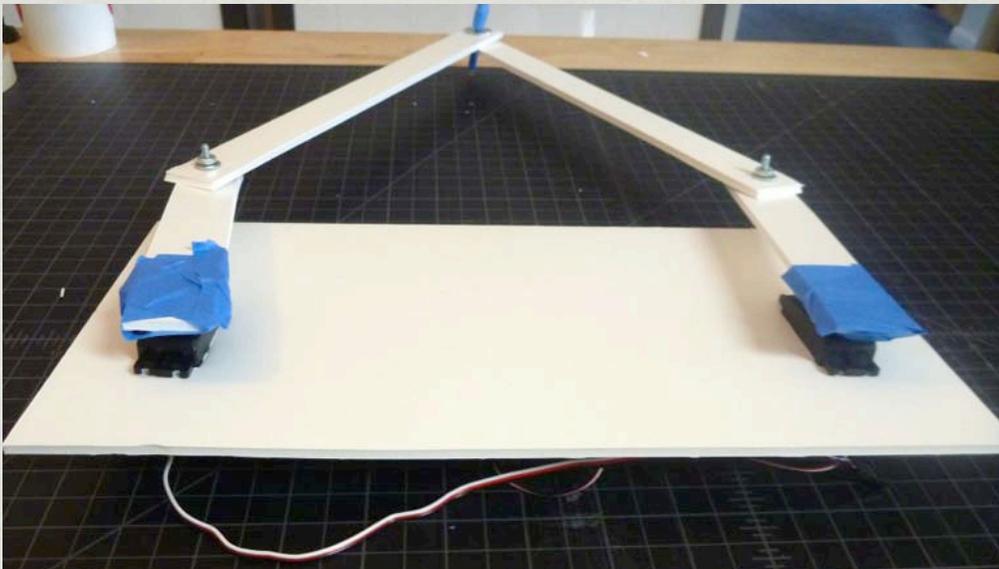
Procedure

Put a pen through the foam core



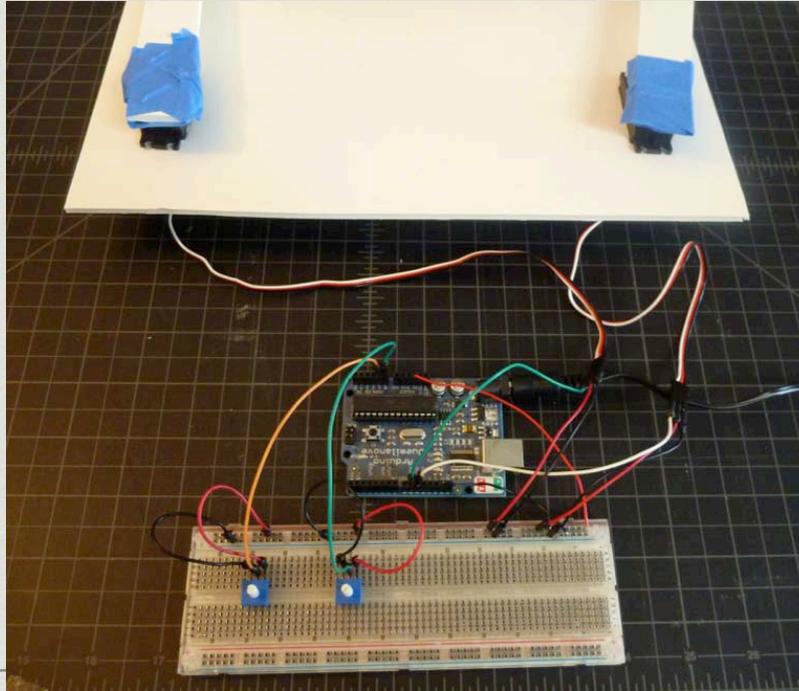
Procedure

Tape the arms to the servos



Procedure

Reconnect the servos to the Arduino



Procedure

Upload some simple code to Arduino

```
#include <Servo.h>          // include the Servo library
Servo servo1, servo2;      // create objects for both servos
int servo1Pin = 10;        // define where the servos are connected
int servo2Pin = 9;        // choose any digital pins you like

int pot1Pin = A0;         // analog pin for first pot
int pot2Pin = A1;         // analog pin for second pot
int pot1Val, pot2Val;     // variables for pot values

void setup() {
  servo1.attach(servo1Pin); // attach the servo objects to digital pins
  servo2.attach(servo2Pin);
}

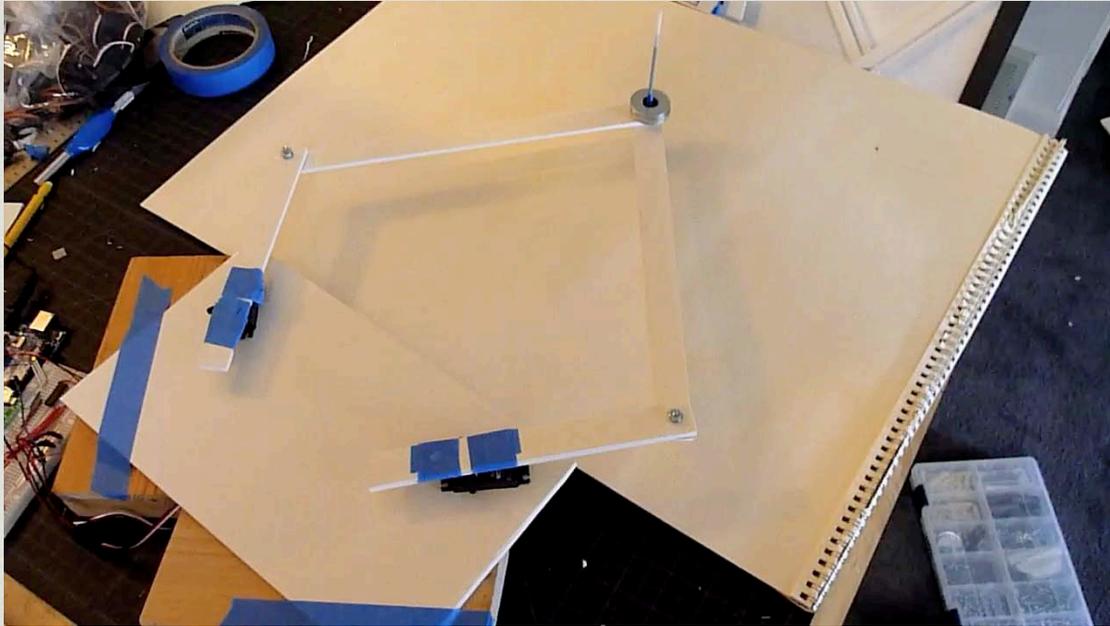
void loop() {
  pot1Val = analogRead(pot1Pin); // read pot1 value
  pot2Val = analogRead(pot2Pin); // read pot2 value

  // map the values received on the analog inputs from the pots
  // to the servo's range of motion.
  pot1Val = map(pot1Val, 0, 1023, 0, 179);
  pot2Val = map(pot2Val, 0, 1023, 0, 179);

  // send the data to the servos
  servo1.write(pot1Val);
  servo2.write(pot2Val);

  delay(30); // give the servos time to react...
}
```

The Dancing Arms Drawing Machine



Conclusions

- * Drawing Machines are an intriguing way to combine art and engineering
- * Long and interesting history
- * Potential for collaboration
 - * *Art students are introduced to engineering*
 - * *Engineering students are introduced to art*

Contact / Handouts

- * Erik Bruvand - ebrunvand@hotmail.com
- * Sandy Brunvand - slbrunvand@hotmail.com
- * Handouts/slides - <http://www.cs.utah.edu/~elb>

