Fundamentals of Physical Computing

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Plan for Today

- Lab Review
- Creative Analog Devices
- Math Review
- Analog Output
- Servos & Sound
- Libraries
- Engagement
- Readings & Assignments

Lab Review

Creative Analog Device Results

Math

Computer Math

- Binary, Decimal, Octal, Hexadecimal
  - Why?
    - Understanding computers
    - Programming helper, communications essential
  - What?
    - It’s all notation

Decimal

- Place system
- Powers
- Adding and carries
- Finger counting, but is that base 10?

Binary

- Place system
- Notation: %010 010b 0b10
- Powers
- Adding and carries
- Finger counting!

Octal

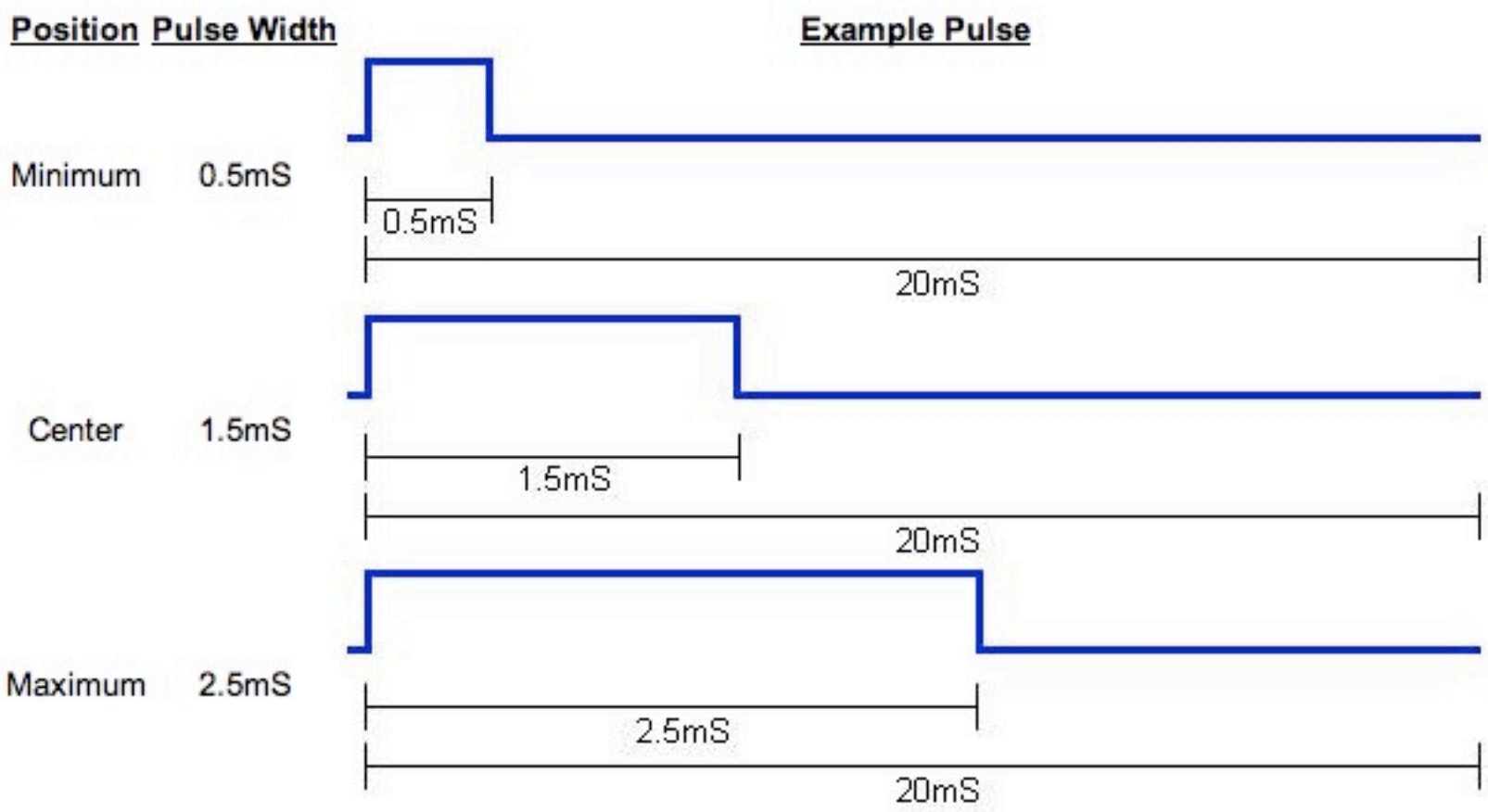
- Place system
- Notation **0**73
- Powers
- Adding and carries
- Finger counting, not really

Hexadecimal

- Place system
- Notation: extra digits, 0x10, #FFFFFF
- Powers
- Adding and carries
- Finger counting?
- Switches yes: 0xFF = 1111 1111 and 0x3C = 0011 1100

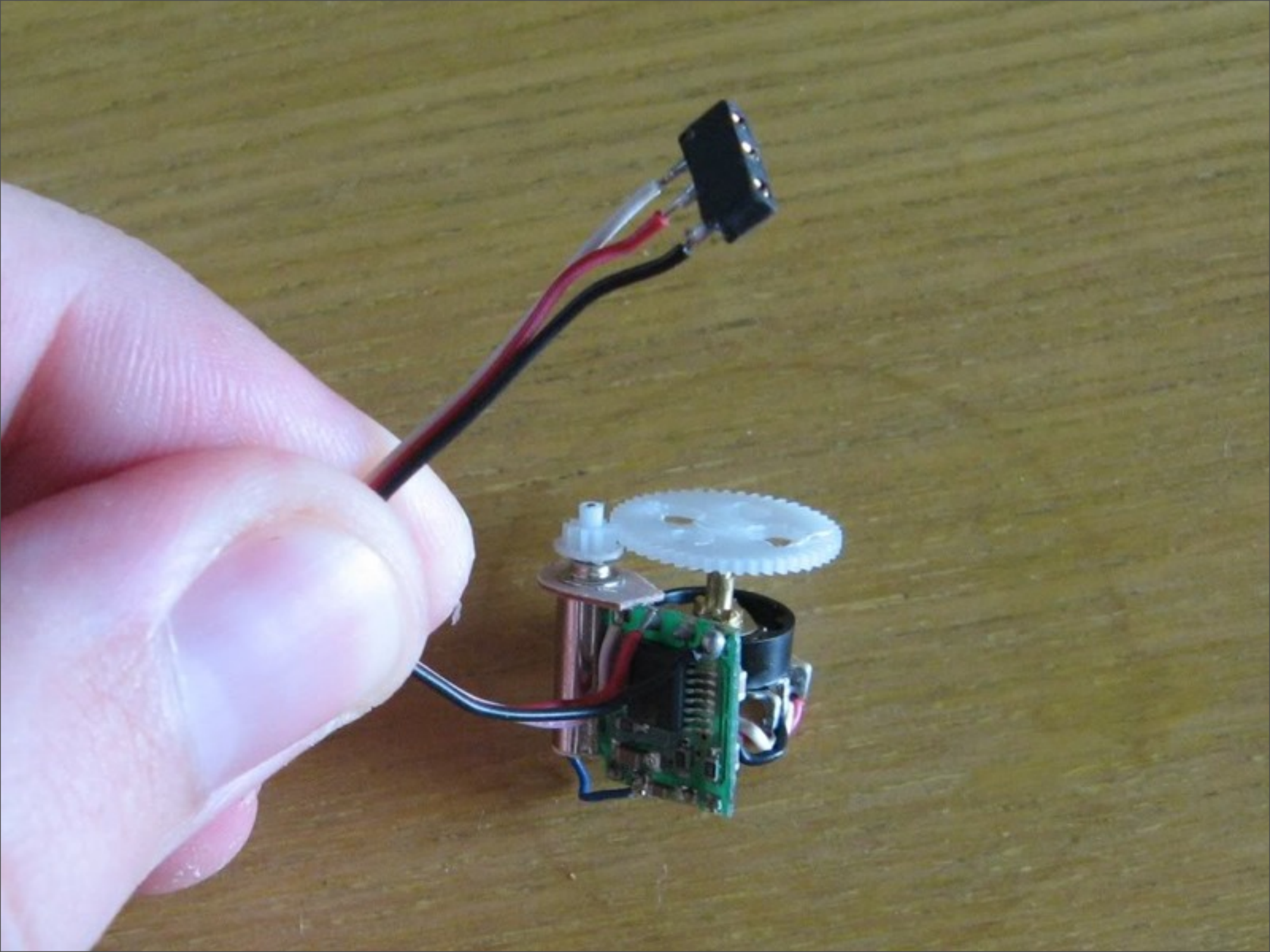
PWM

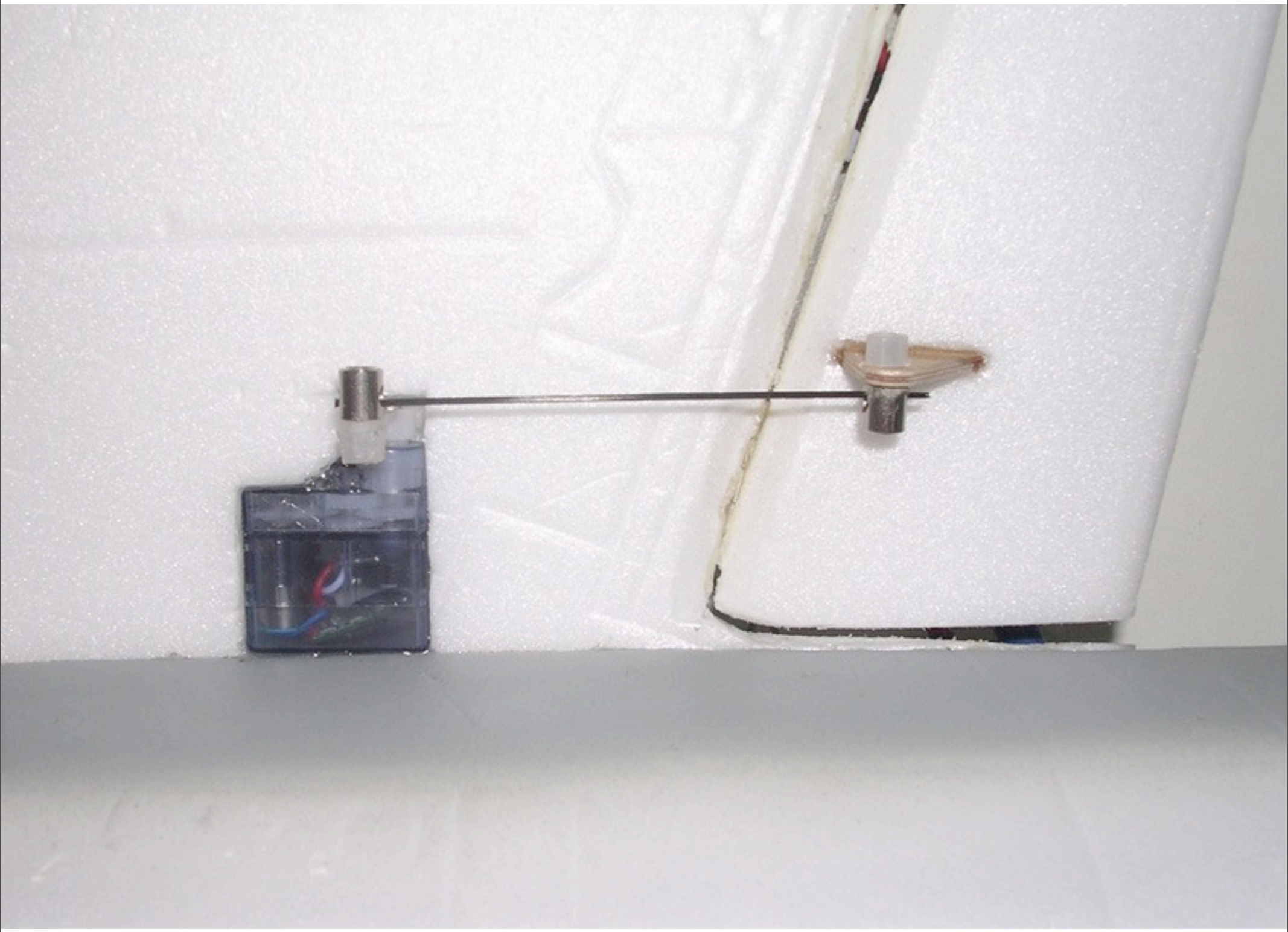
Pulse Width Determines Position



Servos

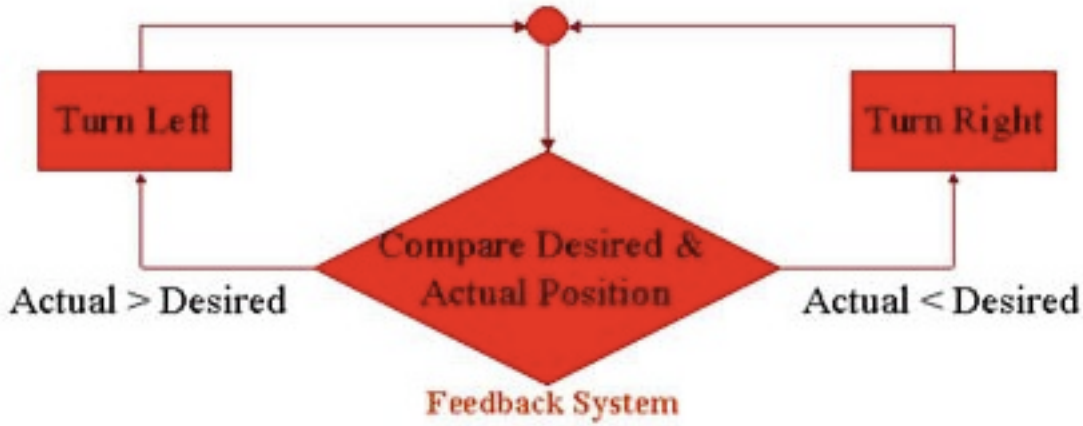
Servo Motors





Motor + Potentiometer + Microcontroller

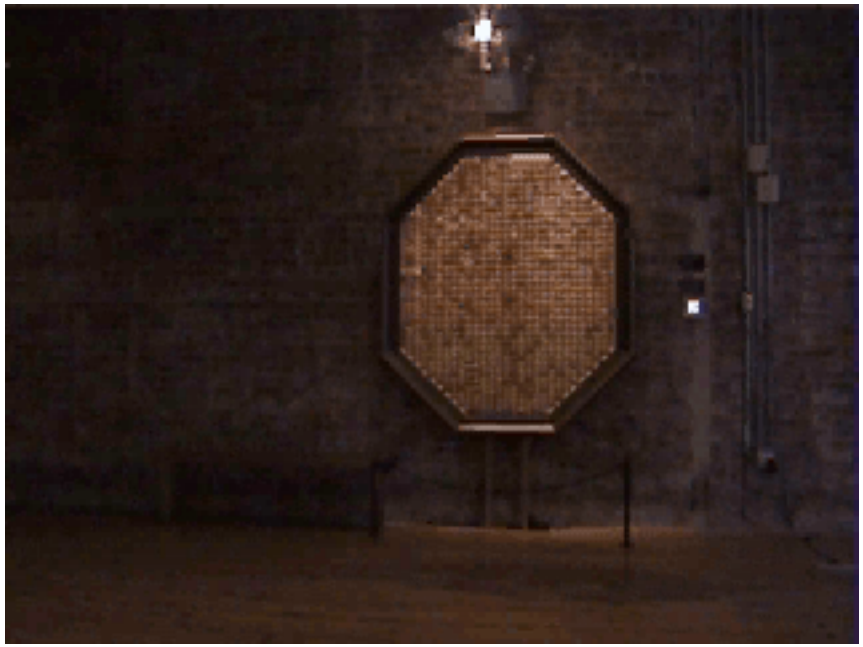
Feedback (negative)



Model Airplanes

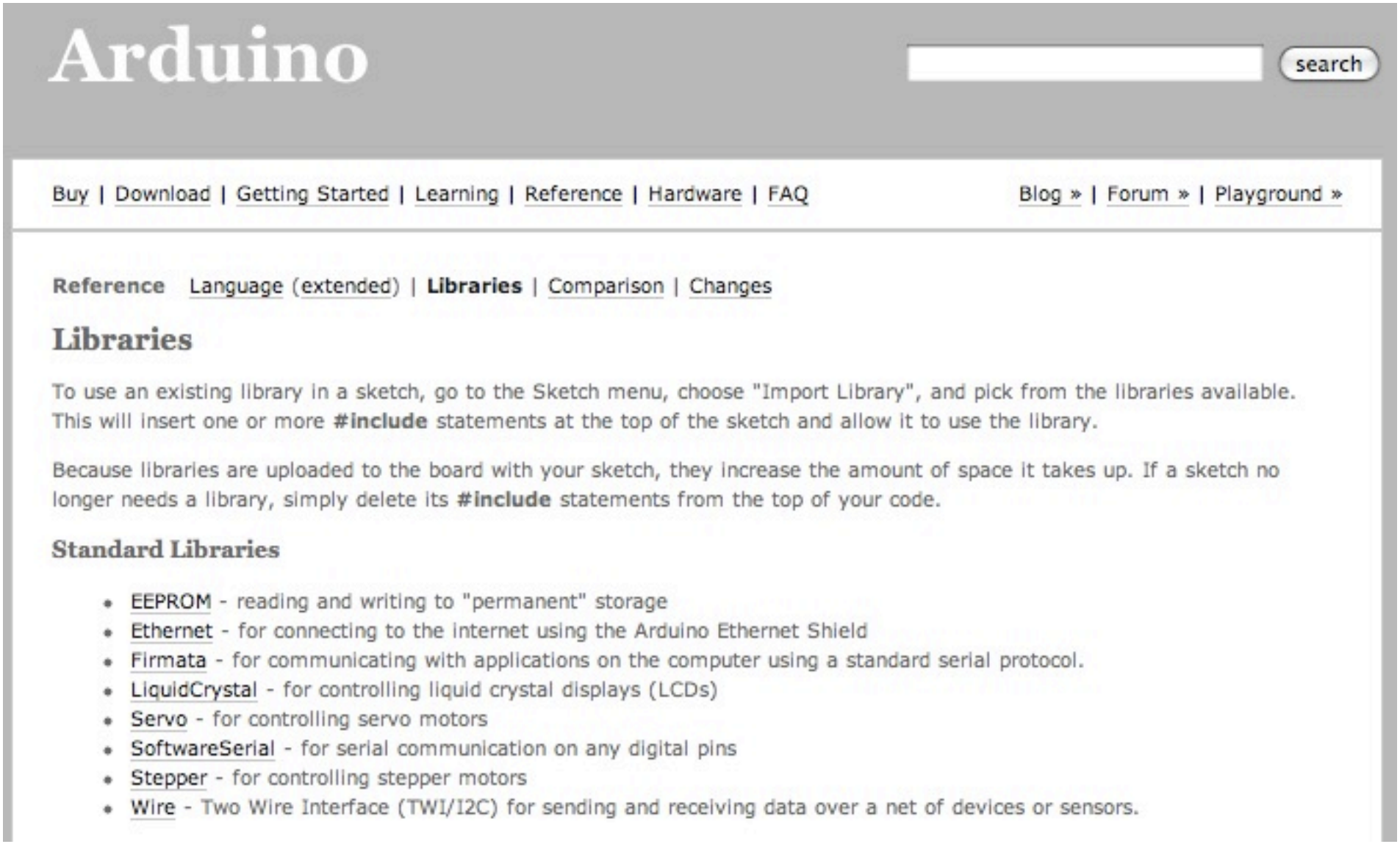
Danny Rozin

Danny Rozin



Libraries

Web Reference



Using Libraries

- path to libraries starting with Arduino 17:
  Documents/Arduino/libraries

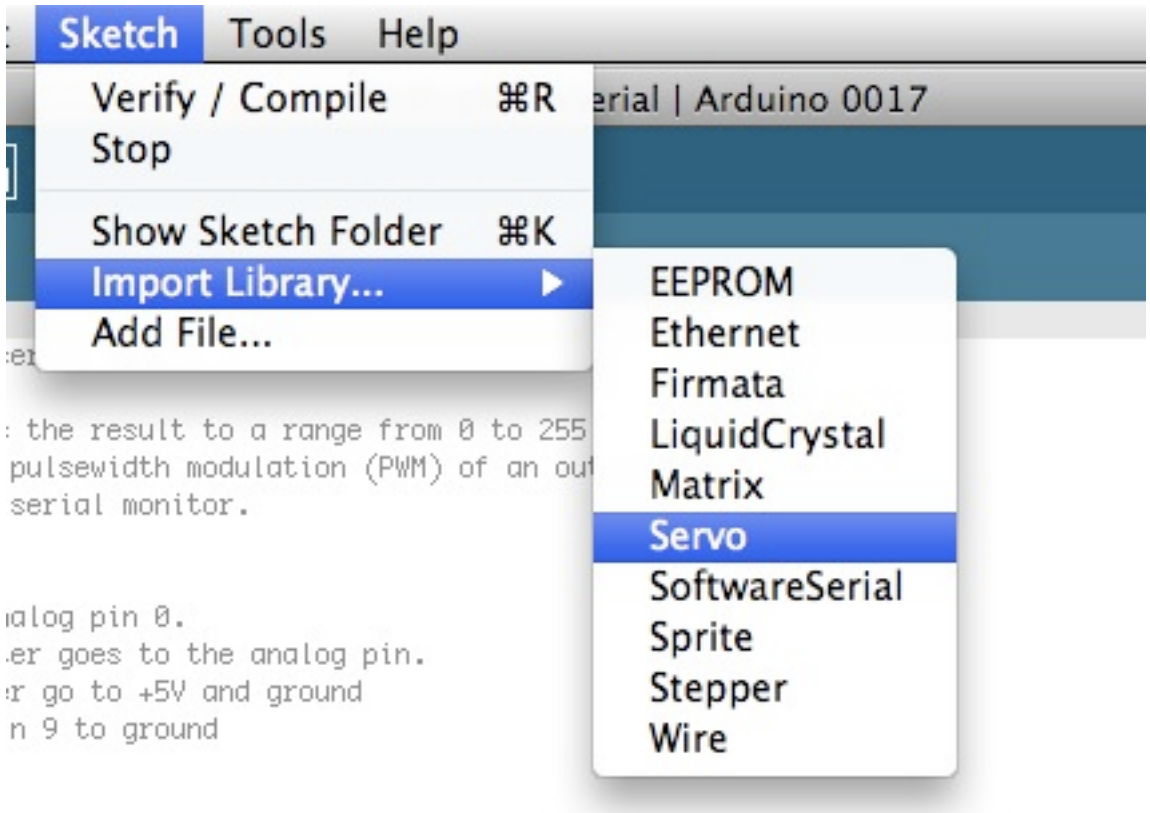
- including the library:
  #include <library.h>

- declaration:
  Object myinstance;

- setup
  myinstance.enable(7);

- commands
  myinstance.dostuff(27, 3);

Adding from menu



Servo Library

Servo

- including the library:
  #include <servo.h>

- declaration:
  Servo myservo;

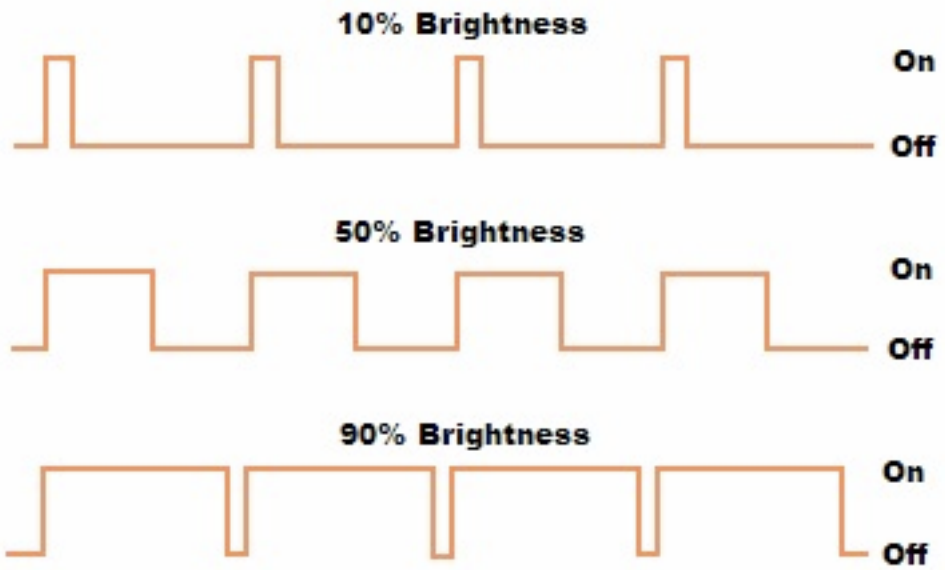
- setup:
  myservo.attach(9);

- commands:
  myservo.write(110);

Tone Library

PWM and Sound

- Why won’t PWM make tones?



Tones

- #include <Tone.h>
- Tone tone1;
- tone1.begin(13);
- tone1.play(1000, 2500);
- tone1.stop()

Engagement

List of things that make engaging interactions

- ...

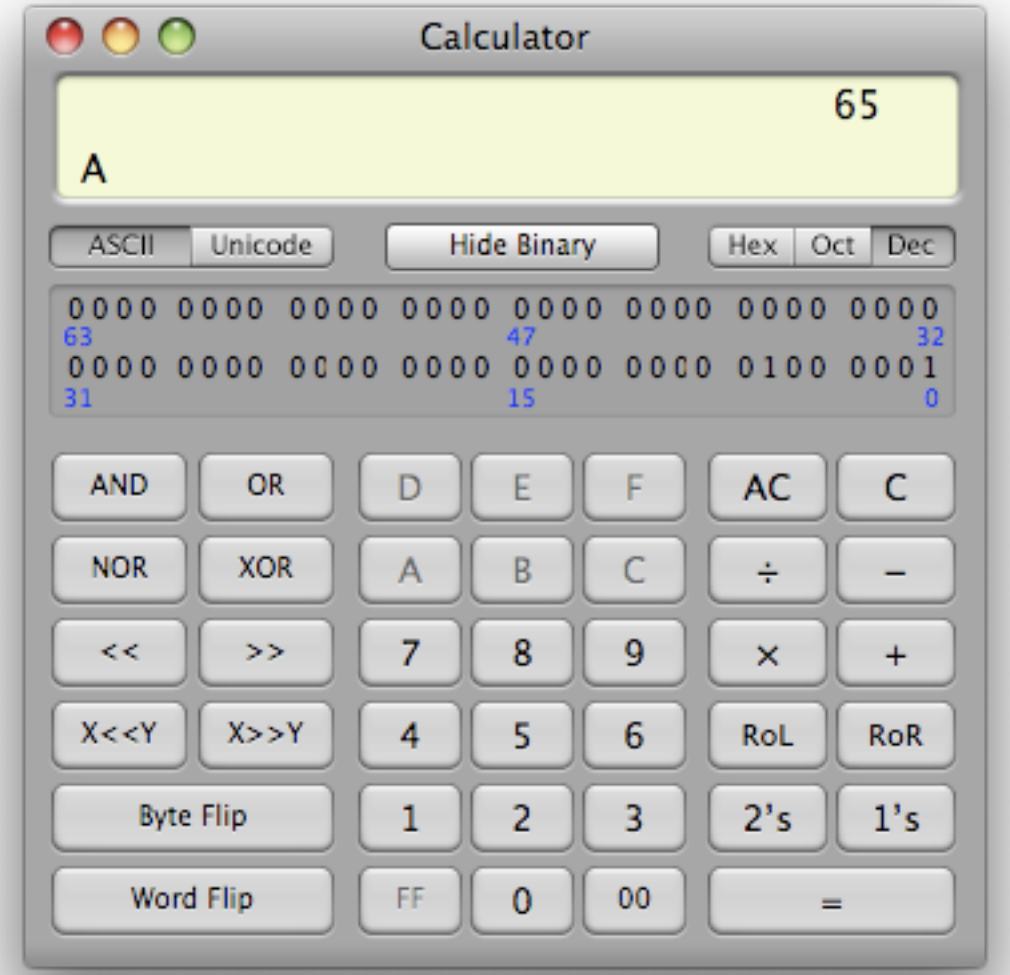
Engaging

- Sound
- Physicality
- Surprise
- Beauty
- Learning
- Depth
- Discovery
- Feedback
- Mapping
- Control
- Richness, multiple senses

Kelly Dobson

Kelly Dobson

Math Fun


Calculator
65
A
ASCII
Unicode
Hide Binary
Hex
Oct
Dec
0000 0000 0000 0000 0000 0000 0000 0000
63 47 32
0000 0000 0000 0000 0000 0000 0100 0001
31 15 0
AND
OR
D
E
F
AC
C
NOR
XOR
A
B
C
÷
−
<<
>>
7
8
9
×
+
X<<Y
X>>Y
4
5
6
RoL
RoR
Byte Flip
1
2
3
2's
1's
Word Flip
FF
0
00
=

Readings and Assignments

- Readings
  - Physical Computing, chapter 6
  - Arduino, chapter 5
- Assignment
  - Analog Output Lab