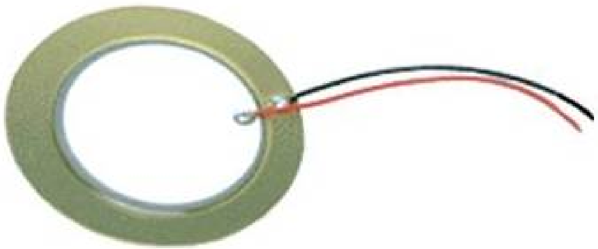
week 05

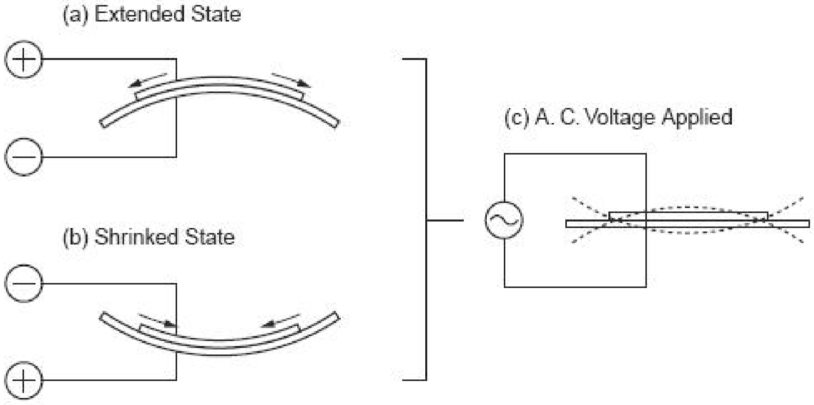
Output 1: Making Sound

Piezo buzzers

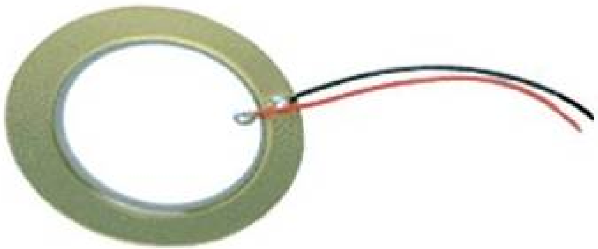
Piezo Buzzer

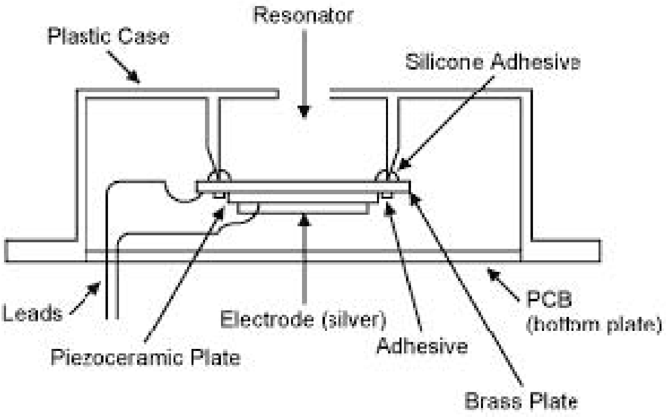
Piezo Buzzer

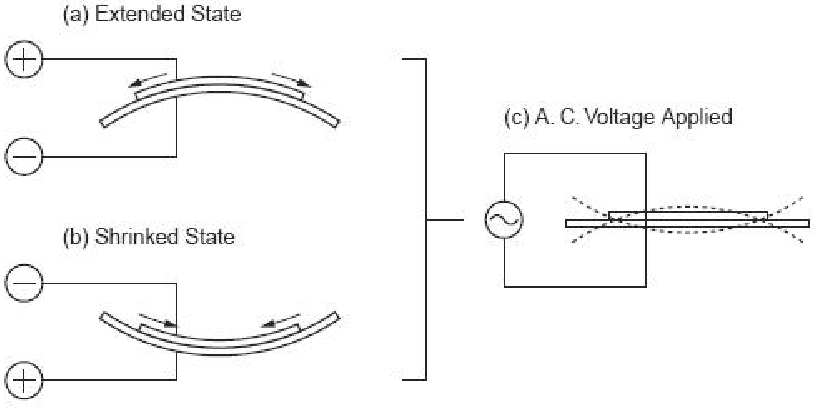


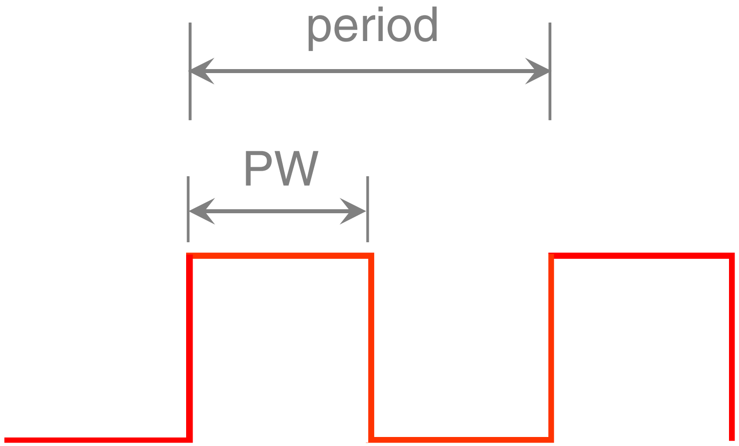


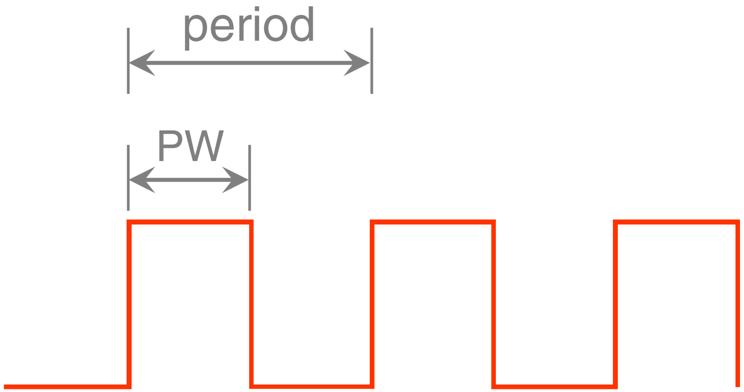
Piezo Buzzer

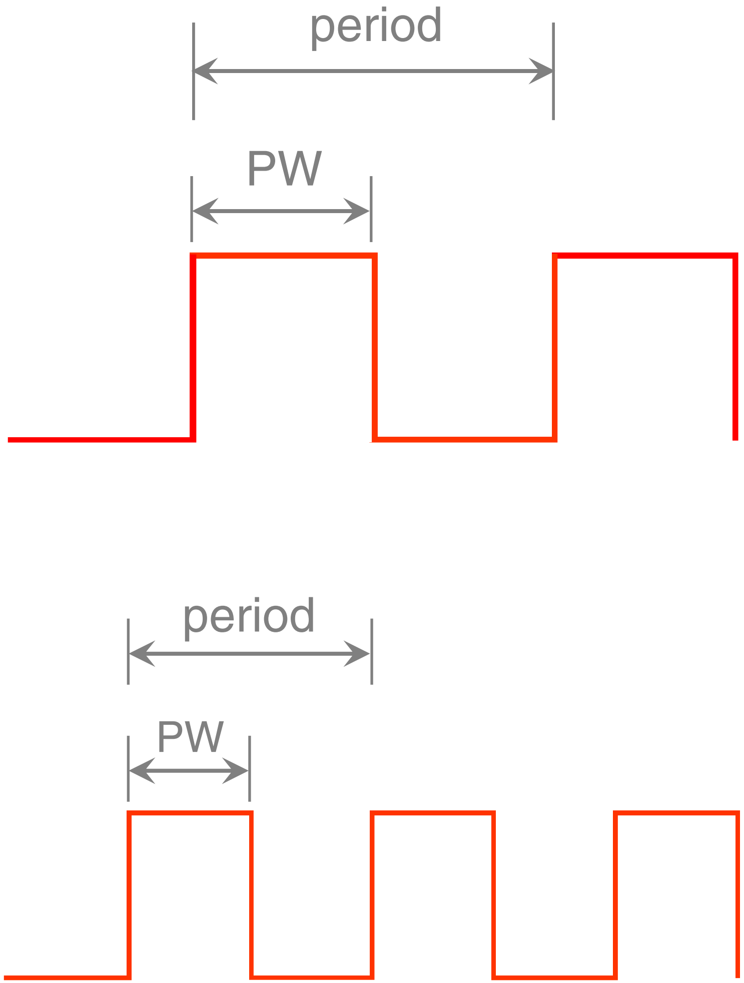






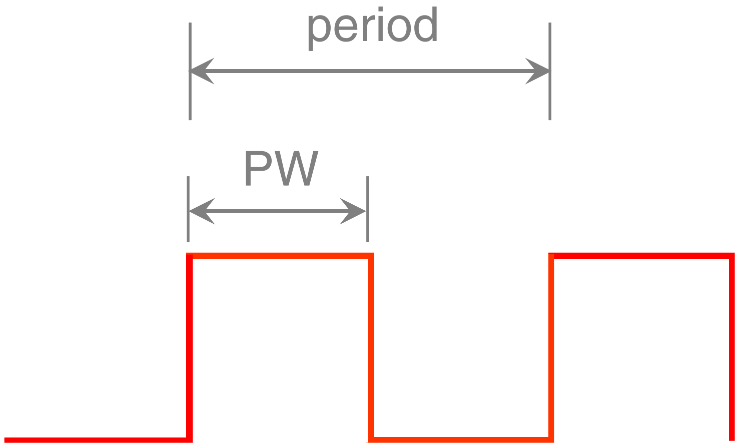

period
PW

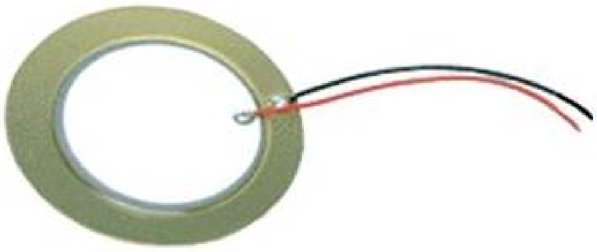

period
PW

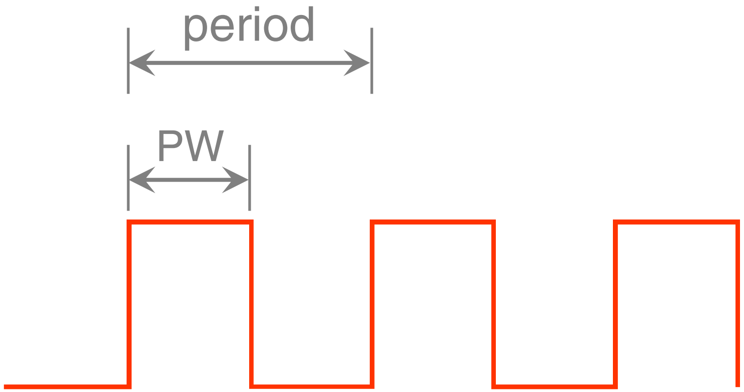


$$\text{Frequency (Hz)} = \frac{1}{\text{Period (sec)}}$$

* note	frequency	period (microseconds)	PW (timeHigh)
* c	261 Hz	3830	1915
* d	294 Hz	3400	1700
* e	329 Hz	3038	1519
* f	349 Hz	2864	1432
* g	392 Hz	2550	1275
* a	440 Hz	2272	1136
* b	493 Hz	2028	1014
* C	523 Hz	1912	956


period
PW

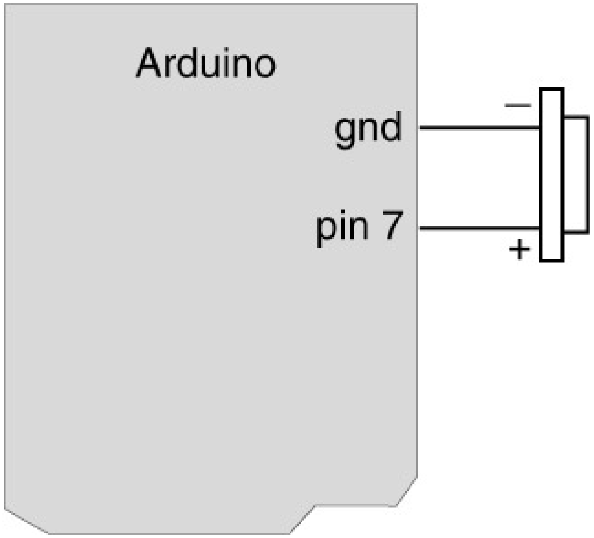



period
PW

In Class Exercise

1. **Connect your piezo buzzer**
2. **Play sound**
3. **Make a Theremin**
4. **Solder wires to a motor (for next Thursday)**

1. Connect your piezo buzzer



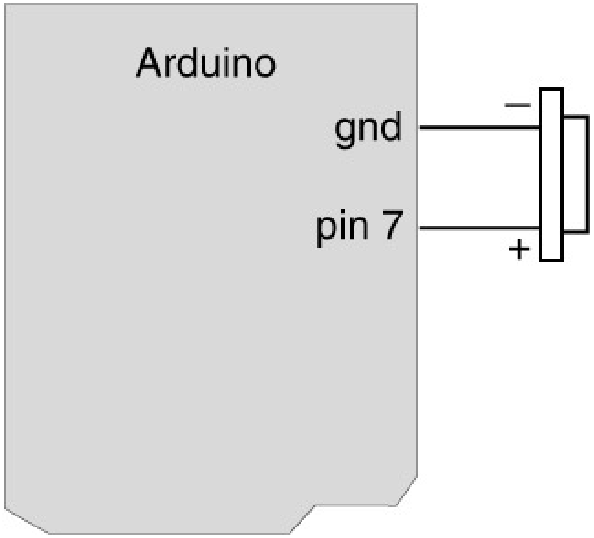
Polarity matters!

black = ground

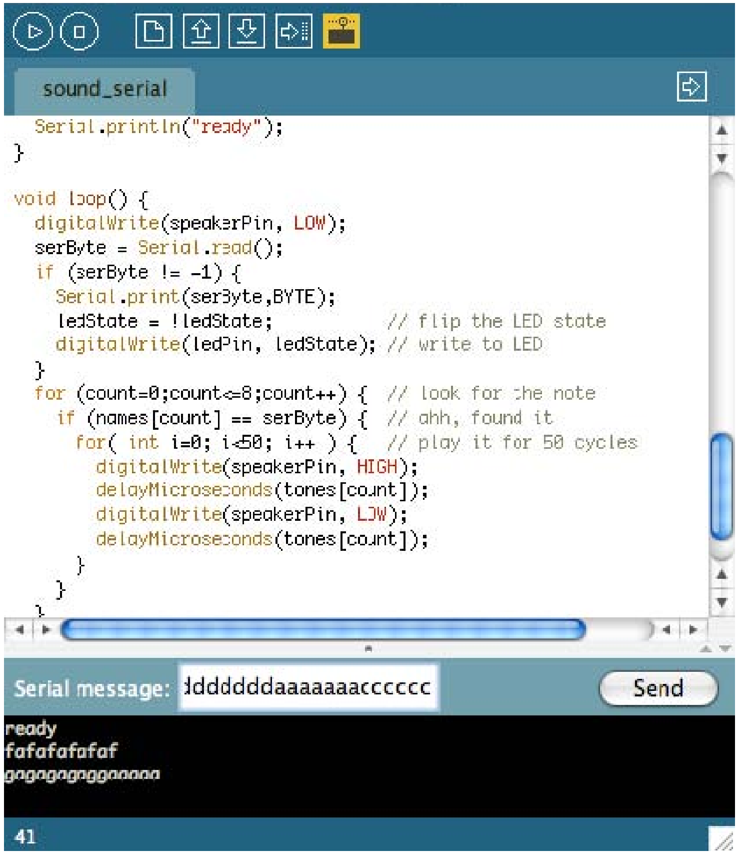
In Class Exercise

1. Connect your piezo buzzer
2. **Play sound**
3. Make a Theremin
4. Solder wires to a motor (for next Thursday)

2. Play Sound



sound_serial



```
  Serial.println("ready");
}

void loop() {
  digitalWrite(speakerPin, LOW);
  serByte = Serial.read();
  if (serByte != -1) {
    Serial.print(serByte,BYTE);
    ledState = !ledState;           // flip the LED state
    digitalWrite(ledPin, ledState); // write to LED
  }
  for (count=0;count<=8;count++) {  // look for the note
    if (names[count] == serByte) {  // ahh, found it
      for( int i=0; i<50; i++ ) {   // play it for 50 cycles
        digitalWrite(speakerPin, HIGH);
        delayMicroseconds(tones[count]);
        digitalWrite(speakerPin, LOW);
        delayMicroseconds(tones[count]);
      }
    }
}
```

Serial message: dddddddaaaaaaacccccc

```
ready
fafafafafaf
gagagagaggaaaaa
```

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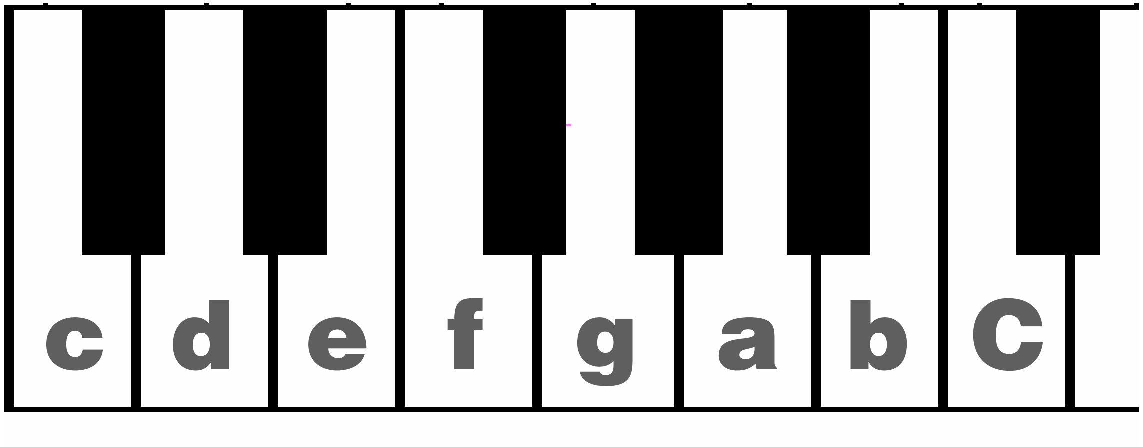
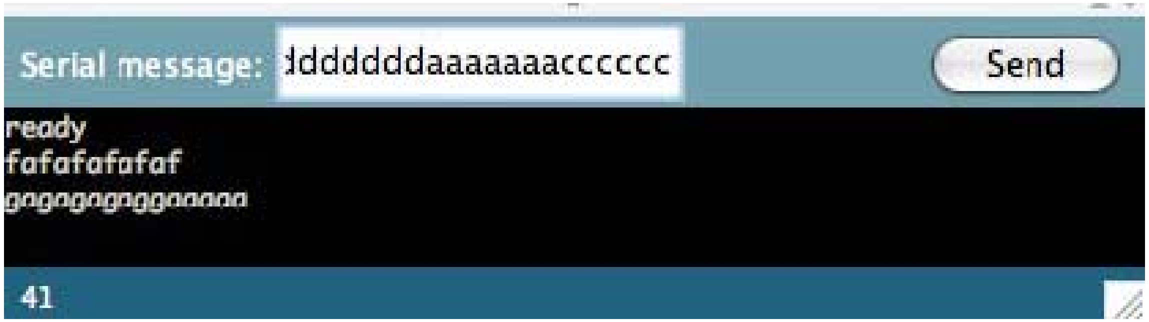
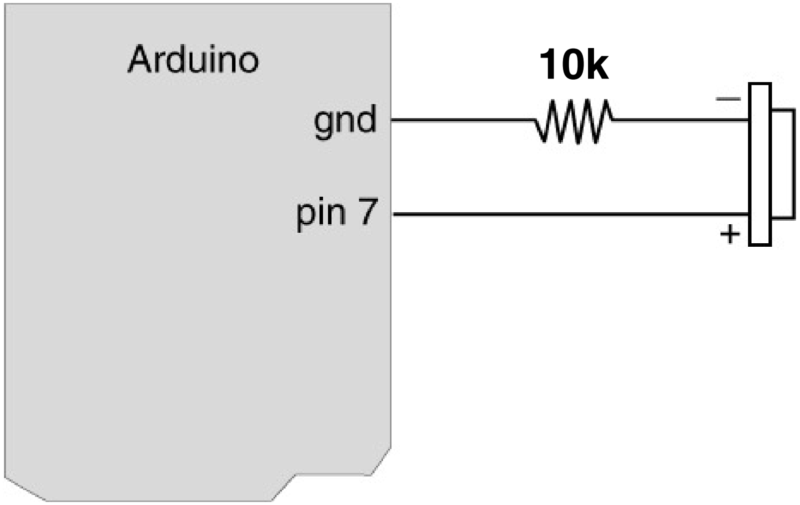



Serial message: ddddddaaaaaaacccccc

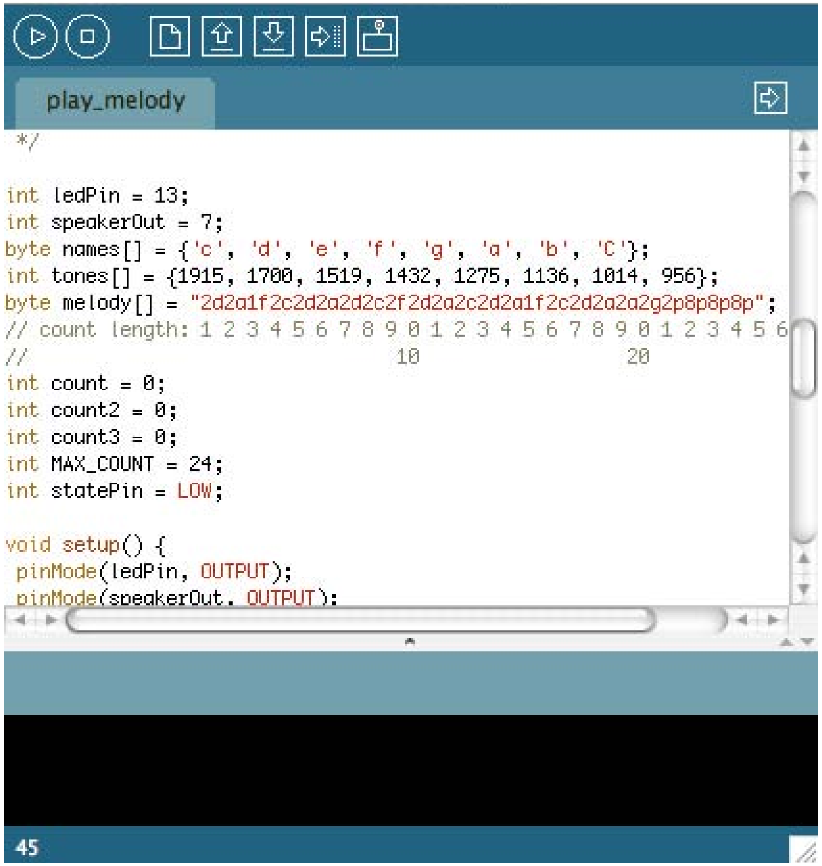
```
ready
fafafafafaf
gagagagaggaaaaa
```

2. Play Sound



If you want to make it quieter, add a resistor.

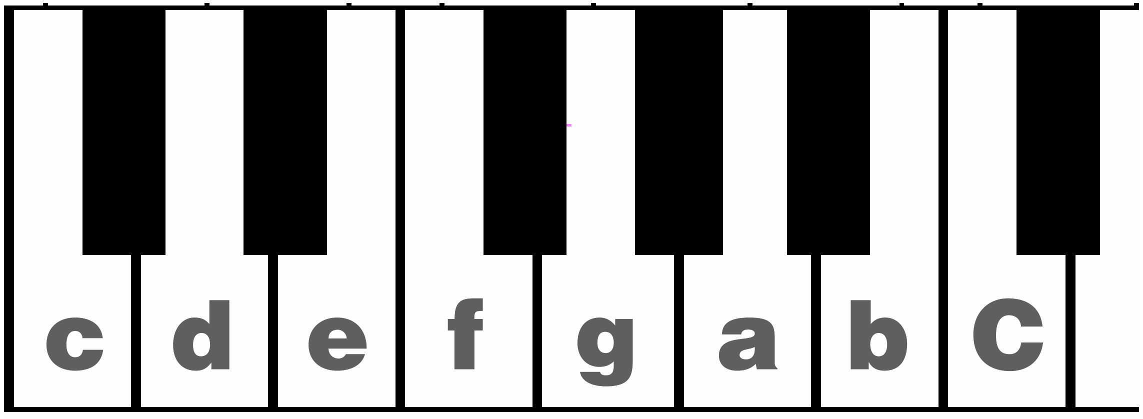
play_melody

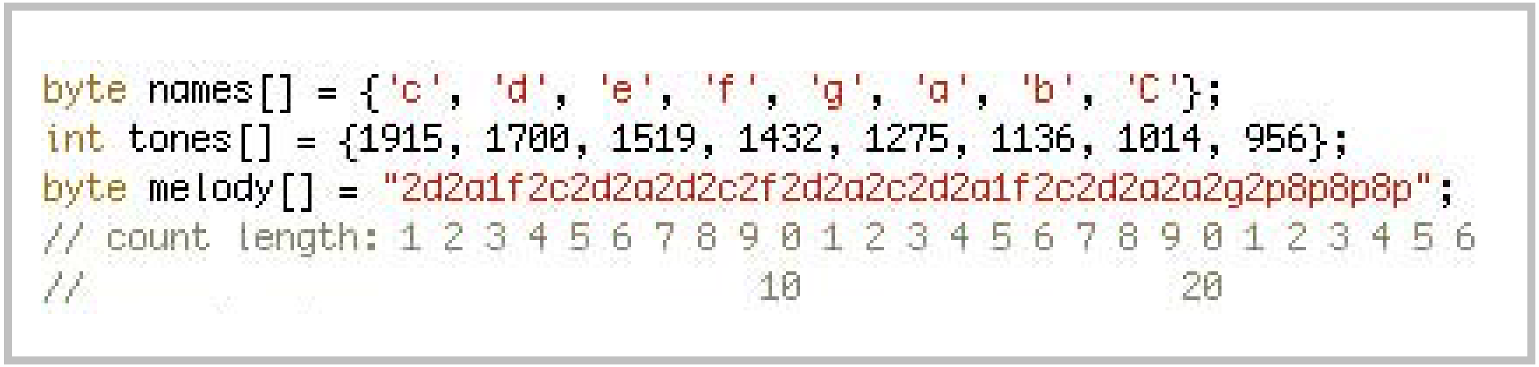


```
 */

int ledPin = 13;
int speakerOut = 7;
byte names[] = {'c', 'd', 'e', 'f', 'g', 'a', 'b', 'C'};
int tones[] = {1915, 1700, 1519, 1432, 1275, 1136, 1014, 956};
byte melody[] = "2d2a1f2c2d2a2d2c2f2d2a2c2d2a1f2c2d2a2a2g2p8p8p8p";
// count length: 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
//                                 10                  20
int count = 0;
int count2 = 0;
int count3 = 0;
int MAX_COUNT = 24;
int statePin = LOW;

void setup() {
 pinMode(ledPin, OUTPUT);
 pinMode(speakerOut, OUTPUT);
```





```
byte names[] = {'c', 'd', 'e', 'f', 'g', 'a', 'b', 'C'};
int tones[] = {1915, 1700, 1519, 1432, 1275, 1136, 1014, 956};
byte melody[] = "2d2a1f2c2d2a2d2c2f2d2a2c2d2a1f2c2d2a2a2g2p8p8p8p";
// count length: 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
//                                10                  20
```

In Class Exercise

1. Connect your piezo buzzer
2. Play sound
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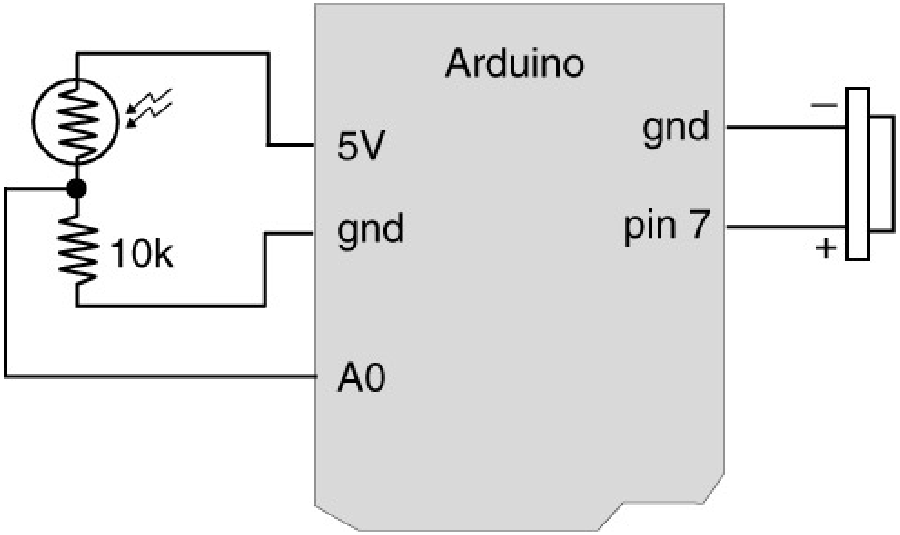
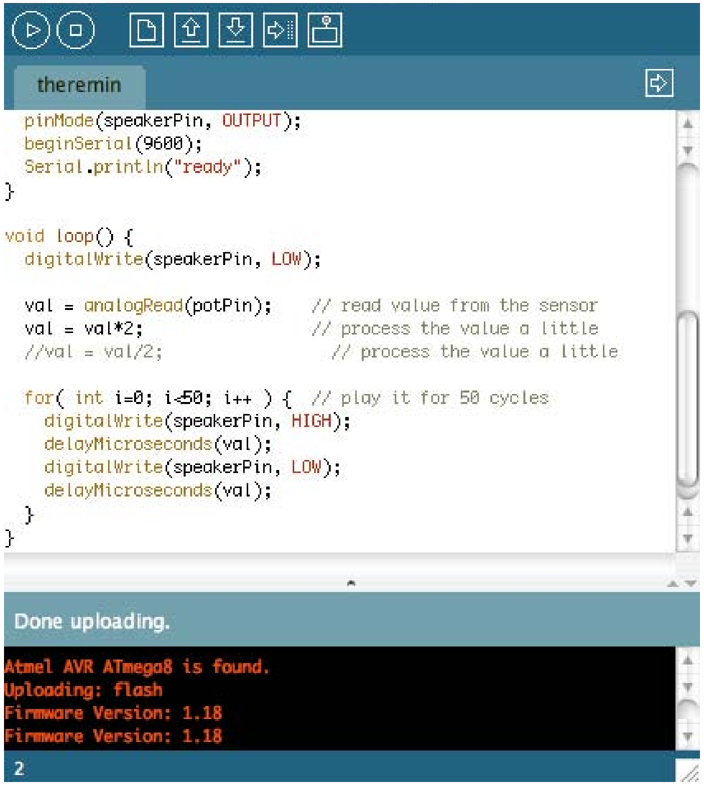
Theremin (by Leon Theremin)

Measures the body’s electric field.

Your Theremin



theremin



```
  pinMode(speakerPin, OUTPUT);
  beginSerial(9600);
  Serial.println("ready");
}

void loop() {
  digitalWrite(speakerPin, LOW);

  val = analogRead(potPin);     // read value from the sensor
  val = val*2;                  // process the value a little
  //val = val/2;                  // process the value a little

  for( int i=0; i<50; i++ ) {  // play it for 50 cycles
    digitalWrite(speakerPin, HIGH);
    delayMicroseconds(val);
    digitalWrite(speakerPin, LOW);
    delayMicroseconds(val);
  }
}
```

Done uploading.

```
Atmel AVR ATmega8 is found.
Uploading: flash
Firmware Version: 1.18
Firmware Version: 1.18
```

2

In Class Exercise

1. Connect your piezo buzzer
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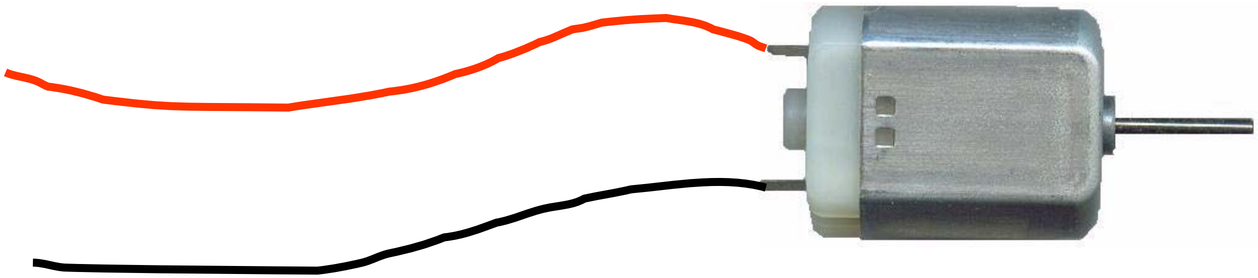
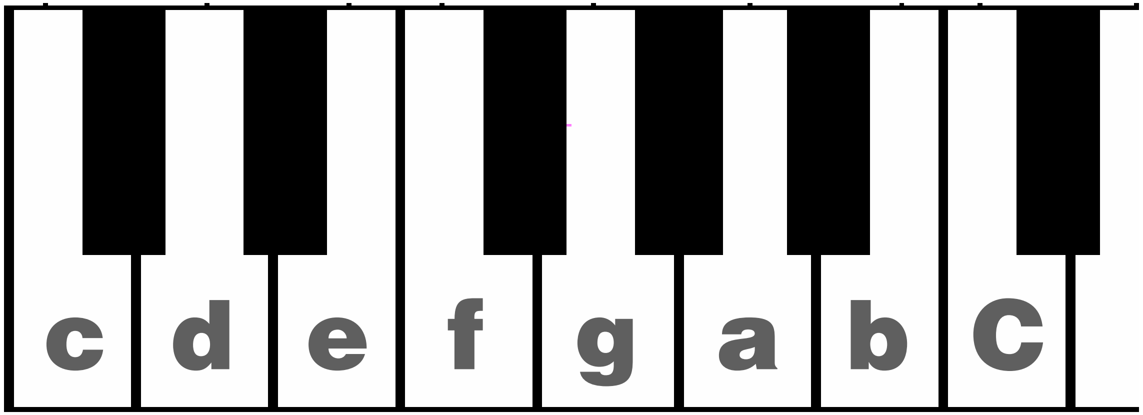
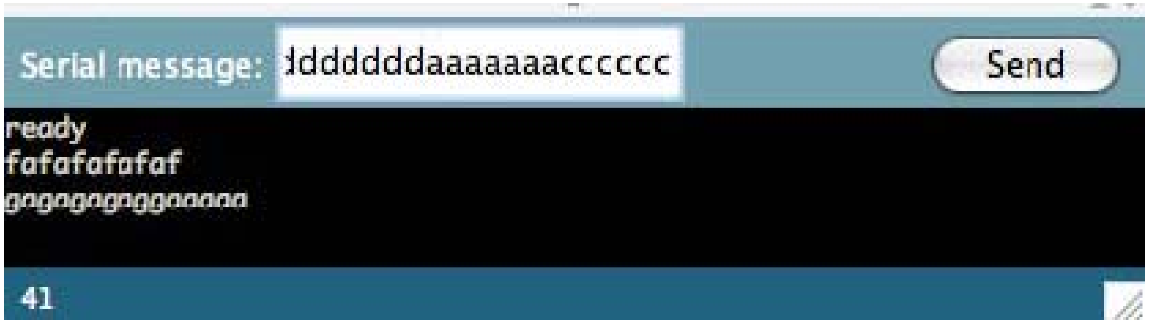


Let’s try to make beautiful music!





```
dddddddaaaaaaacccccc
```

```
ready
fafafafafaf
gagagagaggaaaaa
```

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Homework

Input output coincidence exercise. Design an artifact where both input and output occur at the same place. Use any combination of your input transducers and output transducers (pot, photocell, FSR, LEDs, piezo, screen). E.g., a ball that changes colors and/or plays different sound/melody depending on the pressure being applied. A stick you can twist to color or sound differently… These are just examples to spark your imagination. Be creative!

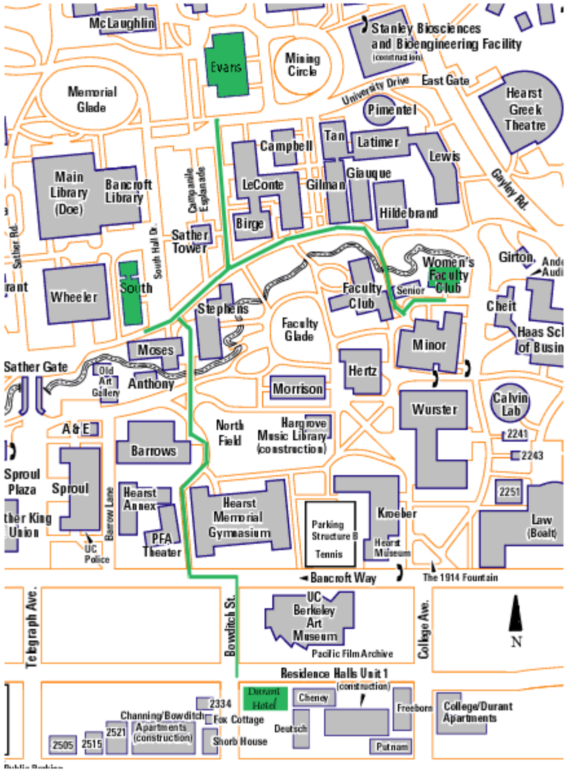
Announcement

Programming course by Dave and Ryan TODAY
Thursday, Sept 27, 2007 6:00PM in 110 South Hall

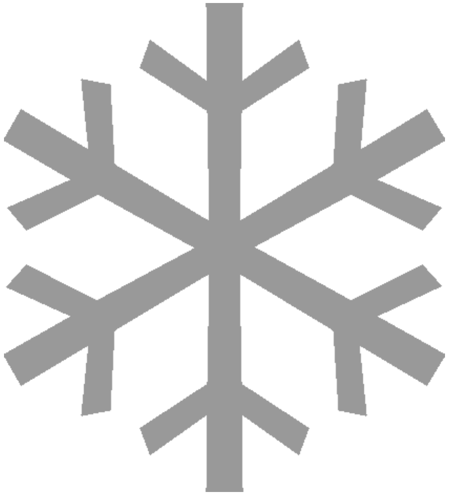
Thanks!

Show and Tell!

Map as an Indexical Sign?



Signs in Context of Use

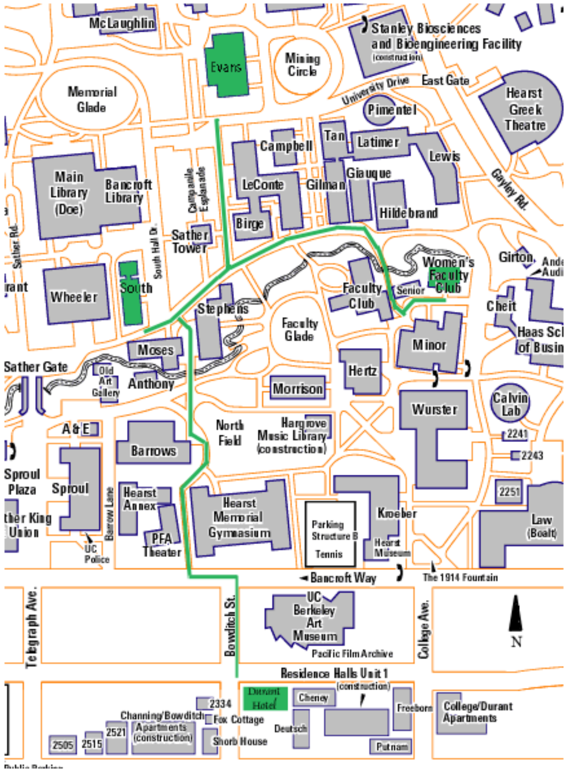


to represent “snow flake” == **Iconic**

to represent “cold weather” == **Indexical**

to represent “GO for ski” == **Symbolic**

Signs in Context of Use



Iconic

Representing directional relations and distances between landmarks

Indexical

Pointing to the location of things

Symbolic

Conventional symbols that must be learned