Dalkey Dojo

Knock Sensor

Here we use a Piezo element to detect sound and vibration, which will allow us to use it as a knock sensor. We are taking advantage of the processors capability to read analog signals through its ADC - analog to digital converter. These converters read a voltage value and transform it into a value encoded digitally. In the case of the Arduino boards, we transform the voltage into a value in the range 0..1024. 0 represents 0volts, while 1024 represents 5volts at the input of one of the six analog pins.

A Piezo is nothing but an electronic device that can both be used to play tones and to detect tones using vibration. In our example we are plugging the Piezo on the analog input pin number 0, that supports the functionality of reading a value between 0 and 5volts, and not just a plain HIGH or LOW. Sometimes it is possible to acquire Piezo elements without a plastic housing, then they will just look like a metallic disc and are easier to use as input sensors.

The other thing to remember is that Piezos have polarity, some devices have a red and a black wire indicating how to plug it to the board. We connect the black one to ground and the red one to the input. We can also connect a resistor in the range of the Megaohms in parallel to the Piezo element; in.

See if you can do the project yourself without any help.

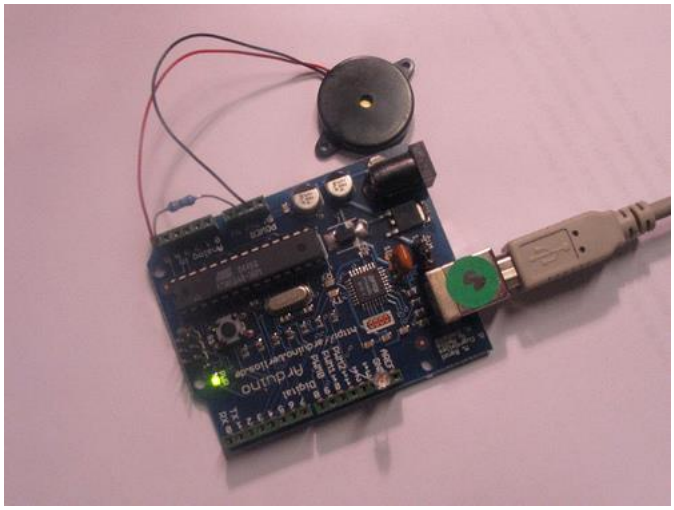
If you get stuck, look at the hints. Each numbered hint will give more information.

Once you are finished try changing the sensitivity and the light signal.

Equipment Required

- Arduino Uno
- Breadboard
- Piezo Sensor
- LED
- Jumper Cables (x4)
- Resistor (Mega Ohm) - Optional

Hint 1: Wiring without a breadboard



Example of connection of a Piezo to analog pin 0 with a resistor

Hint 2 – An outline of the program

```
// Set up the Arduino configuration First

// these constants won't change:
                        // led connected to digital pin 13
                       // the piezo is connected to analog pin 0
                       // threshold value to decide when the detected sound is a knock or not


// these variables will change:
int sensorReading = 0;      // variable to store the value read from the sensor pin

// Start the arduino pins and serial port
void setup() {
                       // declare the ledPin as as OUTPUT
                       //Make sure the LED is off
                       // use the serial port
}

void loop() {
  // read the sensor and store it in the variable sensorReading:


  // if the sensor reading is greater than the threshold:

    // Flash the LED pin

    // send the string "Knock!" back to the computer, followed by newline


  }

                     // delay to avoid overloading the serial port buffer
}
```

Hint 3 – Some of the code completed

```
// these constants won't change:
const int ledPin = ; /* Add code for Digital Pin 13 here*/      // led connected to digital pin 13
const int knockSensor =  ;/* Add code for Analog Pin 0 here*/  // the piezo is connected to analog pin 0
const int threshold = 400;                                    // threshold value to decide when the detected sound is a knock or not


// these variables will change:
int sensorReading = 0;      // variable to store the value read from the sensor pin

void setup() {
 pinMode(ledPin, OUTPUT); // declare the ledPin as as OUTPUT
 digitalWrite(ledPin, LOW); //Make sure the LED is off
 Serial.begin(9600);       // use the serial port
}

void loop() {
  // Add your logic here to read the sensor and
  // read the sensor and store it in the variable sensorReading:
  sensorReading = analogRead(knockSensor);

  // if the sensor reading is greater than the threshold:

    // Flash the LED pin

    // send the string "Knock!" back to the computer, followed by newline


  }
        // delay to avoid overloading the serial port buffer
}
```

Hint 4 – Code completed

```
// these constants won't change:
const int ledPin = 13;      // led connected to digital pin 13
const int knockSensor = A0; // the piezo is connected to analog pin 0
const int threshold = 400;  // threshold value to decide when the detected sound is a knock or not


// these variables will change:
int sensorReading = 0;      // variable to store the value read from the sensor pin

void setup() {
 pinMode(ledPin, OUTPUT); // declare the ledPin as as OUTPUT
 digitalWrite(ledPin, LOW); //Make sure the LED is off
 Serial.begin(9600);       // use the serial port
}

void loop() {
  // read the sensor and store it in the variable sensorReading:
  sensorReading = analogRead(knockSensor);

  // if the sensor reading is greater than the threshold:
  if (sensorReading >= threshold) {
    // Flash the LED pin
    digitalWrite(ledPin, HIGH);
    delay(500);
    digitalWrite(ledPin, LOW);
    // send the string "Knock!" back to the computer, followed by newline
    Serial.println("Knock!");
    Serial.println(sensorReading);

  }
  delay(400);  // delay to avoid overloading the serial port buffer
}
```