Arduino Programming Part 2

EAS 199A Lecture 6 Fall 2010

Overview

- · Variables: assigning and using
 - int
 - float
- Loops
 - for loops

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Assigning and Using Variables

Arduino web site

- http://www.arduino.cc/en/Tutorial/Variables
- http://arduino.cc/en/Tutorial/Foundations

Defining and using variables:

- * All variables must be declared before use
- * Declaration consists of a type specification and the variable name
- A declaration may also include an assignment
- Use meaningful variable names
- Add comments to further clarify meaning

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int Variables

An int is a 16 bit, signed integer

- See: http://www.arduino.cc/en/Reference/Int
- Storage requires two bytes or 16 bits
- **2** 16 = 65536
- ❖ Split into negative and positive range: −32,768 to 32,767
- Computations are rounded and rolled-over as needed

Examples:

```
// declaration only
int sensorVal;
int sensorPin = 3;
                       // declaration and assignment
sensorVal = analogRead(sensorPin);  // assignment
```

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float Variables

A float is a signed number with a fractional part

- See: http://www.arduino.cc/en/Reference/Float
- Stored in 32 bits (twice as much memory as an int)
- Range: -3.4028235 x 10³⁸ to 3.4028235 x 10³⁸
- Floating point arithmetic introduces rounding

Examples:

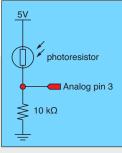
```
int
      sensorVal;
                         // value returned from analog input
                         // pin assigned to analog input
// Maximum range of 10 bit value
int
     sensorPin = 3;
int range = 1024;
float voltage;
                         // Voltage of the input signal
float maxVoltage = 5.0; // Maximum range of analog input
sensorVal = analogRead(sensorPin);
                                           // get reading
\ensuremath{//} convert to floating point voltage
voltage = float(sensorVal)*maxVoltage/float(range);
```

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Try it! Measure photoresistor output

Build the photoresistor circuit and run this program

```
photoresistor
      sensorVal;
int
int
    sensorPin = 3;
                                               Analog pin 3
float voltage;
float input2volts = 5.0/1024.0;
                                           10 kΩ
void setup () {
 Serial.begin(9600);
void loop () {
 sensorVal = analogRead(sensorPin);
 voltage = float(sensorVal)*input2volts;
 Serial.print("Voltage = ");
 Serial.println(voltage);
```



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Loops

Loops allow code to be repeated

- * Repeated code goes in a block, surrounded by { }
- for loops
- need a counter
- while loops
 - need an escape

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Loops

```
Initial value of counter
i=0 only on first pass through the loop

Stopping test: Continue while this condition is true

int i; // declare counter
for ( i=0; i<=12; i++ ) { // standard structure
    Serial.println(i); // send value of i to serial monitor
}

Increment: How to change i on each pass through the loop
```

Loops

Common loop: increment by one

```
for ( i=0; i<=12; i++ ) { // increment by one \dots code block goes here
```

Common loop: increment by two

```
for ( i=0; i<=12; i+=2 ) {    // increment by two
    ... code block goes here
}</pre>
```

Decrement by one

```
for ( i=12; i>=0; i-- ) { // decrement by one
   ... code block goes here
}
```

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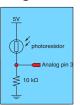
Try it! Modify the photoresistor program

Change the loop function

(modify your previous code)

```
void loop () {
   float sensorAve;
   int sensorSum;
   int nave=5;

   sensor_sum = 0.0;
   for ( i=1; i<=nave; i++ ) {
      sensorVal = analogRead(sensorPin);
      sensorSum = sensorSum + sensorVal;
   }
   sensorAve = float(sensorSum)/float(nave);
   voltage = sensorAve*input2volts;
   Serial.print("Average voltage = ");
   Serial.println(voltage);
}</pre>
```



This code contains errors that you will need to fix before it runs!

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Test it! Break your code to learn how it works

Change nave

- Increase nave from 5 to 10, 50, 100, 500
- Why is the reading negative for large nave?
- How can you fix this by changing the variable type for sensorSum?

Add print statements inside the averaging loop

Serial.print("\t Reading = ");
Serial.println(sensorVal);

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