

# Computer Science E-1



Understanding Computers and the Internet

## Lecture 11: Programming

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# Agenda

- Algorithms
- Pseudocode
- Languages
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  - Compiled
- Scratch
  - Statements
  - Boolean Expressions
  - Conditions
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# Algorithms



# Algorithms



## Counting Students

1. Stand up.
2. Assign yourself the number 1.
3. Find someone else that is standing up.  
(If no one is standing, remain standing until I call on you.)
4. Add your number to that person's number;  
the total is your new number.
5. One of you should then sit down.
6. If you're still standing, go back to step 3.

# Pseudocode



## Changing Diapers

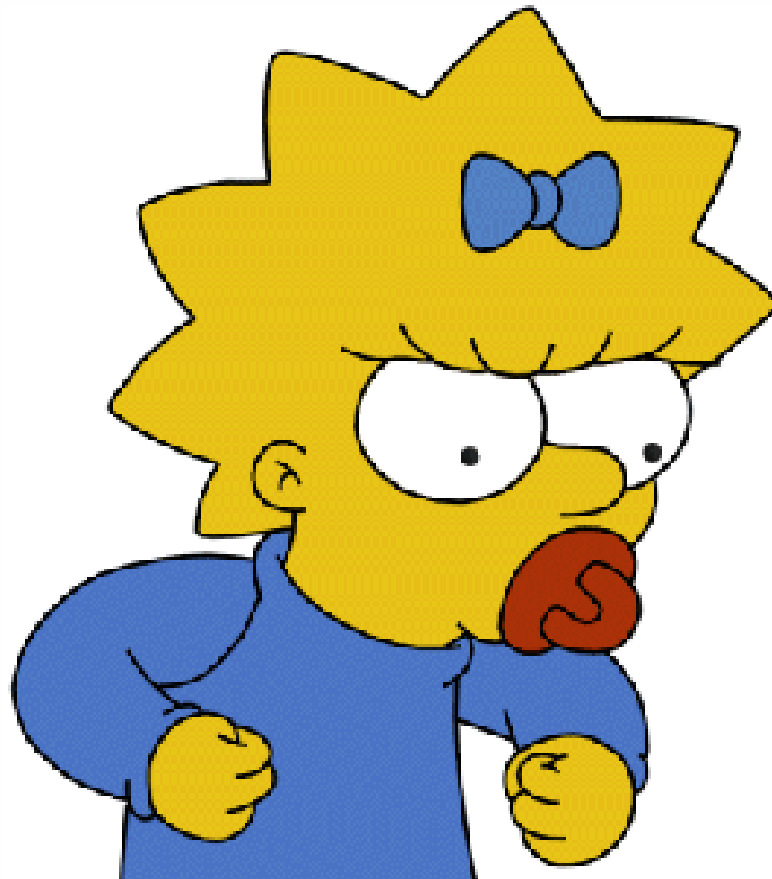


Image from <http://www.angelfire.com/tv2/nellienel211/bios.html>.



# Pseudocode

## Putting on Socks

```
1. let socks_on_feet = 0
2. while socks_on_feet != 2
3.     open sock drawer
4.     look for sock
5.     if you find a sock then
6.         put on sock
7.         socks_on_feet++
8.         look for matching sock
9.         if you find a matching sock then
10.            put on matching sock
11.            socks_on_feet++
12.            close sock drawer
13.         else
14.            remove first sock from foot
15.            socks_on_feet--
16.     else
17.         do laundry and replenish sock drawer
```



# Languages

## Interpreted

```
<!DOCTYPE html
  PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN"
  "DTD/xhtml1-transitional.dtd">

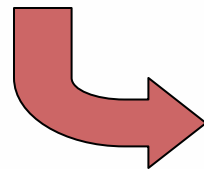
<html>
  <head>
    <title>Hello, World!</title>
  </head>
  <body>
    Hello, World!
  </body>
</html>
```



# Languages

## Compiled

```
int  
main(int argc, char * argv[])  
{  
    printf("Hello world!");  
    exit(0);  
}
```



```
10000011 00000001 00010001 00000000 00111101 11111100 01110100 00111101  
00000000 01000000 00000000 00000000 00000000 00000000 00000000 00000000  
10010000 00000000 00000000 00000000 01010000 00000000 00000111 00110000  
00001011 00000001 00001011 00000011 00001010 00000000 00000000 00000000  
00000000 00100000 00000000 00000000 00000000 00000000 00000000 00000000  
00000000 00100000 00000000 00000000 00000000 00000000 00000000 00000000  
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000  
01110000 00010000 00000000 00100000 00000001 00000000 00000000 00000000  
00000000 00000000 00000000 00100000 00000001 00000000 00000000 00000000  
00000000 00000000 00000000 01000000 00000001 00000000 00000000 00000000  
00000000 00100000 00000000 01000000 00000001 00000000 00000000 00000000  
11111111 11111111 11111111 11111111 11111111 11111111 11111111 11111111  
10010000 10000000 00000000 01000000 00000001 00000000 00000000 00000000  
00101110 01100100 01111001 01101110 01100001 01101101 01101001 01100011  
10110000 00000100 00000000 00100000 00000001 00000000 00000000 00000000  
10110000 00000100 00000000 00100000 00000001 00000000 00000000 00000000  
10100000 00000001 00000000 00000000 00000000 00000000 00000000 00000000  
10110000 00000100 00000000 00000000 00000000 00000000 00000000 00000000  
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000  
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000  
00000000 00000000 00000000 00000000 00000000 00100000 00000000 00000000  
[...]
```





# Languages

## Compiled

```
#include <iostream>
```

```
int
```

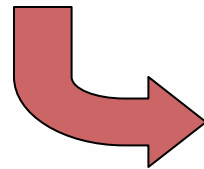
```
main(int argc, char * argv[])
```

```
{
```

```
    cout << "Hello world!" << endl;
```

```
    exit(0);
```

```
}
```



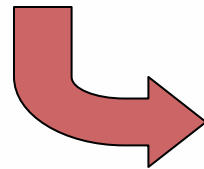
```
10000011 00000001 00010010 00000000 01100001 11111100 01110100 00111101
00000000 11000000 00000010 00000000 00000000 00000000 00000000 00000000
10010000 00000000 00000000 00000000 01010000 00000000 00000111 00110000
00001011 00000001 00001011 00000011 00001010 00000000 00000000 00000000
00000000 00100000 00000010 00000000 00000000 00000000 00000000 00000000
00000000 10100000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00010000 10110000 00000000 00100000 00000001 00000000 00000000 00000000
00000000 00000000 00000000 00100000 00000001 00000000 00000000 00000000
00000000 00000000 00000000 01000000 00000001 00000000 00000000 00000000
00000000 10100000 00000000 01000000 00000001 00000000 00000000 00000000
11111111 11111111 11111111 11111111 11111111 11111111 11111111 11111111
01110000 11111010 00000000 01000000 00000001 00000000 00000000 00000000
00101110 01100100 01111001 01101110 01100001 01101101 01101001 01100011
11110000 00000100 00000000 00100000 00000001 00000000 00000000 00000000
11110000 00000100 00000000 00100000 00000001 00000000 00000000 00000000
10110000 00000001 00000000 00000000 00000000 00000000 00000000 00000000
11110000 00000100 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
[...]
```



# Languages

## Compiled

```
class Hello
{
    public static void main(String [] argv)
    {
        System.out.println("Hello world!");
    }
}
```



```
11001010 11111110 10111010 10111110 00000000 00000011 00000000 00101101
00000000 00100000 00001000 00000000 00010100 00000111 00000000 00010011
00000111 00000000 00011010 00000111 00000000 00011011 00000111 00000000
00011100 00001010 00000000 00000100 00000000 00001001 00001001 00000000
00000101 00000000 00001010 00001010 00000000 00000011 00000000 00001011
00001100 00000000 00001111 00000000 00001100 00001100 00000000 00011110
00000000 00010110 00001100 00000000 00011111 00000000 00001101 00000001
00000000 00000011 00101000 00101001 01010110 00000001 00000000 00010101
00101000 01001100 01101010 01100001 01110110 01100001 00101111 01101100
01100001 01101110 01100111 00101111 01010011 01110100 01110010 01101001
01101110 01100111 00111011 00101001 01010110 00000001 00000000 00010110
00101000 01011011 01001100 01101010 01100001 01110110 01100001 00101111
01101100 01100001 01101110 01100111 00101111 01010011 01110100 01110010
01101001 01101110 01100111 00111011 00101001 01010110 00000001 00000000
00000110 00111100 01101001 01101110 01101001 01110100 00111110 00000001
00000000 00000100 01000011 01101111 01100100 01100101 00000001 00000000
00001101 01000011 01101111 01101110 01110011 01110100 01100001 01101110
01110100 01010110 01100001 01101100 01110101 01100101 00000001 00000000
00001010 01000101 01111000 01100011 01100101 01110000 01110100 01101001
01101111 01101110 01110011 00000001 00000000 00000101 01001000 01100101
[...]
```



# Hello, Scratch!

Hello1.scratch



You can download Scratch at  
<http://scratch.mit.edu/beta/>

Source code available for download at <http://www.fas.harvard.edu/~cscie1/lecture11.zip>.

# Statements



say Hello!

wait 1 secs

play sound meow ▼

...



# Statements

Hello{2,3}.scratch

```
when clicked  
say hello, world! for 1 secs  
wait 1 secs  
say hello, world! for 1 secs  
wait 1 secs  
say hello, world! for 1 secs
```

```
when clicked  
play sound meow  
wait 2 secs  
play sound meow  
wait 2 secs  
play sound meow
```

Source code available for download at <http://www.fas.harvard.edu/~cscie1/lecture11.zip>.

# Boolean Expressions



touching mouse-pointer ?

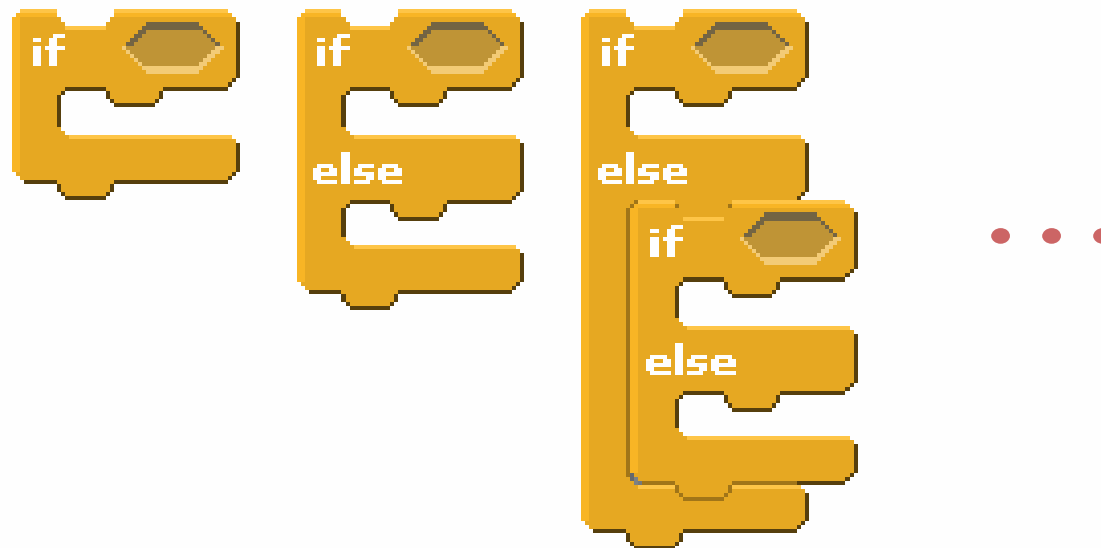
mouse down?



and

...

# Conditions





# Conditions

Hello{ 4,5}.scratch



Source code available for download at <http://www.fas.harvard.edu/~cscie1/lecture11.zip>.



# Loops





# Loops

Hello{6,7,8}.scratch

```
when clicked
  forever
    play sound meow
    wait 2 secs
```

```
when clicked
  forever
    if touching mouse-pointer ?
      play sound meow
      wait 2 secs
```

```
when clicked
  forever
    if touching mouse-pointer ?
      play sound roar
      wait 2 secs
    else
      play sound meow
      wait 2 secs
```

Source code available for download at <http://www.fas.harvard.edu/~cscie1/lecture11.zip>.

# Variables



{Count,Hello9}.scratch

```
when clicked
  set counter to 1
  forever
    say counter for 1 secs
    wait 1 secs
    change counter by 1
```

```
when clicked
  set number to pick random 1 to 10
  say number
  if number < 6
    play sound meow
```

Source code available for download at <http://www.fas.harvard.edu/~cscie1/lecture11.zip>.

# Threads



## Move1.scratch



Source code available for download at <http://www.fas.harvard.edu/~cscie1/lecture11.zip>.

# Threads



## Move2.scratch

```
when clicked
  go to x: -150 y: 150
  point in direction 45
  forever
    if touching edge ?
      if on edge, bounce
    if not touching cat ?
      move 3 steps
```



```
when clicked
  go to x: -160 y: -160
  point in direction pick random 91 to 179
  forever
    if touching bird ?
      play sound roar
      stop script
    point towards bird
    move 1 steps
```



Source code available for download at <http://www.fas.harvard.edu/~cscie1/lecture11.zip>.

# Threads



Hello10.scratch

```
when clicked
  forever
    if muted = 0
      play sound meow
    wait 2 secs
```

```
when clicked
  set muted to 0
  forever
    if key space pressed?
      if muted = 0
        set muted to 1
      else
        set muted to 0
    wait 1 secs
```

Source code available for download at <http://www.fas.harvard.edu/~cscie1/lecture11.zip>.

# Threads

David.scratch



```
when clicked
  set size to 70 %
  go to x: 0 y: -5
  set score to 0
  point in direction 90
  clear graphic effects
  forever
    point in direction 90
    set x to pick random -180 to 180
    wait 0.5 secs
    say 
    if touching leftGlove ? or touching rightGlove ?
      say stop that
      change score by 1
      point in direction pick random 70 to 90
      change color effect by 10
    if score > 15
      point in direction 0
      say I got pwned!
      stop script
```

```
when clicked
  go to x: -70 y: -143
  point in direction 0
```

```
when up arrow key pressed
  go to front
  set y to -140
  point in direction 0
  move 60 steps
  turn 15 degrees
  play drum 64 for 0.2 secs
  turn -15 degrees
  move -60 steps
```

```
when left arrow key pressed
  change x by -6
```

```
when right arrow key pressed
  change x by 6
```



Source code available for download at <http://www.fas.harvard.edu/~cscie1/lecture11.zip>.

# Events



## Marco.scratch

```
when clicked
  forever
    if key space pressed?
      say Marco! for 2 secs
      broadcast event
```



```
when I receive event
  say Polo! for 2 secs
```



Source code available for download at <http://www.fas.harvard.edu/~cscie1/lecture11.zip>.



# "I Love Trash"

Oscartime.scratch



Source code available for download at <http://www.fas.harvard.edu/~cscie1/lecture11.zip>.

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