Key Computing Ideas

The computer follows a program’s instructions. There are four modes:
• Sequencing
  – All statements are executed in sequence
• Function Application
  – Control transfers to the function when invoked
  – Control returns to the statement following upon return
• Repetition
  – Enables repetitive execution of statement blocks
• Selection
  – Enables choice among a block of statements
  – All computer algorithms/programs utilize these modes.

Sequencing

Refers to sequential execution of a program’s statements

do this;
then do this;
and then do this;
• etc.

Function Application

• Control transfers to the function when invoked
• Control returns to the statement following upon return

Repeat frameRate times/second
Default frameRate = 60

Repetition

Enables repetitive execution of statement blocks

lather
rinse
• repeat

Parameter Transfer
Loops: Controlled Repetition

While Loop

while (<condition>) {
    stuff to repeat
}

• Do-While Loop

do {
    stuff to repeat
} while (<condition>)

For Loop

for (<init>; <condition>; <update>) {
    stuff to repeat
}

All of these repeat the stuff in the block

The block {...} is called the Loop’s Body

Conditions

• Conditions are boolean expressions.
• Their value is either true or false
• e.g.
  • POTUS is a woman false
  • 5 is greater than 3 true
  • 5 is less than 3 false

Writing Conditions in Processing

Boolean expressions can be written using boolean operators.

Here are some simple expressions...

< less than 5 < 3
<= less than/equal to x <= y
== equal to x == (y+1)
!= not equal to x != y
> greater than x > y
• >= greater than/equal to x >= y
Logical Operations

Combine two or more simple boolean expressions using logical operators:

$$\land \quad \text{and} \quad \land (x < y) \land (y < z)$$
$$\lor \quad \text{or} \quad \lor (x < y) \lor (x < z)$$
$$\lnot \quad \text{not} \quad \lnot (x < y)$$

|   |   | A & B | A || B | !A |
|---|---|-------|-------|----|
| false | false | false | false | true |
| false | true | false | true | true |
| true | false | false | true | false |
| true | true | true | true | false |

10,000 circles!

while (<condition>) {
  stuff to repeat
}

Loops: Controlled Repetition

While Loop

while (<condition>) {
  stuff to repeat
}

• Do-While Loop

• do {
  • stuff to repeat
  • while (<condition>)
}

For Loops

for (<init>; <condition>; <update>) {
  stuff to repeat
}

• Do-While Loops

do {
  stuff to repeat
} while (<condition>)

• For Loops

for (<init>; <condition>; <update>) {
  stuff to repeat
}
Loops: Critical Components

Loop initialization

Things to do to set up the repetition

• Loop Termination Condition
• When to terminate the loop
• Loop Body
  • The stuff to be repeated

What happens when any one of these is missing or incorrectly encoded?
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All computer algorithms/programs utilize these modes.

Selection: If Statement

```
if (<condition>) {
  do this
}
if (<condition>) {
  do this
} else {
  do that
} else if (<condition>) {
  do that
} else if (...) {
  ...
} else {
  whatever it is you wanna do
}
```

At most ONE block is selected and executed.

Examples with if...

Should I...

```
{ study }
{ sleep }
{ watch a movie }
{ veg out }
{ etc. }
```

- If-statements are one way of doing this