Announcements

- Read Chapter 9.1 for next time
- Assignment 6 out, due October 29
- Today
  - Lecture on Chap 7 Sec 2 and Tips and Tech.
    - While loop – indefinite loop
    - Event Loops

Last time - Loop – definite number

- What happens when this code runs?

```
world.my_first_method ;No parameters

number = 1

while (number > 0) {
  number = number - 1
  if (number == 0) {
    do something
  }
}
```

Repetition

- Sometimes don’t know exactly how many times a set of instructions are repeated.
- Stopping is based on a condition
- Example:
  - Game of Chess, how many moves until win
  - Stop: when markers are in check mate position
Indefinite Repetition

• In programs where number of repetitions not known in advance, can use
  – While statement

While statement

- While some condition is true
  – execute instructions

Example

• Common feature in popular “action films” is a chase scene
• Example: hungry shark chasing fleeing goldfish
  – Repeat: fish swim away from shark, and shark swim toward fish
  – Shark swim distance a little more than fish swim distance
  – Eventually, shark will catch up with fish and eat fish

Storyboard

<table>
<thead>
<tr>
<th>World.chase</th>
</tr>
</thead>
<tbody>
<tr>
<td>While goldfish more than .5 meters from shark</td>
</tr>
<tr>
<td>Do in order</td>
</tr>
<tr>
<td>shark point at goldfish</td>
</tr>
<tr>
<td>Do together</td>
</tr>
<tr>
<td>shark swim (toward goldfish)</td>
</tr>
<tr>
<td>goldfish flee (away from shark)</td>
</tr>
<tr>
<td>shark eat goldfish</td>
</tr>
</tbody>
</table>

shark.Swim, shark.eat and goldfish.flee in book
World.chase

Shark will catch goldfish

- How do you know the shark will eventually catch the goldfish?
  - Shark always moves 0.4 meters towards goldfish
  - Goldfish moves randomly away from shark at most .2 meters
  - Shark will eventually catch up, the loop will end

General “Rule of Thumb”

- As a general rule, a While loop should be written so the loop will eventually end
  - Requires statements inside the loop change the conditions of the world such that condition for While eventually becomes false
- If While loop never ends
  - Infinite while loop

Practice – From Bunny eats Broccoli

- Replace with while loop, bunny hops until close to broccoli (< 1 meter)
Using While with Events

• Create new event “while something is true”

BDE – Begin During End

• Event – actions occur at different times
  • When the event is first true
    – Begin action
  • While the event is still true
    – During action repeats
  • When the event condition is false
    – End action occurs

Result

We call this a “BDE”

Example – Penguins meeting

• While 2 penguins are > 3 meters apart
  – Turn to face each other (Begin)
  – Move towards each other repeatedly (During)
  – Bow to each other (End)

Penguins Event Code
Penguin Begin and During parts

- `world.PenguinsFaceEachOther` No parameters
  - No variables
  - Do together:
    - `penguin` turn to face `penguin2` more...
    - `penguin2` turn to face `penguin` more...

- `world.PenguinsMoveForward` distance
  - No variables
  - Do together:
    - `penguin` move forward `distance` meters more...
    - `penguin2` move forward `distance` meters more...

How do we get this event to happen again?

Another Type of Event – When something is true

- When you want ONE thing to happen when something is true
- Not listed as a new event
- Must create event “while something is true”
- Then “change to” “when something becomes true”
Add in “mama Penguin” (penguin3 resize by 2)

- Control her with arrow keys event

<table>
<thead>
<tr>
<th>Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create new event</td>
</tr>
<tr>
<td>When the world starts</td>
</tr>
<tr>
<td>When a key is typed</td>
</tr>
<tr>
<td>When the mouse is clicked on something</td>
</tr>
<tr>
<td>While something is true</td>
</tr>
<tr>
<td>When a variable changes</td>
</tr>
<tr>
<td>Let the mouse move &lt;objects&gt;</td>
</tr>
<tr>
<td>Let the arrow keys move &lt;subject&gt;</td>
</tr>
</tbody>
</table>

Penguin3 “take” penquin

- What happens when we move penguin3 over to penguin and then steer penguin3 away?

How do we turn off the move over to penguin2?

- Everytime Penguin3 carries away penguin, penguin wants to move over to penguin2
Need another condition

- Can’t turn off the BDE, it kicks in every time the condition is true
- Must make the BDE condition stronger – AND another condition

What is the difference between?

- While something is true (BDE)
- When something is true

• Add in one more event:
  - Can the “when” event happen again if it becomes true again?

Classwork

- World 1 - Modify game from last time with while loop
- World 2 - Start a new world with snow background
  - Add a penguin and a fish resting on the ice
  - Create a BDE that moves the penguin over to the fish and eats it (fish disappears)
  - More with “when event”