CompSci 94
While loops, randomness
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Class Today

• Looping based on a condition – while loop
• Randomness
  – Random variable
  – Making choices based on a random number
Setup for Lecture today

- Put in the following objects:
  - Flyer: Chicken
  - Props: pumpkin, cake, colaBottle, pricklyPearCactus
Story for lecture

• The chicken will walk over to each item and eat it.
• One of the items will randomly move around to make it harder to
Fancy walk –
Taught my chicken how to strut
• Take one step with legs and neck moving…
Looping – exact number of times

• Count loop

• How many steps to get to the cake?
  – 3, 6, 8?
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
  – Where number of repetitions not known in advance
  – Use 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
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
While – walk towards until close

- While condition is true – keep going
- Must have an update inside the loop
EatItem Finish up – eat the item

- After loop, eat the item
Random Numbers

• Random numbers are used in certain kinds of computer programs

• Examples
  – Security for web applications
  – Encryption for satellite transmissions
  – Gaming programs

• We will look at examples of using random numbers in animations

• Example – variable assigned a random number between 0.0 and 1.0
Where is the randomness? How many random numbers are we using?

• This code is inside the while…
Where is the randomness? How many random numbers are we using?

- The variable amount has a value between 0 and 1.
  - Four ways to move – assign them based on the value of amount
  - If amount is 0 to 0.25 – move left
  - If amount is .25 to .50 – move right
  - If amount is .50 to .75 – move forward
  - If amount is .75 to 1.0 – move backward
Random number is spread out around 0.0 and 1.0

• We want to try to have each direction choice equally likely, so we split the possible values into four parts.
Where is the randomness? How many random numbers are we using?

• Other randomness? Yes!
• There is randomness in how far to move
• Two types of randomness
  – 1) randomness in which way to move
  – 2) randomness in how far to move
    • We aren’t saving this one in a variable but we could (see alternate solution on later slides)
  – Note these are DIFFERENT Numbers – note the different types of boxes for the two numbers on the next slide
Final Code eatMovingItem

```
declare procedure eatMovingItem with parameter: SJointedModel, food, Add Parameter...

do in order
  this turnToFace food add detail
  while this getDistanceTo food > =0.5 is true
    this strut
    DecimalNumber amount = nextRandomRealNumberInRange 0.0, 1.0
    if amount 0.25 is true then
      food move LEFT nextRandomRealNumberInRange 0.0, 0.75 duration 0.5 add detail
    else
      if amount 0.5 is true then
        food move RIGHT nextRandomRealNumberInRange 0.0, 0.75 duration 0.5 add detail
      else
        if amount 0.75 is true then
          food move FORWARD nextRandomRealNumberInRange 0.0, 0.75 duration 0.5
        else
          food move BACKWARD nextRandomRealNumberInRange 0.0, 0.75 duration 0.5
    else
      food move BACKWARD nextRandomRealNumberInRange 0.0, 0.75 duration 0.5
  end while
end procedure
```
Final Code (the rest of eatMovingItem)
Another way – use two random number variables

• Variable 1 - store the random number between 0 and 1 in amount and use that number to determine which direction to move (we already do this)

• Variable 2 – store a random number between 0 and .75 in a variable named howFarToMove and then use that variable for the distance to move.
eatMovingItem (version 2, first part of code)
Final Code MyFirstMethod

declare procedure myFirstMethod

do in order

1. this.chicken
2. turnToFace
3. this.cake
4. add detail

- count up to 3

this.chicken
strut

loop

this.chicken
EatItem
food: this.cake

this.chicken
EatItem
food: this.colaBottle

this.chicken
EatItem
food: this.pumpkin

this.chicken
EatMovingItem
food: this.pricklyPearCactus
This lecture covered

• While loops – loop that continues based on a condition
  – When the condition is false it halts
  – There must be some kind of update in the loop

• Random numbers