


UNIVERSITY of WISCONSIN-MADISON
Computer Sciences Department

CS 202 Introduction to Computation Professor Andrea Arpaci-Dusseau Fall 2010

Lecture 16: How can computation... create educational games?



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Move the rat to pick up the numbers in order!

13
15
19
16 12 14 10
11 20 18
Your time: 30.8





How many?
Click on the number.

1 2 3 4 5

Project 1: Variables!

Points-based Game - Open ended

- Must contain integer variable and boolean variables
- Must have multiple levels of difficulty

Today's Challenge

How to create educational games?

- Useful concepts for Project 1 (but not exact)

How to decompose high-level idea and specification into scripts?

- Many different ways to implement same idea

How to develop simple, elegant code?

- Which Sprites are responsible for which tasks?
- Which scripts can be shared across similar Sprites?
- Where can private variables be used?

Counting Game: Overview

Move the rat to pick up the numbers in order!

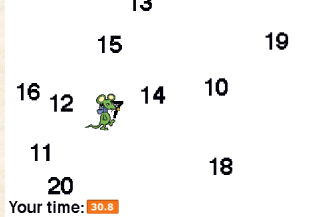
13
15
19
16 12 14 10
11 20 18
Your time: 30.8

What are the Sprites?



Counting Game: Overview

Move the rat to pick up the numbers in order!



Initial State?

- Numbers in random locs
- Timer at 0

Rat?

- Moves with arrow keys
- ### Numbers?
- Must touch in order!
 - Number is **said**
 - Number becomes **larger**
 - **Ignores** if not correct

Timer

- Counts up
- Stops at 20

Rat Scripts

```
when UP arrow key pressed
  point in direction 0
  move 10 steps
```

```
when DOWN arrow key pressed
  point in direction 180
  move 10 steps
```

```
when LEFT arrow key pressed
  point in direction 90
  move 10 steps
```

```
when RIGHT arrow key pressed
  point in direction 270
  move 10 steps
```

Rat very simple!

- Moves in response to arrow keys
- Does nothing else!

(Set rotation to only face left-right)

Number Scripts

Scripts for Sprite Ten

```
when green flag clicked
  clear graphic effects
  set size to 100 %
  go to x: pick random -200 to 200 y: pick random -150 to 150
  broadcast 10
```

What is Initial state?

- Go to random location
- Number 10 is first!

Number Scripts

Scripts for Sprite Ten

```
when I receive 10
  wait until touching mouse
  play sound recording1
  set size to 150 %
  broadcast 11
```

- How to know it is our turn?
- Previous number is done
- How to detect touched by rat?
- Wait until touching...

After 10 is touched, 11 is next...

Number Scripts

Scripts for Sprite Ten

```

when clicked
  clear graphic effects
  set size to 100%
  go to x: pick random 200 to 200 y: pick random 150 to 150
  broadcast 10
  
```

```

when I receive 10
  wait until touching mouse
  play sound recordings
  set size to 150%
  broadcast 11
  
```

Scripts for Sprite Twenty

```

when clicked
  clear graphic effects
  set size to 100%
  go to x: pick random 200 to 200 y: pick random 150 to 150
  
```

```

when I receive 20
  wait until touching mouse
  play sound recordings
  change size effect by 25
  set size to 150%
  broadcast Done
  
```

Scripts for Sprite Eleven

```

when clicked
  go to x: pick random 200 to 200 y: pick random 150 to 150
  set size to 100%
  clear graphic effects
  
```

```

when I receive 11
  wait until touching mouse
  play sound recordings
  set size to 150%
  broadcast 12
  
```

Goal: Simple code, similar across all

Receive msg when next in sequence
 Wait until touching rat
 Play sound and increase size
 Signal next number in sequence

Timer Scripts

```

when clicked
  reset timer
  forever
    set Time to timer
  
```

Timer continuously shows elapsed time

How to know game over?

- Receive signal from Twenty
- How to stop loop?
- Stop all scripts

```

when I receive Done
  stop all
  
```

Identify Game: Overview



What are the Sprites?



Identify Game: Overview



Initial state?

- 0 questions, 0 guesses

1-5 objects

- Random number displayed
- Random locations
- Random costumes

Numbers at bottom

- Correct (matching): Says number
- Wrong: Hide and try again
- Increment Guesses

Repeat with new objects

- Increment questions

Stage Scripts

Stage controls overall action

- Descriptive names for messages
- Can tell who is sending/receiving

Stage sets Global Variables

- Stage picks "How many" objects should be shown
- Stage picks "Costume" the objects should switch to

Stage tells Numbers and Objects when ready

Stage tracks counts of Guesses and Questions

Objects Scripts

Each Object has many different costumes...

Objects Scripts

Each has **private** variable

- My_id
- Remaining code identical across Objects

When receive Stage:Show Objects:Many?

- Determine for itself if it shows
- Shows if "How many >= my_id"
- Use **global** variable Costume so all change to same costume

Global Shared vs Local Private Variables

For all sprites: (Global, shared)

- All sprites see same variable
- When one sprite changes value, all sprites see new value
- Use when want to communicate info btwn Sprites
- Naming: FirstLetterCapitalized

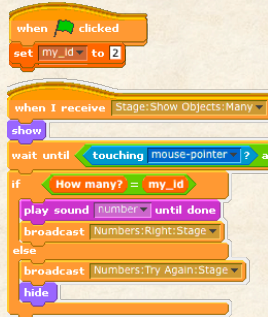
creates a new variable that all sprites can see (such as score)

creates a new variable that only this sprite can see (such as my_lives)

For this sprite only: (Local, private)

- Only this sprite sees variable
- Multiple sprites can have own variables with same name
 - Each contains different values
- Use with similar Sprites; same code, unique data/behavior
- Naming: lower_case_letters

Numbers Scripts



Tip: Draw a box around number and letter Sprites so they are easier to click!

Each Number has private variable: `my_id`

When receive message?

- Each determine if they are right answer
- Waits until clicked
- If `my_id` is right answer, tell Stage done
- Otherwise, tell Stage to try again

Today's Summary

Today's Topics

- Try to write simplest code possible (might not be your first attempt, so be willing to restructure!)
- When developing similar Sprites, perfect a small number
 - Copy to make other identical Sprites
- Use Global Variables to pass information between Sprites
 - All Sprites see same value
 - Example: How Many? And Costume in Identify Game
- Use local variables when each Sprite should have own value
 - Helps make later code identical across similar Sprites
 - Example: `my_id` variable in Identify Game

Exam 1 : Friday 10/15

Programming Project: Friday 10/22 Upload Draft

- Wed 10/27 Due with Demo
- No homework for two weeks...