Lecture 11:
How can computation... help visualize data?

CS 202 Schedule
2/12 F ... Visualize data?
2/15 M ... Guess probabilities?
2/17 W ... Perform simulations? HW 4 Due
2/19 F Exam Review
2/22 M Exam 1: “How can computation help…”
2/24 W Guest: Inside Scratch?
2/25 Th Project 1 Due at Midnight
2/26 F Project 1 Demos in CS Instructional Lab
Homework 3 Solutions

Solutions available from Assignment page
Part 1: Scratch program
• Will be graded over weekend
Part 2 and 3: Pencil-and-paper
• Graded; hand back at end of class
• Some difficulty with part 3 – Please see TA (or me) if confused

Today:
• Similar problems

Homework 4 Available

Part 1: Download Scratch code from website
 http://scratch.mit.edu/projects/dusseau/879996
Complete 3 scripts:
• Calculate Total
• Show Bargains
• Least Expensive

• Involves adding, inserting, replacing, deleting items of list
Exam 1:
How does Computation help...

Administrative Details
- In-class, Monday February 22
- Closed notes, closed reading, closed laptops
- Covers lecture material, readings, homeworks 1-4

Questions of Form:
- What will these Scratch scripts do when executed?
  - You will not write any code yourself
- What will be the value of this variable? List?
- What is wrong with this code? How would you fix? Does the code work if move blocks around?
- Draw corresponding decision tree for given code
- How many times will loop execute?

Go over sample Exam in class Friday, Feb 19

Project 1: Due 2/25
Animation for Music or Poetry

Intentionally open-ended, underspecified (unlike most homeworks)
- Ideas? Look at suggestion projects and TED talk

Grading: 3 Projects worth 35% of final grade
- Specification (15 points) Did you do type of project we asked?
- Creativity/Effort (30 points): Do backgrounds and characters have theme?
- Documentation (20 points) Descriptive names for sprites, costumes, variables, and broadcasts? Comments and project notes?
- Code Style (15 points) Do you use the correct programming structures?
- Demo (20 points) Explain your code to TA? Show your project to the class?
  - Must sign up for 15 minute grading time with TA
  - Class Demo Day: Friday 2/26

Getting Help
- Last day I’m available for help: Friday 2/19!
- Strongly recommend working in Lab with optional TA guidance
  - Lab: 1370 Computer Sciences (1st floor)
  - TA: David Guild
  - Hours: Tuesday and Thursday 2:30 - 3:30
  - TA: Pratima Kolan
  - Hours: Monday and Wednesday 11:00-12.00
- Can get suggestions and fixes, but no borrowing code from person or project
Credit Card Example 1

What does this code do?

<table>
<thead>
<tr>
<th>Code Snippet</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>when clicked</code></td>
<td>Ask previous balance and wait</td>
</tr>
<tr>
<td><code>set balance to answer</code></td>
<td>Ask total monthly purchased and wait</td>
</tr>
<tr>
<td><code>set monthly payment to answer</code></td>
<td>Ask payments to answer</td>
</tr>
<tr>
<td><code>set New Balance to Balance + Purchases + Payments</code></td>
<td>Join your new balance is $</td>
</tr>
</tbody>
</table>

Is this code equivalent?

<table>
<thead>
<tr>
<th>Code Snippet</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>when clicked</code></td>
<td>Ask previous balance and wait</td>
</tr>
<tr>
<td><code>set balance to answer</code></td>
<td>Ask total monthly purchased and wait</td>
</tr>
<tr>
<td><code>set purchases to answer</code></td>
<td>Ask monthly payment to answer</td>
</tr>
<tr>
<td><code>set balances to Balance + Purchases + Payments</code></td>
<td>Join your new balance is $</td>
</tr>
</tbody>
</table>

Yes!

Credit Card Example 2

What does this code do?

<table>
<thead>
<tr>
<th>Code Snippet</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>when clicked</code></td>
<td>Set INTEREST RATE to 12%</td>
</tr>
<tr>
<td><code>set balance to previous balance</code></td>
<td>Ask previous balance and wait</td>
</tr>
<tr>
<td><code>set balance to answer</code></td>
<td>Ask total monthly purchased and wait</td>
</tr>
<tr>
<td><code>set balance to answer</code></td>
<td>Ask payments to answer</td>
</tr>
<tr>
<td><code>set balance to Balance + Purchases + Payments</code></td>
<td>Join your new balance is $</td>
</tr>
<tr>
<td><code>set Interests to balance * INTEREST RATE</code></td>
<td>Change balance by interest</td>
</tr>
</tbody>
</table>

Constant: INTEREST RATE

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Holds same value over lifetime of program</td>
</tr>
<tr>
<td>Makes code easier to read and understand</td>
</tr>
<tr>
<td>Makes code easier to modify (one place)</td>
</tr>
</tbody>
</table>

Naming convention: Use CAPITAL letters
Credit Card Example 3

What does this code do?

```javascript
when [clicked]
  set INTEREST RATE to 5.0
  ask Previous balance and wait
  set Balance to answer
  ask Total monthly purchases and wait
  set Purchases to answer
  ask Monthly payment and wait
  set Payments to answer
  set Balance to Balance + Purchases - Payments
  repeat 5
    set Interest to Balance * INTEREST RATE
    change Balance by Interest
    say Join You're paying interest of $ Interest for 2 weeks
    say Join Your new balance is $ Balance for 2 weeks
```

How do variables change?

Initially Balance = 100
Purchases and Payments = 0
What are Interest and Balance at end of each iteration?

<table>
<thead>
<tr>
<th>Iteration</th>
<th>Interest</th>
<th>Balance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5.0</td>
<td>105.0</td>
</tr>
<tr>
<td>2</td>
<td>5.25</td>
<td>110.25</td>
</tr>
<tr>
<td>3</td>
<td>5.5125</td>
<td>115.76</td>
</tr>
<tr>
<td>4</td>
<td>5.7881</td>
<td>121.55</td>
</tr>
<tr>
<td>5</td>
<td>6.0775</td>
<td>127.63</td>
</tr>
<tr>
<td>6</td>
<td>6.3814</td>
<td>140.71</td>
</tr>
</tbody>
</table>

Credit Card Example 4

What does this code do?

```javascript
when [clicked]
  ask Previous balance and wait
  ask Balance and wait
  ask Monthly payment and wait
  ask Total monthly purchases and wait
  ask Payments and wait
  set Balance to Balance + Purchases - Payments
  if Balance <= 100
    set Interest Rate to 8
  if Balance > 100 and Balance <= 500
    set Interest Rate to 12
  if Balance > 500
    set Interest Rate to 16
  change Balance by Interest
  say Join Your new balance is $ Balance
```

Interest rate depends upon remaining balance:

- if <= $100, then 8%
- if > $100 and <= $500, then 12%
- if > $500, then 16%
Credit Card Example 5

Is this code equivalent?

Interest rate depends upon remaining balance:

if <= $100, then 8%

if > $100 and <= $500, then 12%

if > $500, then 16%

Today’s Topic: Data Visualization

Excellent TED talks

- Annual conference on innovative ideas
- Focus: Technology, Entertainment, Design
- Wide range: 3 minutes – 20 minutes

“Demo: Stunning data visualization in the AlloSphere”

- See, hear and interpret scientific data
- Dive into the brain, feel electron spin, hear the music of the elements
- 6 minutes

http://www.ted.com/talks/joann_kuchera_morin_tours_the_alloosphere.html
Today’s Topic: Data Visualization

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• **Focus: Technology, Entertainment, Design**
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Hans Rosling: “Let my dataset change your mindset”

• Visualizing time-series data sets can give new insights
• Data-bubble software bursts myths about the developing world (health, wealth)
• 20 minutes

http://www.ted.com/talks/hans_rosling_at_state.html#

Steps towards Visualization in Scratch

What do you think this will do?
2: What will these scripts do?

Stage scripts

Sprite scripts

How long is each List? How are x, y varied? How many pen points for each x,y? What is relationship of two Lists? What is purpose of `c`?

3: What will these scripts do?

What if change from mod to abs?

What if move outside repeat loop?

What if move change mod to x^x?
How to plot $y = x^2$?

Today’s Summary

Today’s topic

- Visualizing data can help everyone better understand the world we live in

“Reading”

- TED talks linked on Course Schedule page
- Please watch!

Announcements

- Please use Lab Hours with TAs
- Project 1 available, will have demo
- Exam 1: Monday Feb 22