UNIVERSITY of WISCONSIN-MADISON
Computer Sciences Department

CS 202
Introduction to Computation

Professor Andrea Arpaci-Dusseau
Fall 2010

Lecture 4:
How can computation...
create animated stories?

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"I'm too tired to listen to a story tonight, mom.
Just e-mail something and I'll read it tomorrow."

Flowcharts

Flowchart:
- Visual representation of steps of algorithm
- Summarizes how algorithm behaves given specific answers

Symbols
- Boxes: Represent states (or actions or actions)
- Arrows (or edges): Show transitions (or decisions) between states

Lamp doesn't work

Lamp plugged in? — No → Plug in lamp

Yes

Bulb burned out? — Yes → Replace bulb

No

Buy new lamp

Flowchart Example

Collections**

Taxpayer Files Return	
Audit Notice Received	
30-Day Letter Issued (Proposed Deficiency)	
Protest the Proposed Deficiency? No	
Yes	
Appeals attempts to resolve the matter. (Appeals Conference)	
Agreement reached? No	
Yes	

90-Day Letter Issued (§6212)

Petition the Tax Court? No

Yes

Appeals attempts to resolve the matter. (Appeals Conference)

Agreement reached? No

Yes

Decision Document determines any deficiency (§6211) or overpayment.

Appeals forwards to IRS Counsel for trial prep.

Agreement reached at pre-trial with counsel? Yes No

Case goes to Tax Court.

Tax Court decision in favor of our taxpayer? Yes No

Does Taxpayer owe any tax? No Yes

Close Case: Thank you for using the LITC.

Tax is Assessed (§6201-03)

Notice and Demand for Payment w/in 60 days of assessment (§6303)

Series of requests for payment (§6502)

Notice of Lien - 30-Day Letter*** (§6320)

Lien (§6321)

Notice of Intent to Levy - 30-Day Letter*** (§6330)

Levy (§6331) (Stop with OIC or Installment Agreement)

OIC/Installment Agreement/CNC or pay any tax due in full

Does Taxpayer have a valid claim for deductions/expenses/credits denied by the IRS? No Yes

Has the SOL expired on a claim for refund?

File a 1040X (Claim for Refund) - This will result in Audit Reconsideration.

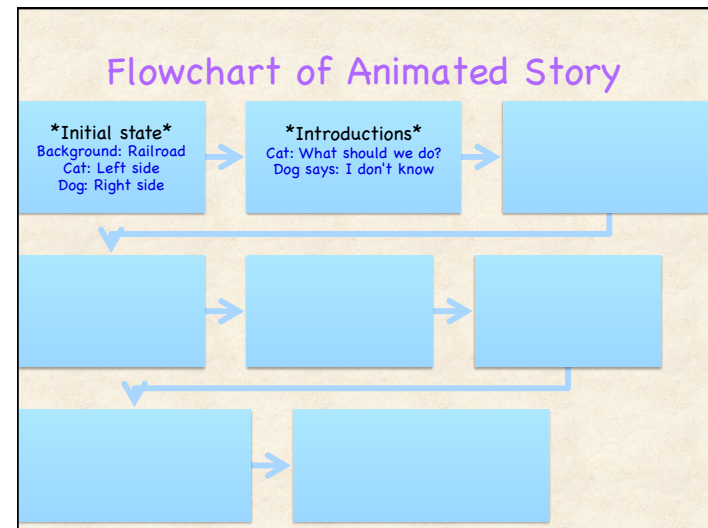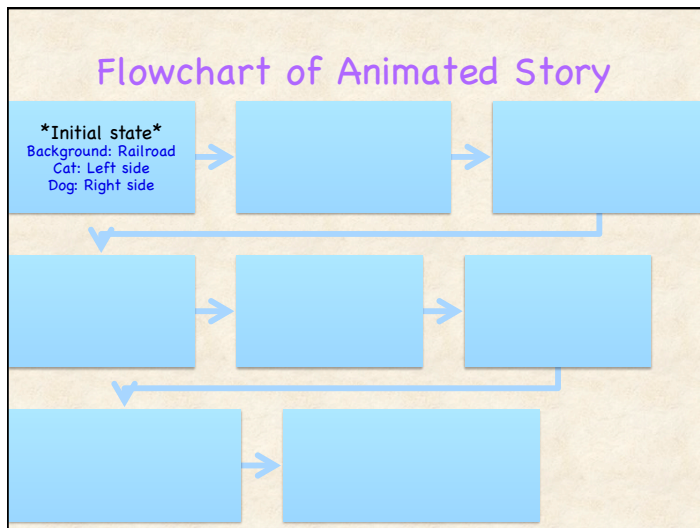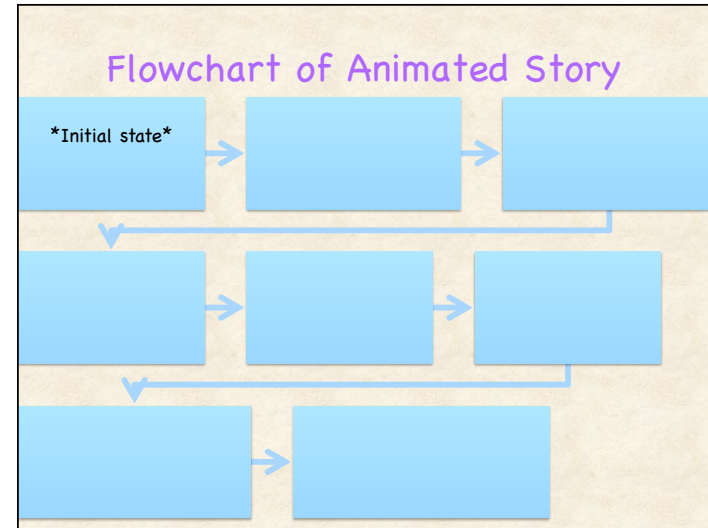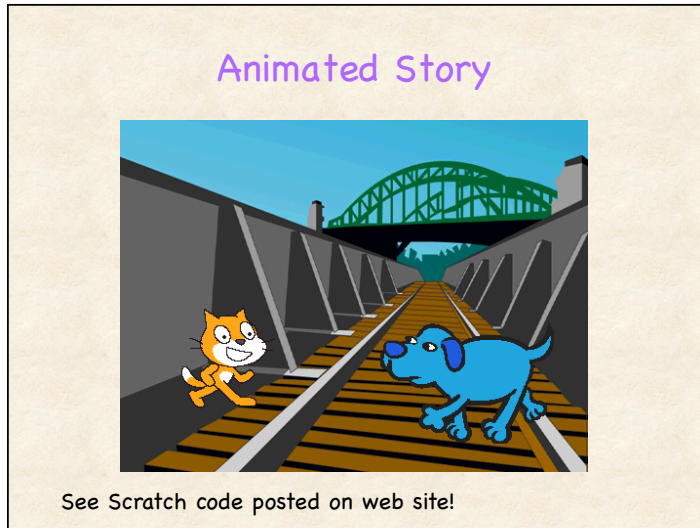Can the Taxpayer's liability be reduced (not requesting a refund)? No Yes
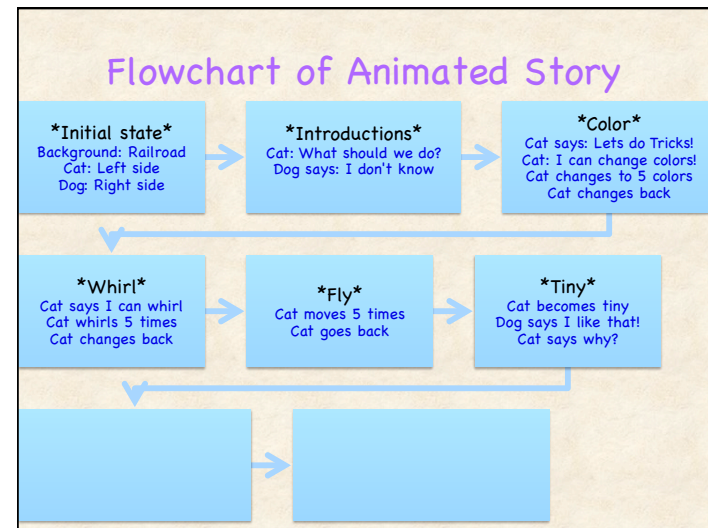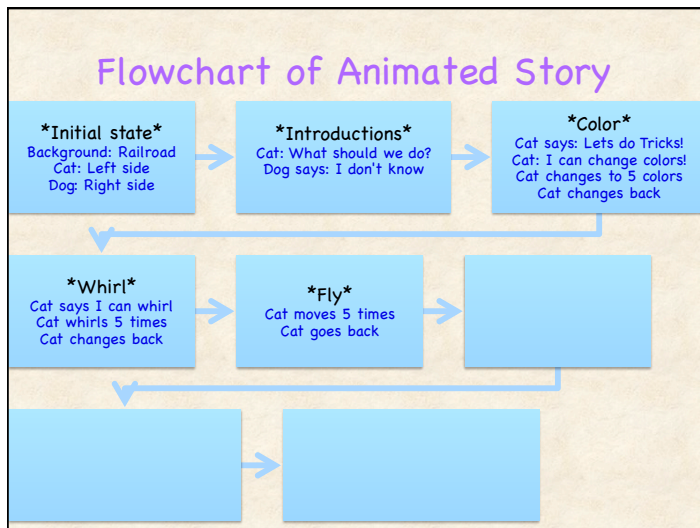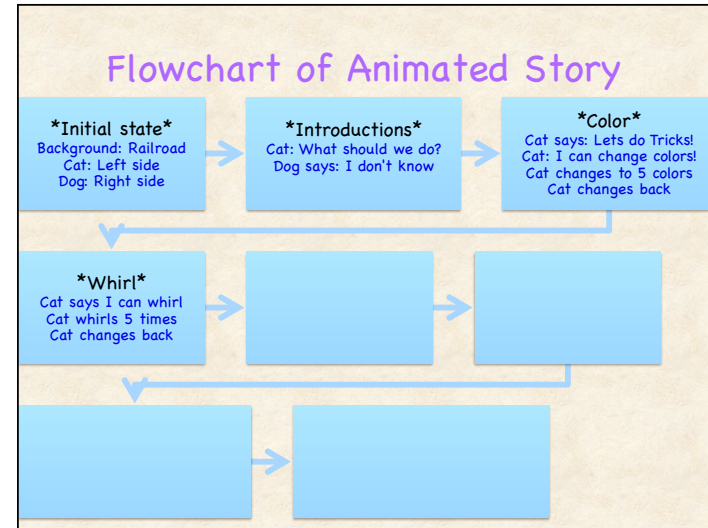
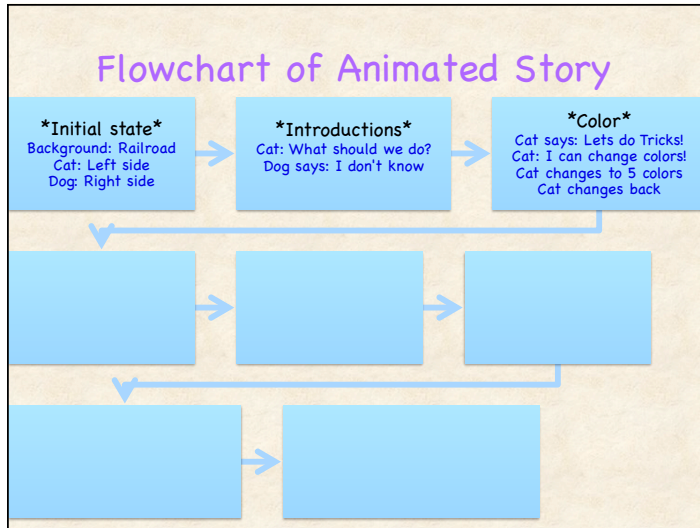File an Audit Reconsideration

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Flowchart for Animated Story

Animated Story: Behaves the same every time
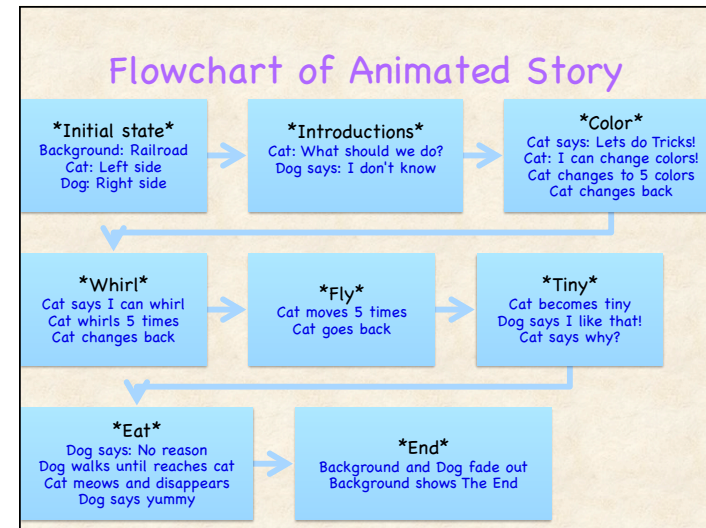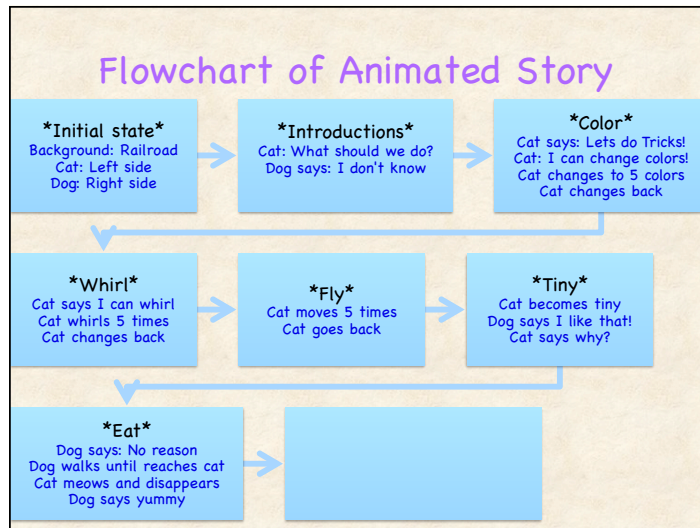- No decisions!
- Flowchart is summary of sequential action of story

How to create flowchart?
- Identify Initial State or Scene
- Group individual actions into higher-level "scenes"
  – Somewhat subjective (no right answer)
  – Label with descriptive name
- Identify characters of story
  – Specify actions of each character in scene
- Connect scenes sequentially

Animated Story

See Scratch code posted on web site!

Flowchart of Animated Story

Initial state

Flowchart of Animated Story

Initial state
Background: Railroad
Cat: Left side
Dog: Right side

Flowchart of Animated Story

Initial state
Background: Railroad
Cat: Left side
Dog: Right side

Introductions
Cat: What should we do?
Dog says: I don't know

Slide 1

Flowchart of Animated Story

Initial state
Background: Railroad
Cat: Left side
Dog: Right side

Introductions
Cat: What should we do?
Dog says: I don't know

Color
Cat says: Lets do Tricks!
Cat: I can change colors!
Cat changes to 5 colors
Cat changes back

Slide 2

Flowchart of Animated Story

Initial state
Background: Railroad
Cat: Left side
Dog: Right side

Introductions
Cat: What should we do?
Dog says: I don't know

Color
Cat says: Lets do Tricks!
Cat: I can change colors!
Cat changes to 5 colors
Cat changes back

Whirl
Cat says I can whirl
Cat whirls 5 times
Cat changes back

Slide 3

Flowchart of Animated Story

Initial state
Background: Railroad
Cat: Left side
Dog: Right side

Introductions
Cat: What should we do?
Dog says: I don't know

Color
Cat says: Lets do Tricks!
Cat: I can change colors!
Cat changes to 5 colors
Cat changes back

Whirl
Cat says I can whirl
Cat whirls 5 times
Cat changes back

Fly
Cat moves 5 times
Cat goes back

Slide 4

Flowchart of Animated Story

Initial state
Background: Railroad
Cat: Left side
Dog: Right side

Introductions
Cat: What should we do?
Dog says: I don't know

Color
Cat says: Lets do Tricks!
Cat: I can change colors!
Cat changes to 5 colors
Cat changes back

Whirl
Cat says I can whirl
Cat whirls 5 times
Cat changes back

Fly
Cat moves 5 times
Cat goes back

Tiny
Cat becomes tiny
Dog says I like that!
Cat says why?

Flowchart of Animated Story

Initial state
Background: Railroad
Cat: Left side
Dog: Right side

Introductions
Cat: What should we do?
Dog says: I don't know

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Cat says: Lets do Tricks!
Cat: I can change colors!
Cat changes to 5 colors
Cat changes back

Whirl
Cat says I can whirl
Cat whirls 5 times
Cat changes back

Fly
Cat moves 5 times
Cat goes back

Tiny
Cat becomes tiny
Dog says I like that!
Cat says why?

Eat
Dog says: No reason
Dog walks until reaches cat
Cat meows and disappears
Dog says yummy

Flowchart of Animated Story

Initial state
Background: Railroad
Cat: Left side
Dog: Right side

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Cat: What should we do?
Dog says: I don't know

Color
Cat says: Lets do Tricks!
Cat: I can change colors!
Cat changes to 5 colors
Cat changes back

Whirl
Cat says I can whirl
Cat whirls 5 times
Cat changes back

Fly
Cat moves 5 times
Cat goes back

Tiny
Cat becomes tiny
Dog says I like that!
Cat says why?

Eat
Dog says: No reason
Dog walks until reaches cat
Cat meows and disappears
Dog says yummy

End
Background and Dog fade out
Background shows The End

How to Transform Flowchart to Scripts?

Approach

- For each scene in flowchart, specify a script
  - May need to specify script for each character
  - Blocks in script show individual actions to be performed
- How to determine when script can run?
  - When should "Initial state" run?
  - When should "Introductions" scene run?
  - When should "Color" scene run?

How to Tell Another Script to Run?

`broadcast`

`broadcast jump` sends the message "jump" to all sprites

`broadcast` sends a message to all the sprites (and the background)

This is useful if you want to tell other sprites when to do something.

What do you want them to do when they receive the message?

See `when I receive`

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Programming Concepts

General

- Divide high-level functionality into logical units
- Descriptive naming is important
- Initial state must be specified
- Incrementally test code as you go
- Scripts must be activated to run
  – When flag clicked; When receive message
- Execution within script proceeds sequentially
- Control : forever, repeat <times>, repeat until
- Parameters (to blocks) specify behavior
- Goal is to make "non-fragile" code

Today's Summary

Today's Topics

- How to create animated stories in Scratch
- How to outline a sequential flowchart of steps
- How to broadcast and receive messages in Scratch

Reading:

- Scratch User's Guide

Announcements

- Homework 2 due before class Friday
  – See web page for hw details (www.cs.wisc.edu/~cs202-1)
  – Any questions Send mail to cs202-tas@cs.wisc.edu
- Lab Hours in 1370 CS
  – Monday, Wednesday: 12-2pm
  – Tuesday, Thursday: 4-6pm