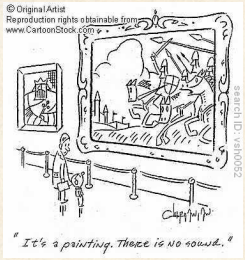
UNIVERSITY of WISCONSIN-MADISON
Computer Sciences Department

CS 202: Introduction to Computation — Professor Andrea Arpaci-Dusseau

How can computation create art?

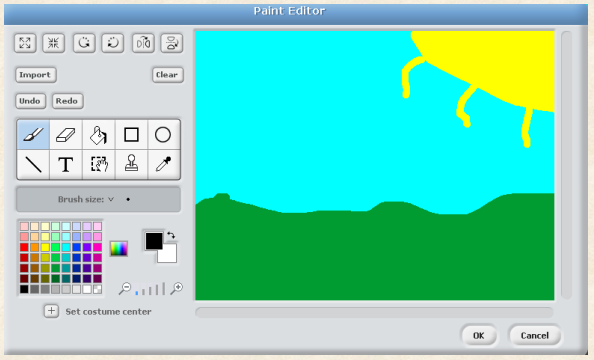


What are different approaches of "Computer Art"?

1. Human uses computer to modify digital images
2. Human uses computer as drawing/painting tool
3. Human designs algorithm; computer follows to create exact picture (e.g. drawing in Scratch) – Homework 2
4. Human designs algorithm w/ some randomness, unknown result
   - Human examines results, picks most appealing
   - Or, computer "evaluates" and shows best (according to some metric)
5. Human interacts with computer
   - Algorithm translates pitch to shape; volume to size; movement to color
   - Golan Levin makes art that looks back at you
   - http://www.ted.com/talks/golan_levin_ted2009.html

1) Modify Digital Images

2) Computer as Paint Editor



3) Computer draws same picture by following algorithm

Program (Problem) Specification

- Describes problem to be solved
  - What should outputs be? (as function of inputs)
  - Does **not** say HOW to solve the problem **(not** the algorithm!)
- What is Output? Anything coming out off computer…
  - Anything sent to display (Scratch: Stage)
  - Anything sent to printer
  - Messages sent over network
  - Data stored permanently in files
- What is Input? Anything going into computer…
  - User typing on keyboard
  - Mouse actions
  - Messages arriving over network
  - Data read from files
  - Any other sensors (GPS location, motion)

What is the Specification?

Initial state:

- Starts with background

Draws:

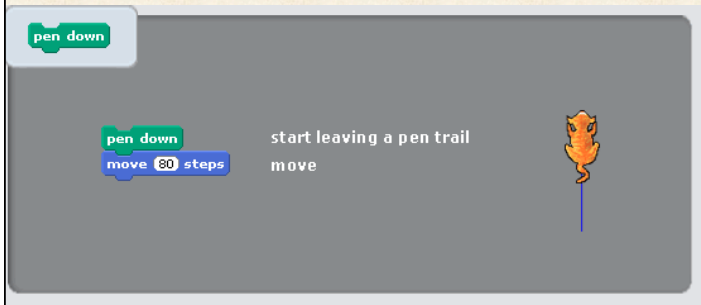
- 1 house
- 5 trees on grass
- 3 stars in sky
- Takes no input!

How?

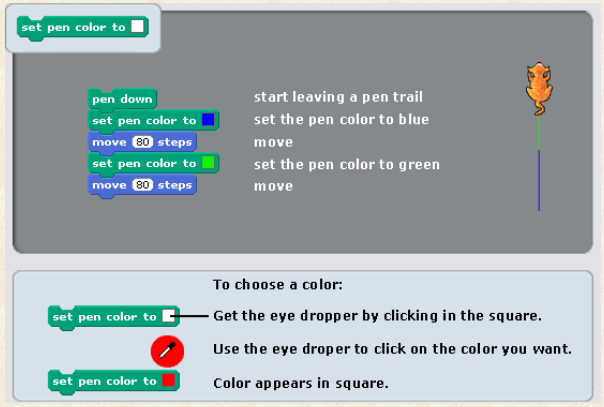
What steps? algorithm?

Watch screencast from course website for full details

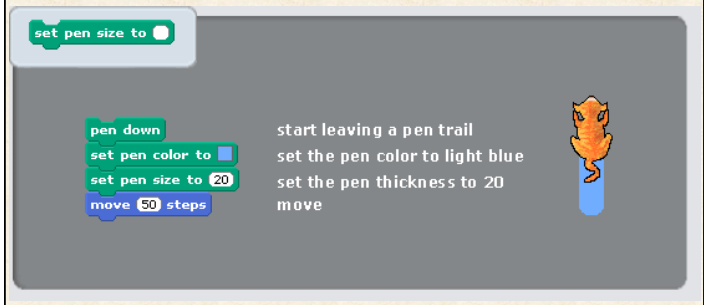
Art in Scratch: Pen



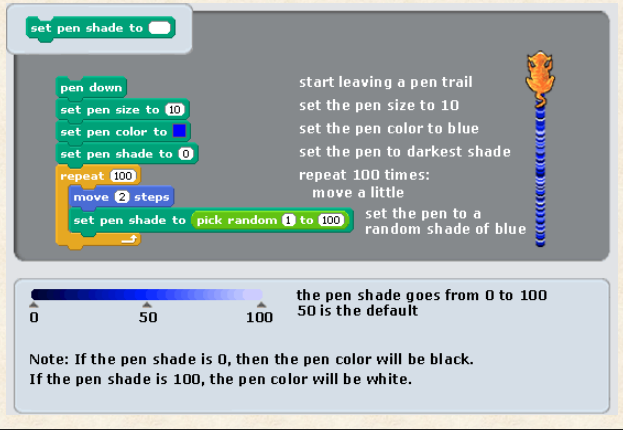
Art in Scratch: Pen



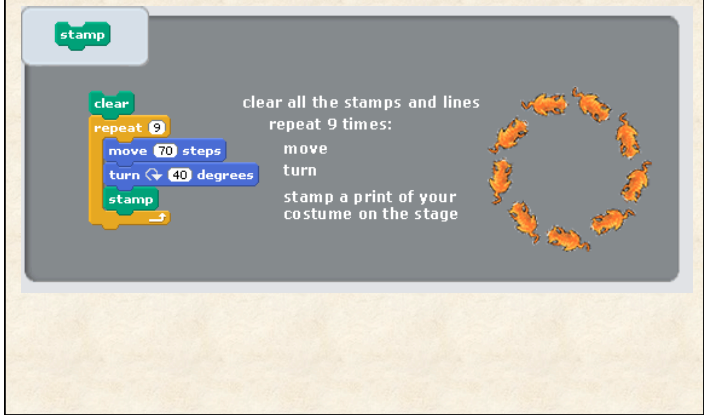
Art in Scratch: Pen



Art in Scratch: Pen

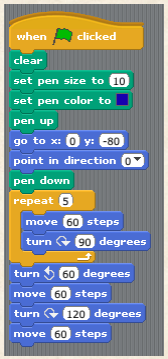


Art in Scratch: Stamp



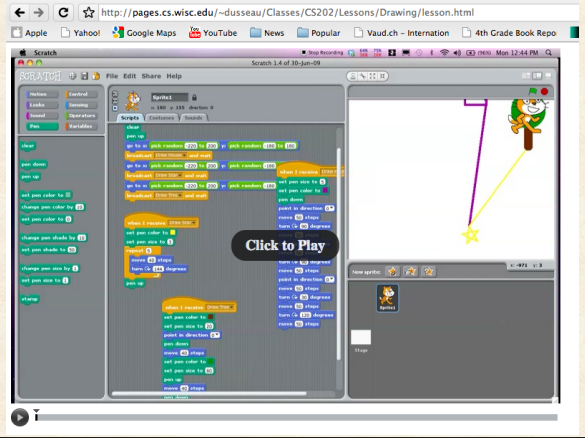
Develop code for house now…

How to Draw a House?



- Activate script by clicking flag
- Code runs sequentially
- Set pen characteristics
- Make sure "pen up"
- Move to starting point
- Put "pen down"
- Move Sprite along desired path, using move and turn blocks

Screencast on Course Website



4) Art with Randomness

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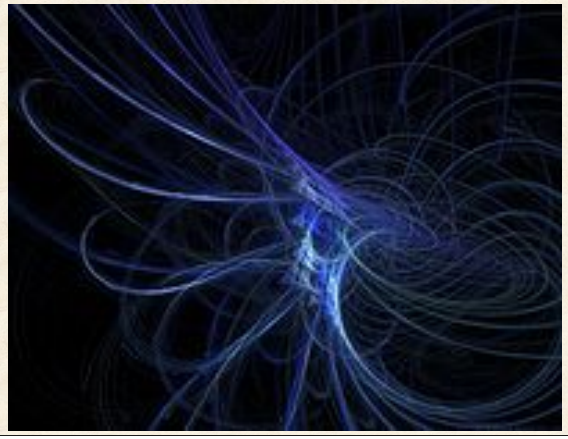


4) Art with Randomness

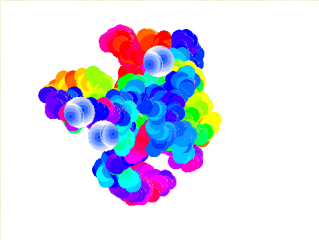
http://www.kurzweilcyberart.com/aaron/history.html

4) Algorithm with Randomness: Version A: Brownian Motion

Specification?

Initial state
- Stage is empty
- Marker begins in middle of stage

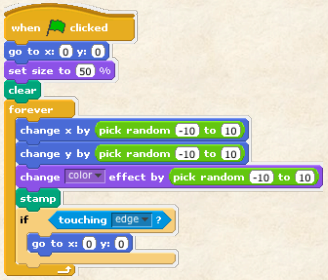
Repeat forever
- Move randomly up/ down and left/right
- Change to random (nearby) color
- If reach edge, go back to center



Brownian Motion

Initial state
- Stage is empty
- Marker begins in middle of stage

Repeat forever
- Move randomly up/ down and left/right
- Change to random (nearby) color
- If reach edge, go back to center



4) Algorithm with Randomness: Version B: Random Turns

Specification

Initial state
- Stage is empty
- Marker begins in middle

Repeat forever
- Change to random (nearby) color
- Move in irregular arc of circle
- If reach edge, move to center

Random Turns

Initial state
- Stage is empty
- Marker begins in middle

Repeat forever
- Change to random (nearby) color
- Move in irregular arc of circle
- If reach edge, move to center

What does this code forget to do????

Programming Concepts

General

- Think about initial state
- Incrementally test code as you go
- Scripts must be activated to run (when flag clicked)
- Execution within script proceeds sequentially
- Control : forever, repeat <times>, if <question> then

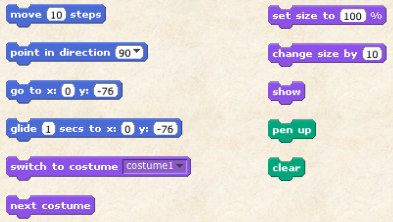
Blocks in Scratch

- Movement: X-Y coordinate system for Stage
- Pen and stamps
- Random numbers

Today's Checkup

What happens if you don't specify the initial state of your program?

Which are likely to be used for initialization?



Announcements

Homework 2 due before class Monday

- See web page for hw details
- Any questions with cs202-tas@cs.wisc.edu

Homework 1 Graded – Available thru Learn@UW

Optional: TED Talk

- Golan Levin makes art that looks back at you
- http://www.ted.com/talks/golan_levin_ted2009.html