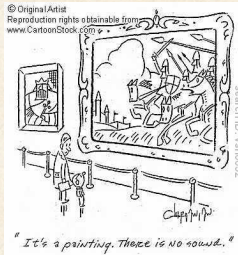


UNIVERSITY of WISCONSIN-MADISON
Computer Sciences Department

CS 202: Introduction to Computation

Professor Andrea Arpaci-Dusseau

How can computation create art?



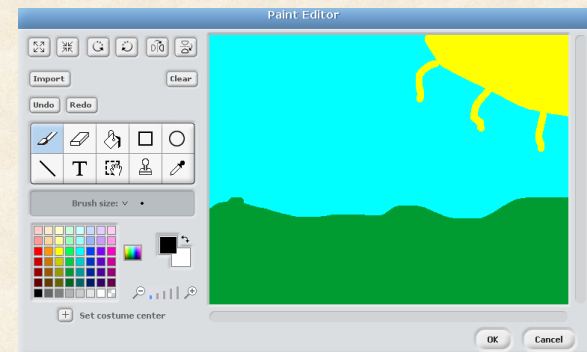
What are different approaches of "Computer Art"?

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!

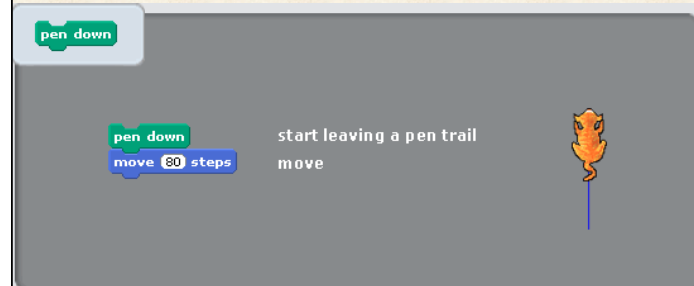
How?

What steps? algorithm?






Watch screencast from course website for full details




Art in Scratch: Pen




Art in Scratch: Pen


set pen color to 


pen down start leaving a pen trail
set pen color to  set the pen color to blue
move 80 steps move
set pen color to  set the pen color to green
move 80 steps move


To choose a color:
set pen color to  Get the eye dropper by clicking in the square.
 Use the eye dropper to click on the color you want.
set pen color to  Color appears in square.




Art in Scratch: Pen


set pen size to 

pen down start leaving a pen trail
set pen color to  set the pen color to light blue
set pen size to 20 set the pen thickness to 20
move 50 steps move




Art in Scratch: Pen

set pen shade to 

pen down start leaving a pen trail
set pen size to 10 set the pen size to 10
set pen color to  set the pen to darkest shade
set pen shade to 0 set the pen to a random shade of blue
repeat 100 repeat 100 times:
 move 2 steps move a little
 set pen shade to pick random 1 to 100 set the pen to a random shade of blue

the pen shade goes from 0 to 100
 50 is the default


Note: If the pen shade is 0, then the pen color will be black.
 If the pen shade is 100, the pen color will be white.



Art in Scratch: Stamp

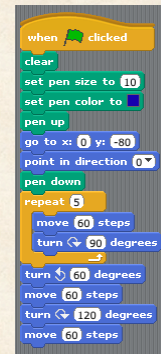
stamp

clear clear all the stamps and lines
repeat 9 repeat 9 times:
 move 70 steps move
 turn 40 degrees turn
 stamp stamp a print of your costume on the stage



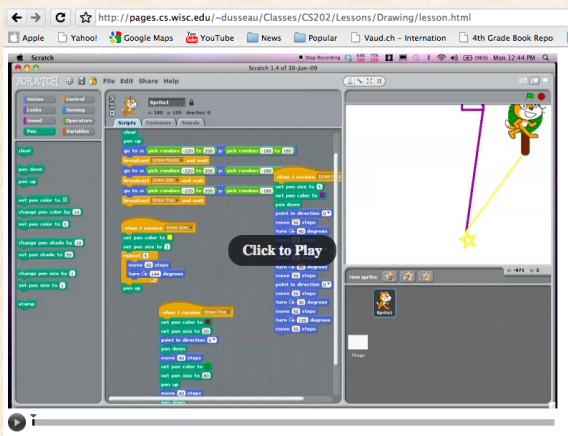
Develop code for house now...

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



4) Art with Randomness



4) Art with Randomness



4) Art with Randomness



4) Art with Randomness



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

4) Algorithm with Randomness: Version A: Brownian Motion

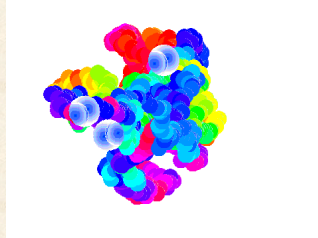
Specification?

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

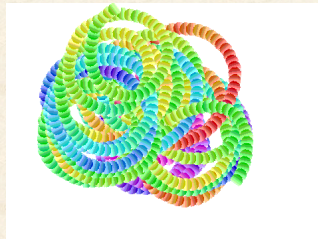
Specification

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