


UNIVERSITY of WISCONSIN-MADISON
Computer Sciences Department


CS 202
Introduction to Computation

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Fall 2010

Lecture 4: How does computation ... create art



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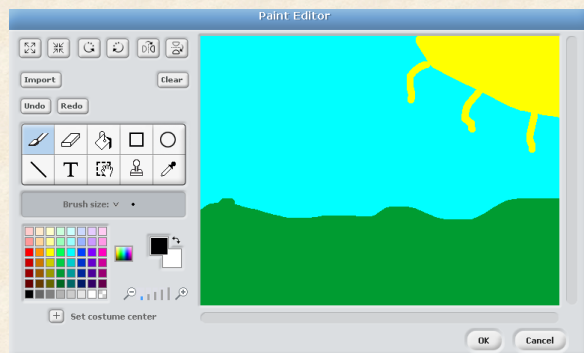


"It's a painting. There is no sound."

What are different approaches of "Computer Art"?

1. Human uses computer as drawing/painting tool
2. Human designed algorithm computer follows to create exact picture (e.g. [drawing](#) in Scratch)
3. Human designed algorithm w/ randomness - human examines results, picks appealing
4. Human designed algorithm w/ randomness - computer evaluates and shows best
5. Human interacts with computer (e.g., algorithm translates sounds to shapes; volumes to sizes; movement to color)
 - Golan Levin makes art that looks back at you
 - http://www.ted.com/talks/golan_levin_ted2009.html

1) Computer as Paint Editor



2) 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

How?

What steps? algorithm?



Watch screencast from course website for full details

Art in Scratch: Pen

pen down

pen down start leaving a pen trail
move 80 steps move

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
set pen color to
set pen size to 20
move 50 steps
    
```

start leaving a pen trail
 set the pen color to light blue
 set the pen thickness to 20
 move




Art in Scratch: Pen

set pen shade to

```

pen down
set pen size to 10
set pen color to
set pen shade to 0
repeat 100
  move 2 steps
  set pen shade to pick random 1 to 100
    
```

start leaving a pen trail
 set the pen size to 10
 set the pen color to blue
 set the pen to darkest shade
 repeat 100 times:
 move a little
 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
repeat 9
  move 70 steps
  turn 40 degrees
  stamp
    
```

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



How to Draw a House?

```

when clicked
clear
set pen size to 10
set pen color to
pen up
go to x: 0 y: 480
point in direction 0
pen down
repeat 5
  move 60 steps
  turn 90 degrees
turn 60 degrees
move 60 steps
turn 120 degrees
move 60 steps
    
```

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

3) Algorithm with Randomness



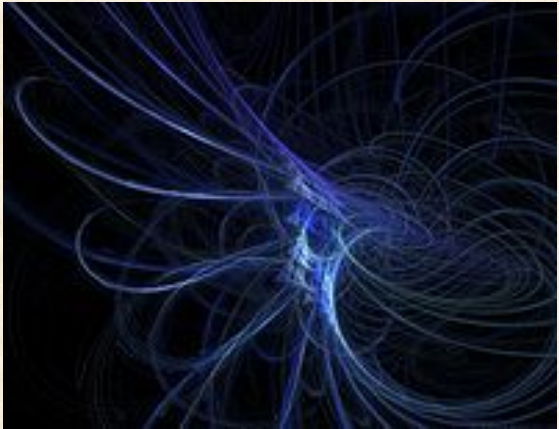
3) Algorithm with Randomness



3) Algorithm with Randomness



3) Algorithm with Randomness



3) Algorithm with Randomness: Version A: Brownian Motion

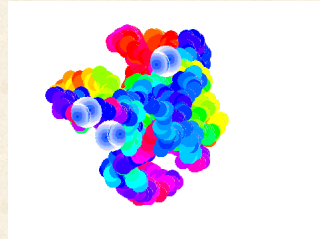
Specification?

Initial state

- Stage is empty
- Pen begins in middle of stage

Repeat until reach edge

- Move randomly up/down and left/right
- Change to random (nearby) color



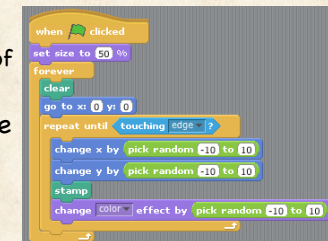
Brownian Motion

Initial state

- Stage is empty
- Pen begins in middle of stage

Repeat until reach edge

- Move randomly up/down and left/right
- Change to random (nearby) color



3) Algorithm with Randomness: Version B: Random Turns

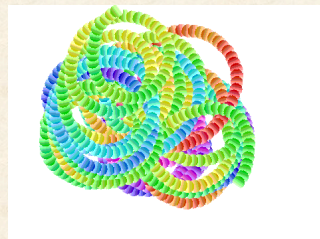
Specification

Initial state

- Stage is empty
- Pen begins in middle

Repeat until reach edge

- Move in irregular arc of circle
- Change to random (nearby) color



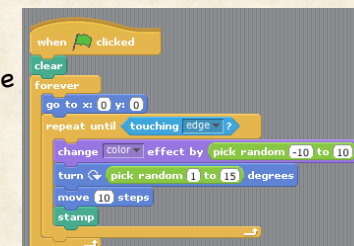
Random Turns

Stage is empty

Pen begins in middle

Repeat until reach edge

- Move in irregular arc of circle
- Change to random (nearby) color



Programming Concepts

General

- Initial state must be specified
- Incrementally test code as you go
- Scripts must be activated to run (when flag clicked)
- Execution within script proceeds sequentially
- Control : forever, repeat <times>, repeat until

Blocks in Scratch

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

Today's Summary

Today's Topics

- Can create art with pen and stamp tools

Reading: TED Talk

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

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-fas@cs.wisc.edu
- Lab Hours in 1370 CS
 - Monday, Wednesday: 12-2pm
 - Tuesday, Thursday: 4-6pm
 - Text books available for use in room