

Squeak- a Free Computer Application to Enhance Math and Science Learning

HASTI 2006

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pervasivet**technology**labs

AT INDIANA UNIVERSITY

Outline

(distrib copy of Squeak?)

- ◆ Collective “thank you”
- ◆ My/Lab’s background and interests
- ◆ Intro to Squeak – with demos
- ◆ Interactive – with you
- ◆ Your thoughts and ideas



Speaker' s background

- ◆ **B.S. Comp Math, Eastern Illinois U.**
- ◆ **M.S. Comp Science, U. of Utah**
- ◆ **M.A. Mathematics, Arizona State U.**
- ◆ **25 yrs scientific programming**
- ◆ **Scientific data visualization/analysis**
- ◆ **2 children (ages 9 and 5)**
- ◆ **SDA Lab: improve science understanding**



If you need to leave early

- ◆ <http://squeakland.org>
- ◆ <http://sda.iu.edu/K-12>
- ◆ heiland@iu.edu



Squeak

- ◆ What is it?
- ◆ How can you get it?
- ◆ What can it do?
- ◆ What can't it do (easily)?



Squeak – what is it?

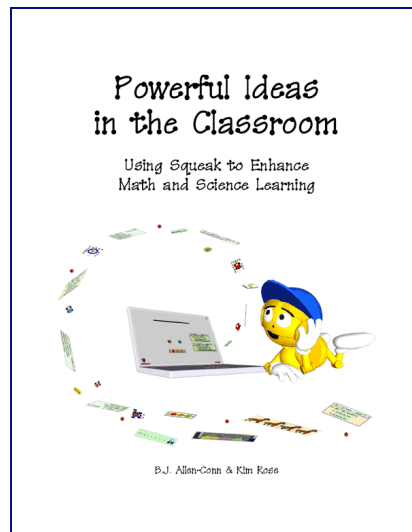
- ◆ 2-D graphics application
- ◆ Open source (=free) (for Windows, Mac, Linux)
- ◆ Multimedia authoring environment
- ◆ Drag & drop programming environment
- ◆ Constructivist learning environment



Squeak – how can you get it?

- ◆ Download from squeakland.org
(installer ~6M ; virus-free)
- ◆ a.k.a. Etoys=Educational toys

Optional
media (\$)
Book,DVD



Squeak – what can it do?

- ◆ Let children be artistically creative
- ◆ Let children create dynamic “stories”
- ◆ Let children create [mathematical] games and artwork
- ◆ Teach (object-oriented) programming
- ◆ Let children create math & science simulations



Squeak – what can't it do (easily)?

- ◆ 3-D graphics
- ◆ Automatic graphing of data (it's not a spreadsheet application)
- ◆ Image editing (it's not Photoshop)
- ◆ Sharing over the Internet
- ◆ Custom sounds/music

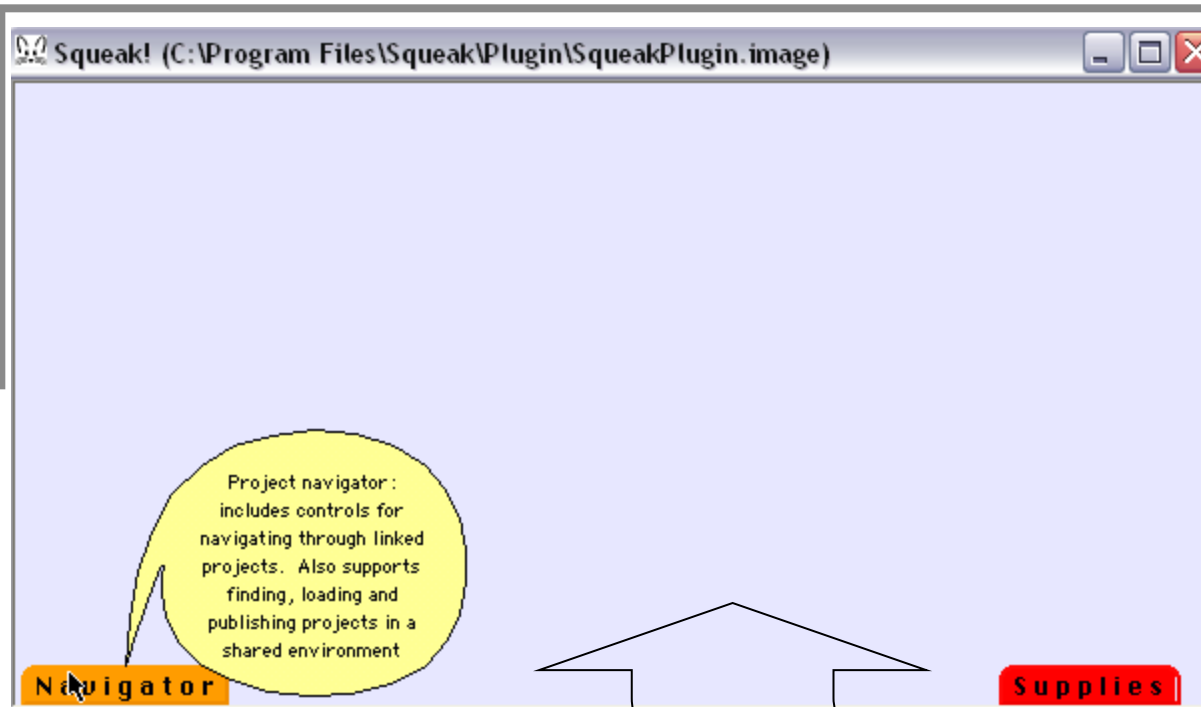


Demos...

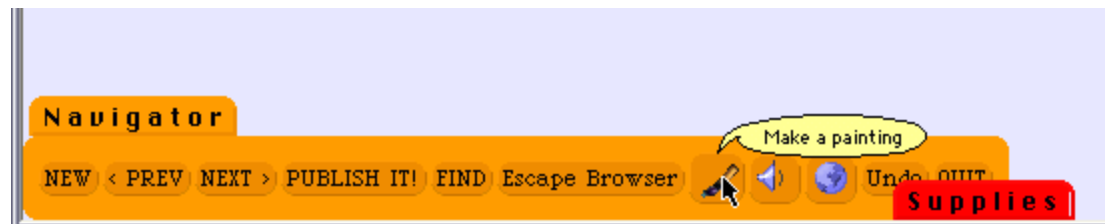
- ◆ Getting started
- ◆ Paint a sketch
- ◆ Program (script) a sketch
- ◆ Math/Science simulations



Getting started



“Mousing over” something often produces balloon help.

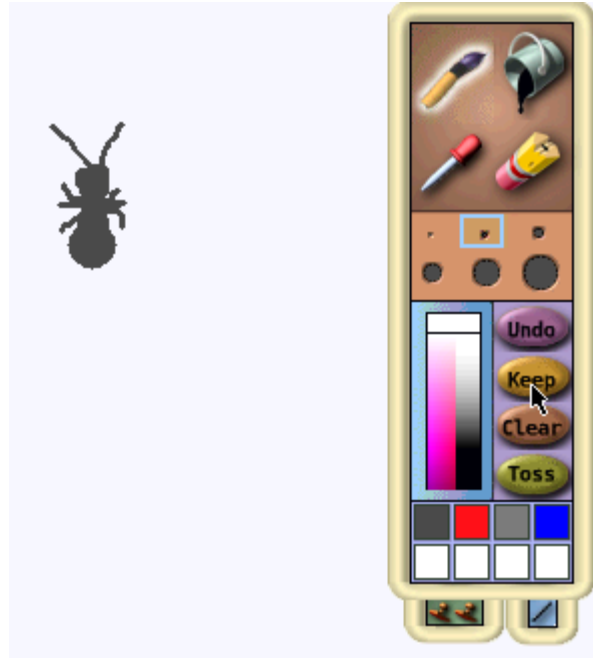


Open region
= “World”

Click on the paintbrush



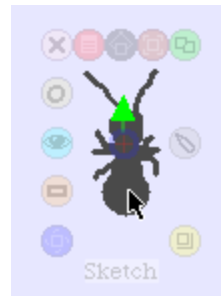
Paint a sketch



Experiment with the paint tools to create a sketch. When you're done, 'Keep' it.

→ Observe your world.

“Mousing over” your sketch will show its halos.



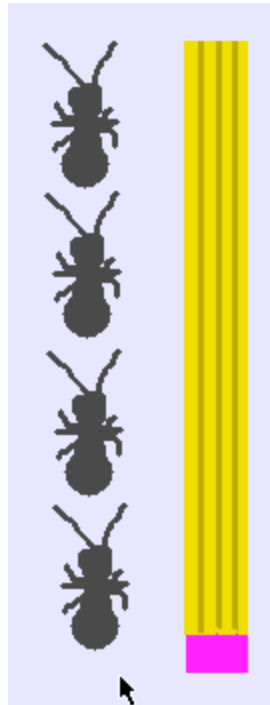
A sketch's default orientation is 'up' (green arrow).

You'll directly edit your sketch via the halos.

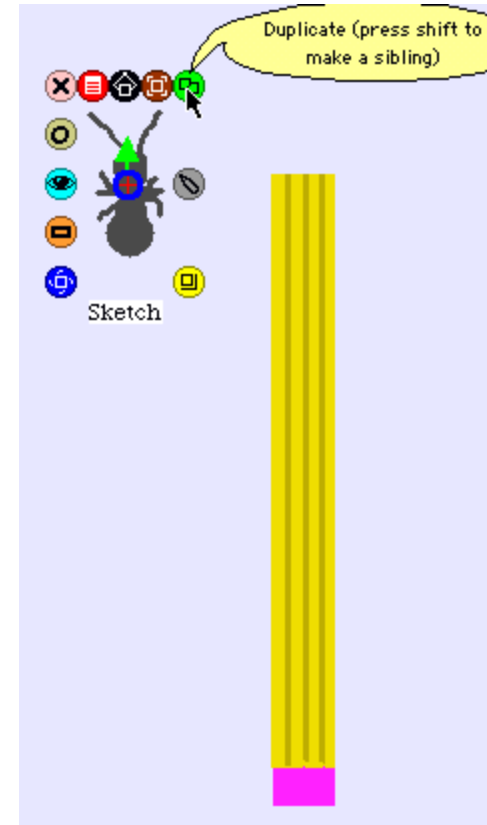


Paint another sketch: pencil

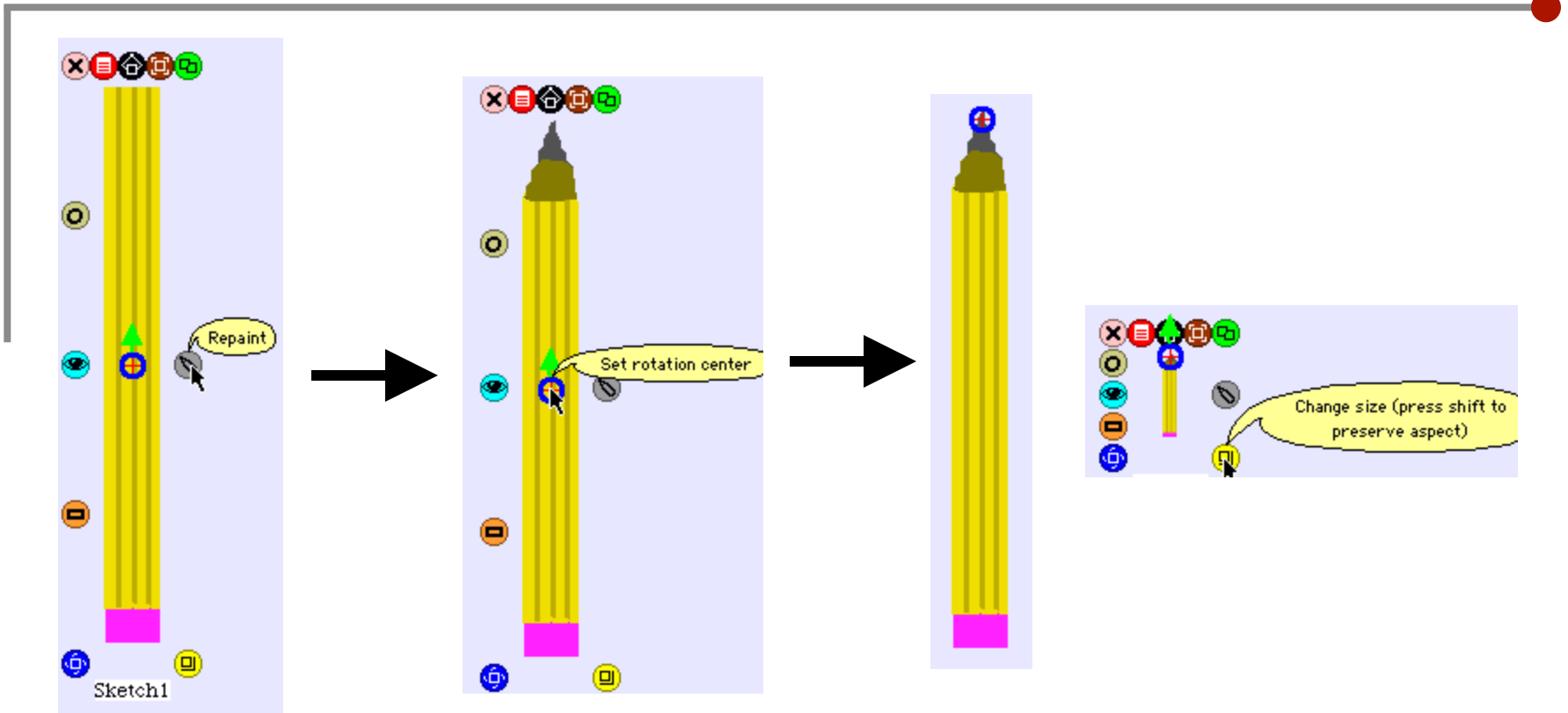
- ◆ Q: how many ants is the same length as a pencil?



→ Counting, estimation



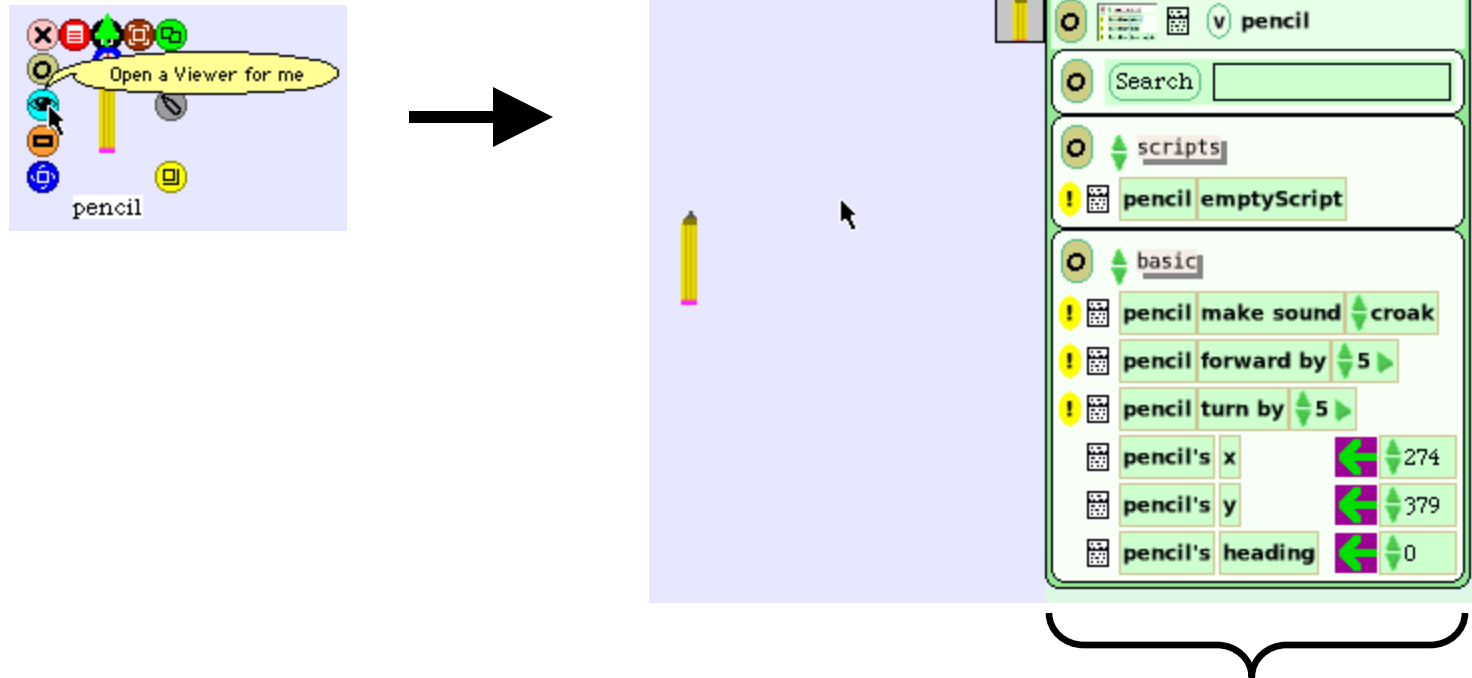
Repaint: “sharpen” the pencil



After repainting/Keep, move its rotation center to the tip (hold **Shift** key to move it) then shrink the pencil.



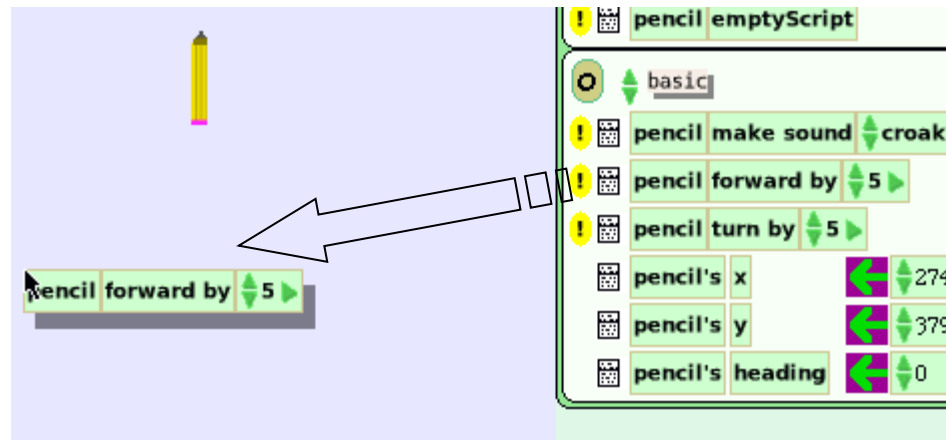
Program (script) a sketch



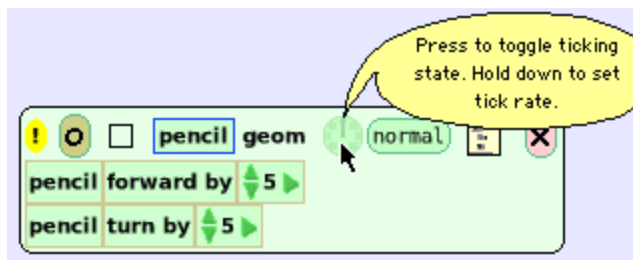
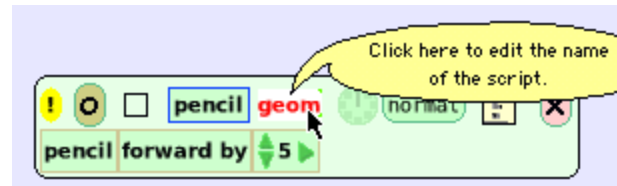
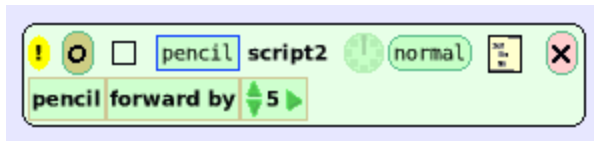
A viewer contains tiles
(in categories/blocks)



Program a sketch (2)



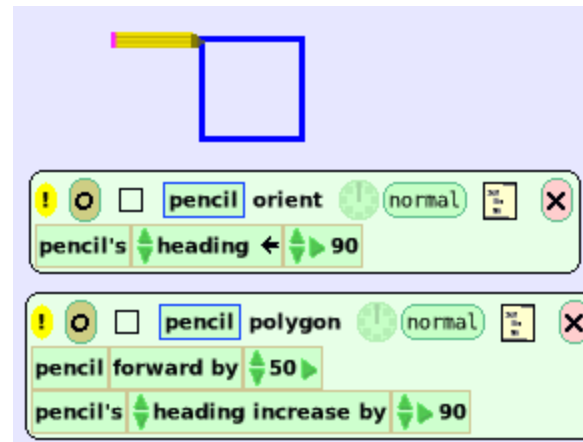
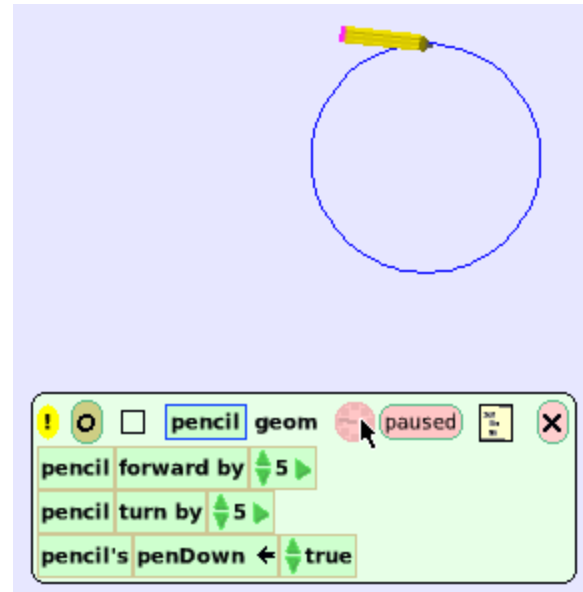
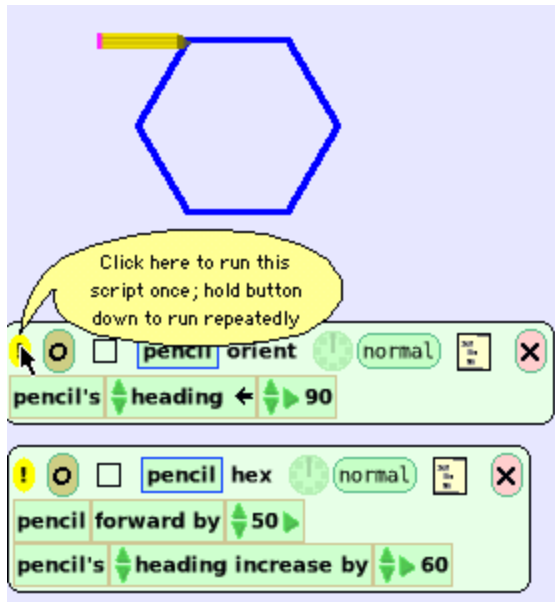
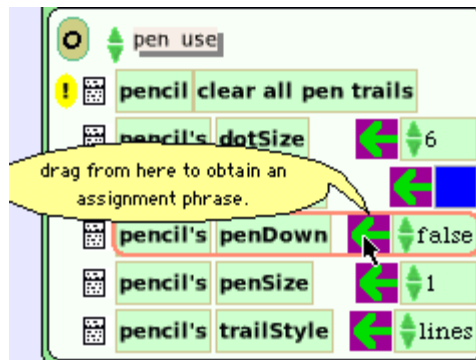
Drag/drop a tile into the World to create a script.



Click on the timer clock to run the script (toggle on/off)



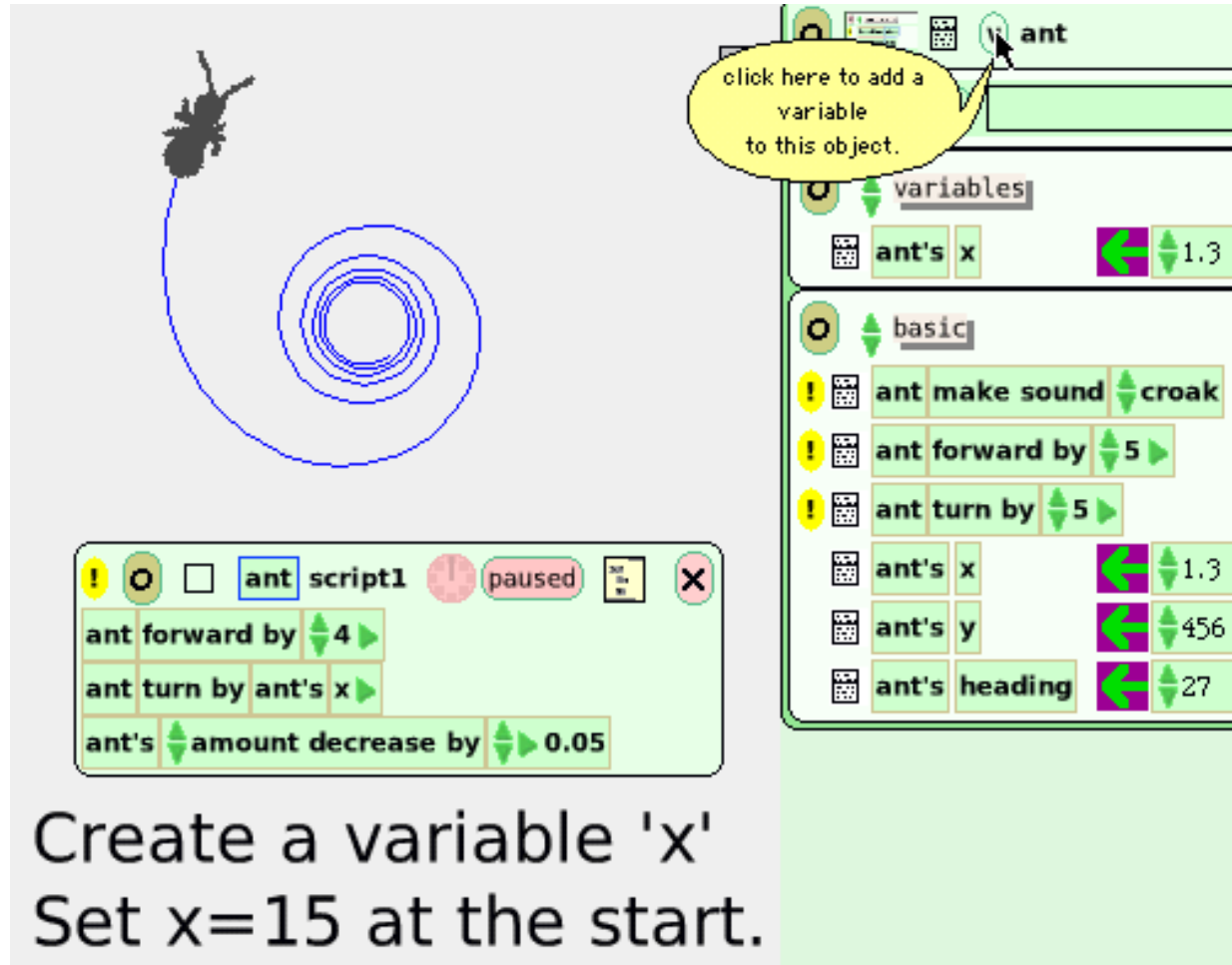
Simple geometry



Visually
seeing effect
of direct
manipulation
of numbers
(+/-)



More geometry + algebra



click here to add a variable to this object.

ant

variables

ant's x 1.3

basic

ant make sound croak

ant forward by 5

ant turn by 5

ant's x 1.3

ant's y 456

ant's heading 27

ant script1 paused

ant forward by 4

ant turn by ant's x

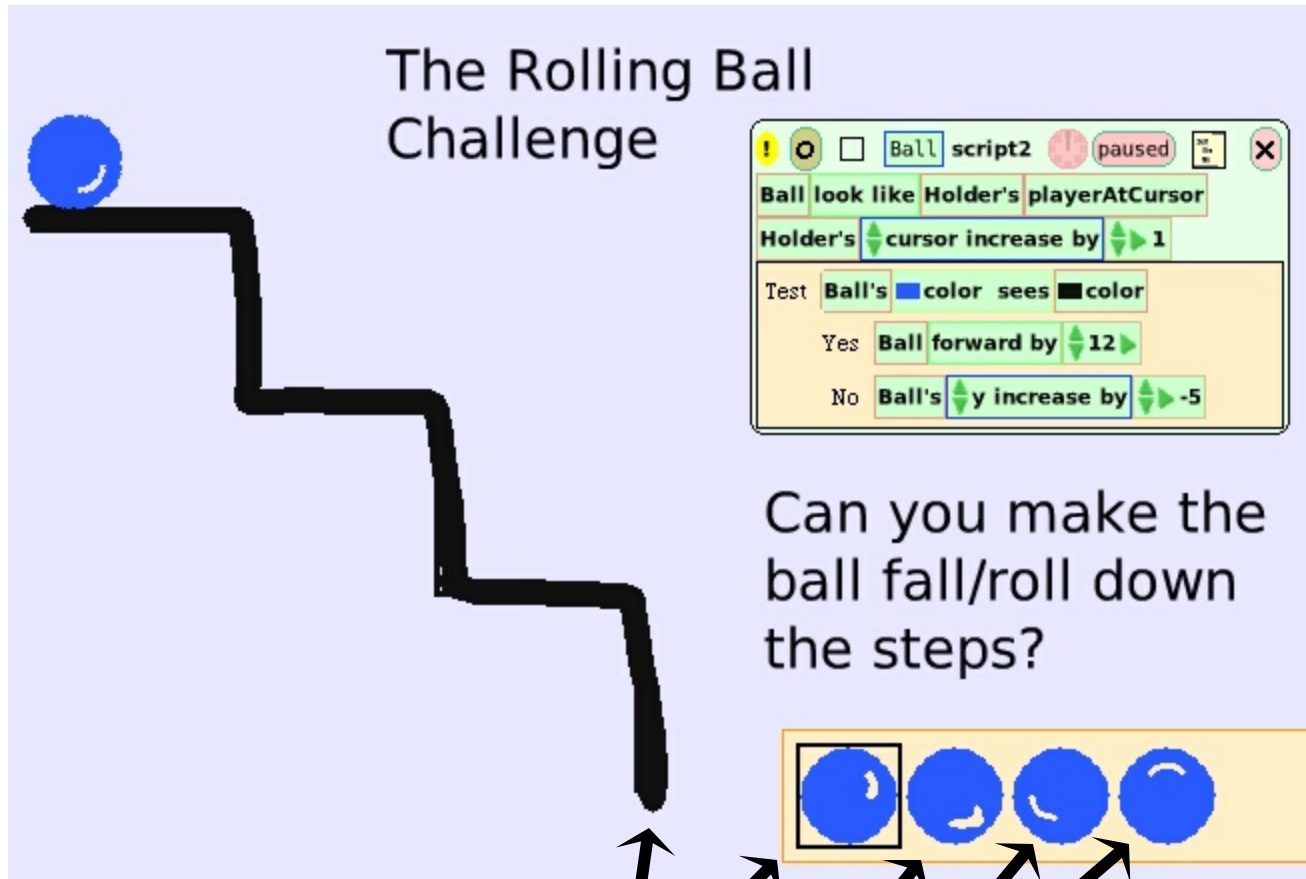
ant's amount decrease by 0.05

Create a variable 'x'
Set x=15 at the start.

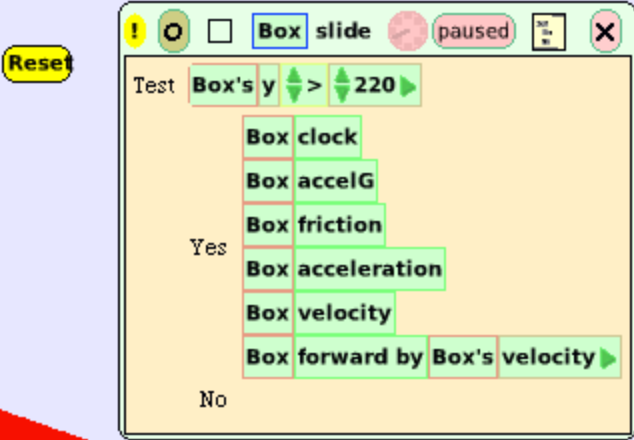
What happens if you keep 'turn by' fixed but change the 'forward by' (speed) ?



Animations: logic and programming



Physics



Coefficients of Friction	
Surface	Coefficient
Ruber	0.84
Glass	0.31
Wood	0.59
Aluminum	0.19
Ice	0.48

Box's acceleration = 0.0

Box's time = 0.0

Box's accelG = 19.4

Box's friction = 7.0

Box's velocity = 0.0

Incline's inclination = 19

Box's coeffric = 0.36

Box's mass = 9

090

01

0100

Overview

This simulation emulates a box of given mass sliding down an inclined plane. There are three variables which can be controlled by the user; the boxes mass, the coefficient of friction between the box and the incline, and the angle of inclination. The box's mass is in kg, the higher the mass, the greater the acceleration of the box. The coefficient of friction determines how much friction will result of the physical action. This number should be between 0 (no friction) and 1 (complete friction). The final variable is the angle of inclination, which represents the angle, in degrees, that the incline forms with the surface, and should be between 0 and 90, but preferably somewhere inbetween 30 and 60.

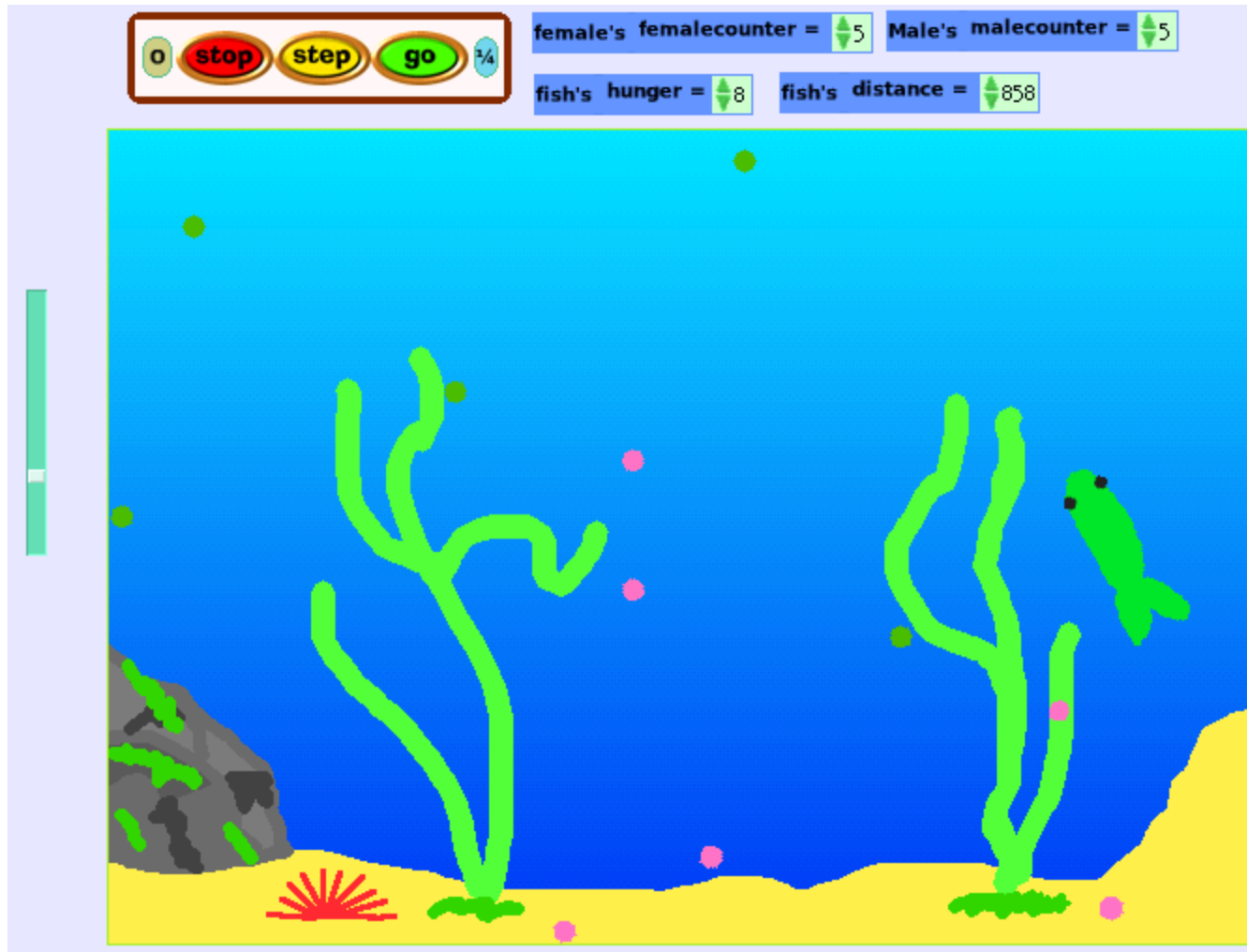
Instructions

Before you begin, set the three variables on the bottom row variables on the top of the screen, which are mass, coeffric, and inclination. Next, press the reset button, and then place the box on the surface. Then run the 'run' script'. At the top of the screen, you can see the various qualities of the box. Refer to the table to determine the coefficient of friction for a specific surface.

From squeakland.org → kids play → Etoys



Ecology



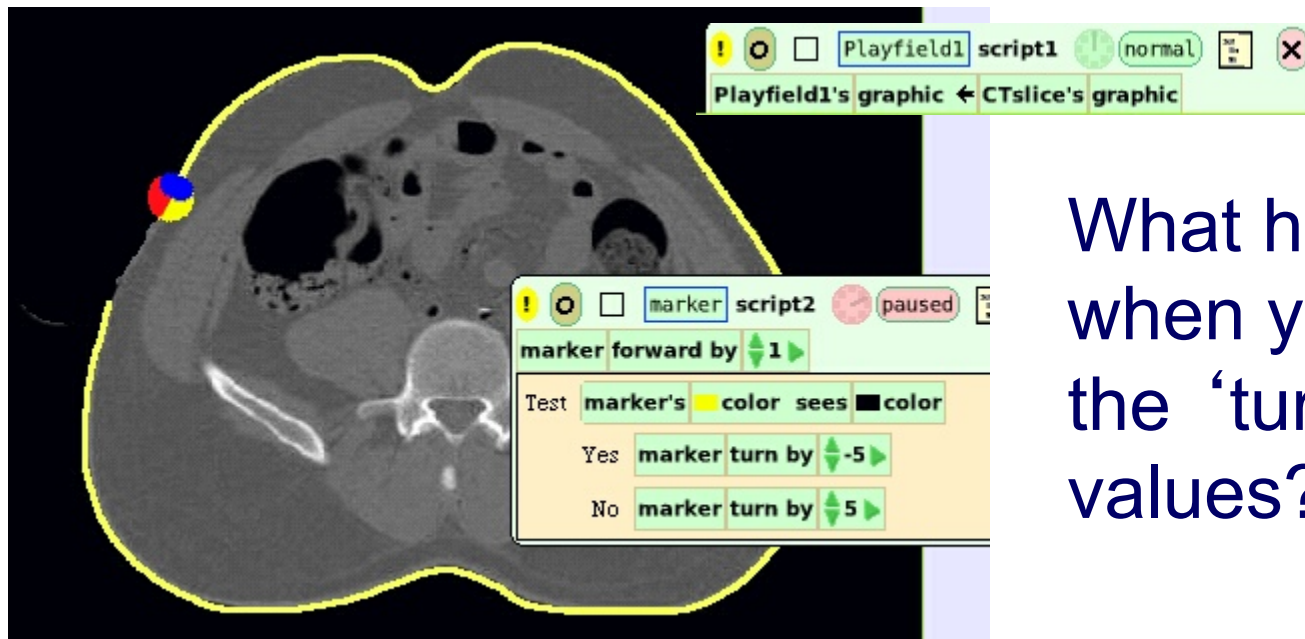
From squeakland.org → kids play → Etoys



Medical image analysis

Simply drag/drop images from your computer into Squeak's World

Image segmentation:



What happens when you change the 'turn by' values?



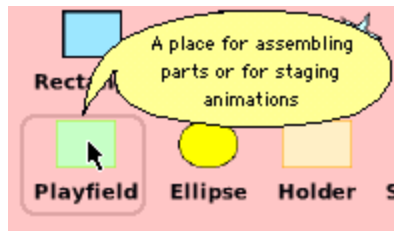
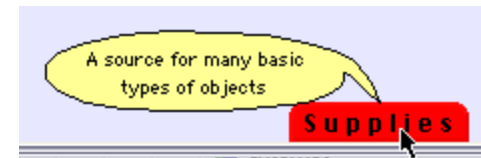
Health education



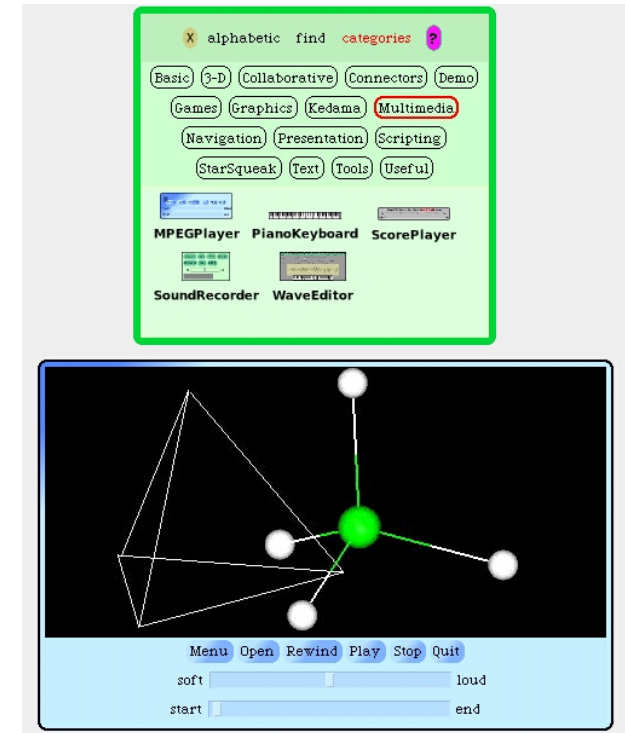
A simulation that shows blood cells flowing through a vein but getting clogged by plaque (in white). The plaque decreases as more fruits and vegetables are consumed.



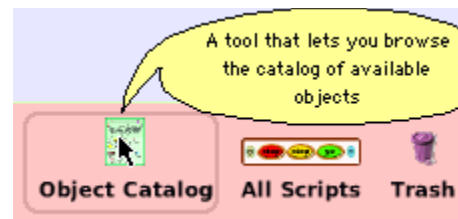
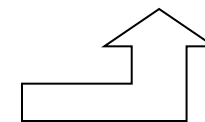
Misc: 'Supplies' tab



Drag a 'playfield' into the World to provide a fenced in region for sketches.



Mpeg player



Help at squeakland.org

