University of Illinois **Computer Science Department**
Squeak Lab Manual

Lab 1: Introduction to Squeak

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We begin our journey into Squeakland – the wonderful world of programming!

At the end of this section, you should be able to…

- Have an understanding of what Squeak is (no, it is not the mouse noises we are talking about here)
- Know where to get Squeak so you can use it at home.
- Start up Squeak
- Be able to perform basic operations with Squeak
    - Control objects
        - Manipulate or change behavior of an object
        - Make two objects interact

What is Squeak?

Squeak is a software environment that allows you to learn real programming. Unlike other programming languages, you do not have to type in a bunch of code, you can join together code snippets that are already written to make all sorts of interesting things happen!

Learning Squeak will teach you the basic concepts and fundamental ideas of programming through a GUI (graphical user interface) environment.

What can I use Squeak for?

You can use Squeak to make your own games, multimedia presentations, computer art, animated storybooks, computer simulations and many other things. Just wait and see!

Where can we find Squeak?

Squeak is available for free download from www.squeakland.org. You will also be given a CD with squeak on it when you leave the camp. Installing Squeak on your computer at home is not difficult, but you may need to ask for help from your parents or whoever administers your computer. Mostly though, it is a point-and-click process.

How do we use squeak?

For this first lab, before starting up squeak, make sure that you have logged on to your tablet pc

To start squeak, simply double-click on the squeak alias which is on the desktop. (It looks like a mouse's face). If you do not see it there, ask for help.

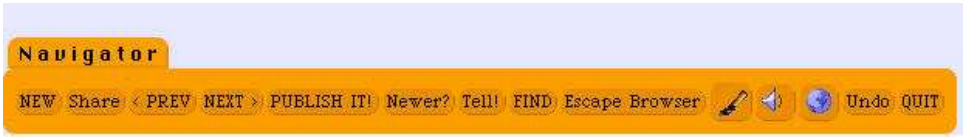
Getting to know Squeak better

When you open up Squeak you see this big empty gray space with two tabs at the bottom – **Navigator** and **Supplies**.

This is called the **World**. Everything you do from now on will happen in this **World**!
Whatever you do in Squeak is called a project. We'll refer to your work as **projects** from now on.

Navigator

When you click on the **Navigator** flap, you get something like this:



All these buttons will allow you to navigate across different Squeak projects (done by both you and others). For now, note the **Publish It,** the **Find** and the **Quit** buttons. To save a project you will use the **Publish it** button. To find a project that you have saved you will use the **Find** button. To leave Squeak you will use **Quit** (duh!!)

Supplies

When you click on the **Supplies** flap, you get something like this:

We'll be using stuff from **Supplies** later on in our projects.

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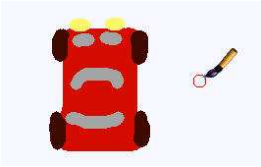
Your very first Squeak project: Operating a Car using a steering wheel

No, you won't be actually operating a *real* car – you are not old enough! But in the Squeak world, age isn't a barrier if you know the right tools – you can make a car and drive it – no questions asked!! Since this is a virtual car – you can make it do anything you like – paint it to be bright orange even, go backwards … oh, the possibilities!

Step 1: Paint the car

1. Click on **Navigator** to open up the Navigation flap. Click on **New** to open up a new project.
2. Choose the paint brush to open up Squeak's paint palette.
3. Draw a blob – which looks like the shape of a car.

4. If you don't like what you drew, click on **Undo** on the paint palette.
5. Choose different colors for the wheels, windows and so on.
6. When you are happy with what you have drawn, click on **keep** to save your drawing.



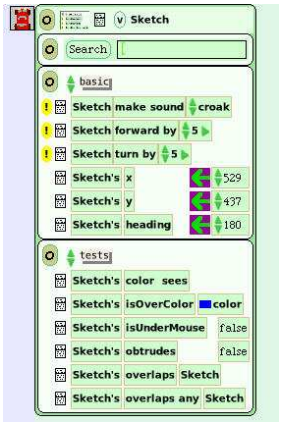
Congratulations! You have just created your first Squeak object – a bright new shiny car!!!

Step 2: Making your car move

Right now your car object is just a piece of drawing. But every object in Squeak has characteristics (properties) and behavior, just like real world things. You can manipulate the properties and behavior of the objects to make them do different things.

If you hover your mouse over the car object, you will see little ovals surrounding the car. These are called Handles. Through these handles, you can access the properties of your object and also modify its behavior.
For now, we will be concentrating only on the viewer handle - which is the turquoise eyeball. Click on it to reveal the viewer.

Click on the viewer handle to get the viewer



The viewer contains property tiles that show what your car is and what it can do.

You can "collapse" the viewer against the right edge by clicking on the small tab with the picture of your car on it. To make the viewer re-appear, simply click on the tab again.

Step 3: Changing the *name* property of the car:

First, let's change the name of the object from **Sketch** to **Car**. Find the word Sketch at the top of the viewer. Click on it to highlight it and type in the word **Car**. Press **enter** to save the new name. From now on, your object will be known as **Car.**

Step 4: Getting into more action!

Look at the tiles in the **basic** category pane. You will see two types of tiles: some are preceded by a yellow exclamation point ! and others are not. The tiles following an exclamation point are *action* tiles.

Clicking on an exclamation point will fire the action once. Holding down an exclamation point will 'run' the action repeatedly. Try driving the car around the world using the exclamation points.

Step 5: Changing the behavior of the car - manually

Numeric values of the tiles can be changed by either clicking on the up or down arrow on the left of the value or by selecting the value and typing in a new number and hitting **enter** once. After changing the value, click on the ! again.

Try different numbers – what do you think will happen if you type in negative numbers?

Step 6: Changing the properties of the car

Tiles which are not followed by an exclamation point are *value* tiles. Each of these is followed by a green arrow that assigns or sets that value as the current value for a particular attribute or property of the car.

In the real world, objects have properties, such as size, color, location, direction, and so on. Every object that you draw or pull out of the supplies bin in squeak automatically has many standard properties that tell us about the object, where it is, what it looks like, etc. Later we will see that we can create new properties for objects (for example, "car's age", and make the program behave differently (example – go slower) depending on the age.

Step 7: Changing the behavior of the car – automatically

Manually pressing down on the exclamation point as you did in Step 5 to make the car move seems very inefficient and not very interesting. However, to make the car move on its own, until some condition is reached (i.e. for one minute, until the car reaches an obstacle etc) we can use *scripts*.

1. Creating a script

Scripts are created for objects by assembling tiles – in a scriptor (**script** edit**or**). There are two ways to get a scriptor. For now, use the first option.

(a) Drag out the tile "car forward by 5" from the viewer and drop it on the world. A scriptor will sprout around it. You can do this with any action tile.
(b) If you'd like to start with an empty scriptor, go to the **scripts** pane of the viewer, and drag out "car emptyscript". (You can scroll between panes by clicking on "**basic"** and additional pane choices will appear.)

2. Naming the script

You now probably have something like this: 

Click on "script1" to highlight it, and then change it by typing "drive". When we program, we want our scripts and objects to be named things that tell us what their purpose is.

3. Running the scripts

Clicking on the exclamation mark fires the action once – meaning the car will go forward 5 points. However, to make the car *keep* moving, click on the clock symbol (ticker)  on the scriptor. Notice that in the title of the script, the word 

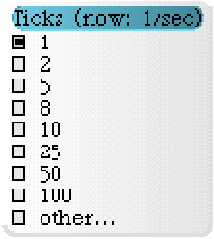
has changed to say "ticking" If you click it again, the script will stop, and it will show "paused".

4. Experiment with different values and different scripts

Change the different values. How can you make your car go faster? Slower? Go backwards? Go around in a circle? What scripts do you need to add for these?

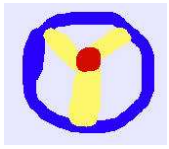
5. Changing the "ticking" rate.

Another way to change a script is to modify its "ticking rate". Every script is born with the default rate of 8 ticks per second. You can speed things up, or slow them down, by holding down the mouse button over the clock icon until the following menu appears, after which you can make your selection.

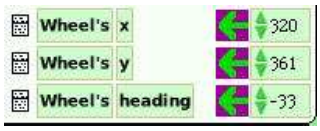


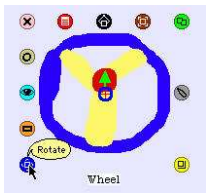
Step 8: Creating the steering wheel object

1. Paint a steering wheel.
2. Bring up the handles of the steering wheel by hovering your mouse over the steering wheel.

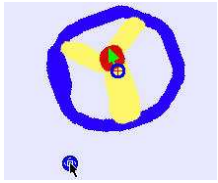


3. Open the viewer for the steering wheel by clicking on the eyeball handle.
4. Change the name of the object to **Wheel.**
5. Bring up the handles of W**heel** again. Click on the blue **Rotate** handle.



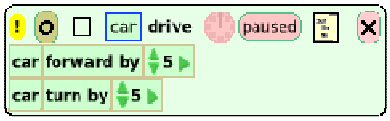


6. By clicking and dragging the blue rotation handle you can rotate the steering wheel. If you look at the wheel's **heading** in the viewer, you will see how the values change as you rotate the wheel.



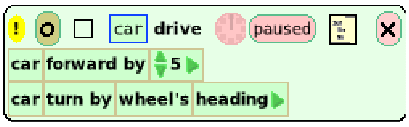
Step 9: Controlling the car through the steering wheel

In the **car**'s scriptor, make sure you have the following tiles, as shown in the figure.



To control the car through the steering wheel, the car and the steering wheel have to be connected. Specifically, the turn of the car has to be connected to the heading of the steering wheel. Heading indicates at what angle the object is rotating. As the car moves forward, if the heading of the steering wheel is negative, it will turn left. If the heading is positive, it will turn right and if the heading is 0, then the car will move straight ahead.

To connect the heading of the steering wheel to the turn of the car," drag the **heading** tile of the steering wheel from the viewer and position it over the "5" in the **turn by** tile of the car on its scriptor. You should end up with this:



Step 10: Drive the car using the steering wheel

You are now ready to drive the car using the steering wheel. In **wheel's** basic pane, set the value of heading to 0. Then start the car's script by clicking on the ticker in the car scriptor. Quickly bring up the handles of the wheel. Mouse down on the blue rotation angle and start driving the car!

Step 11: Using math to scale the effect of the wheel on the car

You will probably find that the car is too sensitive to the wheel. At every "tick", the car turns by the wheel's heading. So, if the wheel is heading slightly to the right, say, 5 degrees, then, assuming 8 ticks per second, the car is spinning 40 degrees every second. Dizzying!

Click on the small green arrow just next to the word "heading", and it will change to say "car turn by heading + 1". You can change the "+" to a variety of other math operations, and you can change the "1" to any number. Try some of the following and determine what they do, and which effect you want in order to get the car to be less senstivie to the wheel"

"car turn by wheel's heading –5"
"car turn by wheel's heading * 5"
"car turn by wheel's heading * -5"
"car turn by wheel's heading / 5"
and so on.

Step 12: Publish the car/save the car project

We do not "save" squeak projects, we "publish" them. In the Navigator tab, click on the word "Publish". A form will appear. Using the form, name the project. Make sure that the project name *includes your own name*, but for security reasons, leave your last name as an initial. Include descriptive information in the name. Don't use any special symbols in the name other than dashes. You need not fill out the other information; you can come back to that later.

After you click "ok" on the form, a blue window will appear. Click *once* on "My Squeak" (*or wherever else your instructor tells you to publish to*) which is a special folder on your computer, and then click "OK" at the top of the blue window. Wait for Squeak to finish publishing.

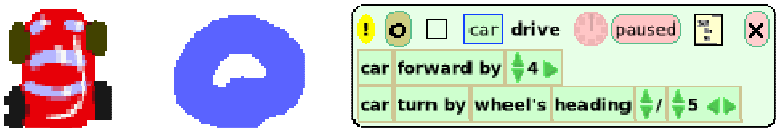
Congratulations! You have just completed your very first Squeak project. Now go ahead and play with the different options that we explored!!

When you are done, go back to the Navigator tab and click on "Quit".

Lab 1 Skill Summary

Finding Squeak on the Web
Starting squeak
Navigator and Supplies Tab
Escape browser
Mouse hover to get Halo. Viewer icon
Name property: changing it in viewer, or on object.
Basic properties, first glimpse: x, y, heading.
Firing scripts from viewer (forward)
Changing properties in viewer (x, y, heading) by arrows or by kbd entry.
Sprout a new *scriptor* by dragging an action tile onto the world
Opening an empty scriptor by choosing emptyscript from scripts pane
Naming a script
Tickers and fire-once usage
Adding tiles to a script
Changing ticking rate
Rotate icon and heading, degrees 0 through 180 and –180 and mod 360
Replacing value tiles with other tiles by drag and drop (green highlight) to get objects to interact.
Use math expression to scale (divide, multiply) or change the value.
    collapsing or expanding the number of terms.
    warning to avoid anything other than short expressions due to order of eval.
Opening and closing viewers with picture tabs (is this in Lab 1?)
Publish and Quit

At end of this tutorial, you should have this:



Lab 1 Review Questions

1. What is a "halo" of an object?

2. How do you open a "viewer" for an object

3. What can you view in a viewer?

4. Name five properties of any object.

5. What is a "scriptor"?

6. What is the difference between these buttons: 

7. Can you think of circumstances when you'd want to fire this script once?
   How about circumstances when you'd want to start it ticking?

8. What is the "heading" of an object? What does it mean if a ticking program changes the heading so that it increases by 90? If you were riding on the object, what would you say happened?

9. How can you make an object move backwards?

10. Chelsea wants to program a "hot air balloon" to go up and down as she drags a picture of a sandbag up and down. Can you describe how she can do this in squeak? Be real specific, because she hasn't seen squeak before.

Challenge: how would you make the balloon go up and down much further than the sandbag?