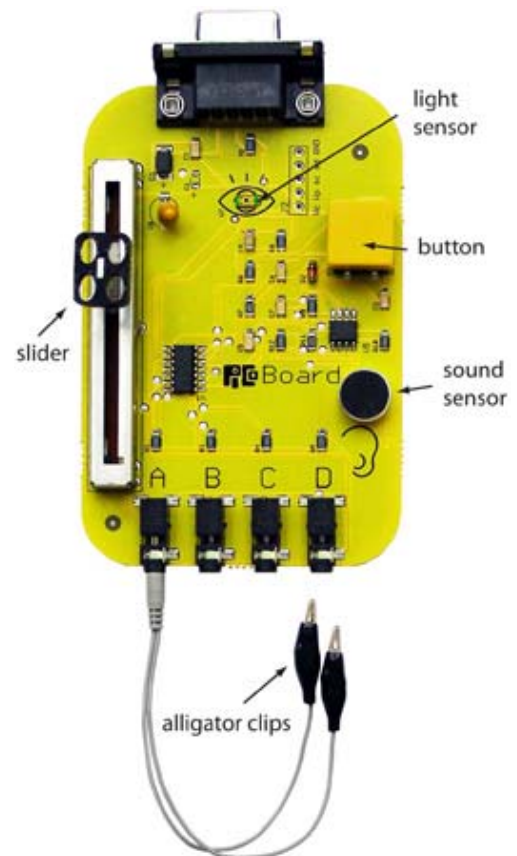# Problem Set 0: Scratch

due by 7:00 P.M. on Friday, 26 September 2008,
per the directions at this document's end

**Goals.**

- Introduce some fundamental programming constructs.
- Empower you to implement your own animation, game, or interactive art.
- Impress your friends.

**diff pset0.pdf hacker0.pdf.**

- Hacker Edition requires integration with a Scratch Board (aka PicoBoard).

**Getting Started.**

0.      O hai!

Print out and fill out the form at this document's end.  Bring the completed form to office hours, a schedule for which appears on the course's website, and hand the form to a member of the staff in exchange for a Scratch Board (aka PicoBoard) plus accessories.[1]  Alternatively, email loans@cs50.net to set up, if possible, an alternative day and time for pickup!

If you have a roommate or neighbor who also plans to tackle this Hacker Edition, allow us to suggest that you consider sharing a Scratch Board, borrowing it under just one of your name, so that we have more to to around!  Just realize that you'll each need to build your own projects.

1.      Obtain an FAS (Faculty of Arts and Sciences) Computer Account, if you haven't one already, by visiting the URL below and following the on-screen instructions.

https://www.fas.harvard.edu/fasit/utilities/activate-pin/

Not only will this account will provide you with access to FAS's computer facilities, it will also provide you with an email address of the form username@fas.harvard.edu, where username is your FAS username.  Additionally, this account will allow you to access via SFTP and SSH nice.fas.harvard.edu, FAS's New Linux Computing Environment, use of which may be required by some problem sets.  SFTP and SSH clients are available for various platforms via the course's website.  Usage thereof will be taught in section and office hours.

**Itching to Program?**

2.      Surf on over to the URL below and sign up for an account on MIT's website.

http://scratch.mit.edu/signup

Any username (that's available) is fine, but take care to remember it and your choice of password.

3.      Then head to the URL below and take note of the resources available to you before you dive into Scratch itself.

http://scratch.wik.is/Support

Of particular help may be the links to **Getting Started**, **Videos, Reference Guide**, **Scratch Cards**, **Sensor Boards**, and **Help Screens**.

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[1] Note that Scratch Boards, manufactured by MIT, and PicoBoards, manufactured by PICO, are functionally identical but look slightly different.  In particular, they have different logos, and PicoBoards have little handles on their sliders.  We bought some of each; it doesn't matter which one you borrow!

You might also want to skim the tutorial below, which presents Scratch in terms a (soon-to-be) programmer should understand.

http://www.eecs.harvard.edu/~malan/scratch/

4.    If not already installed on the computer you're using, download Scratch itself via the URL below.[2]

http://scratch.mit.edu/download

Take care to download version 1.3.  Once downloaded, install the software by double-clicking its icon and/or following any on-screen directions.

Then download a driver for your Scratch Board from the URL below, taking care to follow the page's directions carefully.

http://www.picocricket.com/picoboardsetup.html

If you happen to be running 64-bit Windows XP or 64-bit Windows Vista, note that you might need to procure your own serial-to-USB cable for which there exist 64-bit drivers or your own RS-232 cable.[3]

5.    Head to

http://cs50.net/lectures/

and follow Week 0's link to **IceMonkey** by David Wu '11.  You should find yourself at MIT's website with David's project (screenshot below) embedded in your browser.



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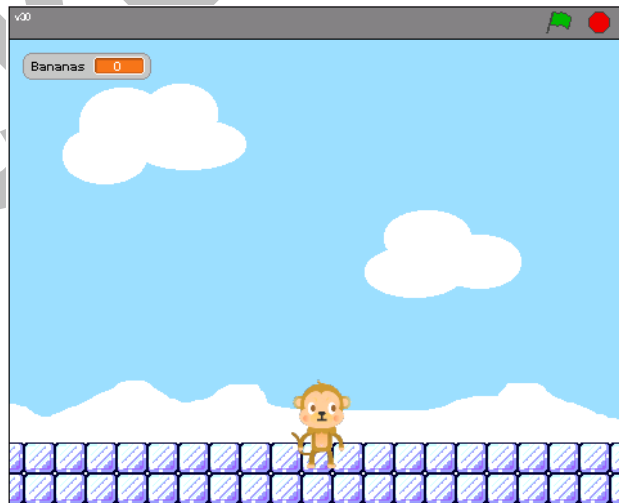
[2] Students running an operating system other than a supported version of Mac OS or Windows should please find a computer with a supported operating system to use for this problem set (*e.g.*, in the Science Center, a house's lab, or a friend's room).
[3] Odds are you're not running 64-bit Windows XP or 64-bit Windows Vista.  But if you are, you probably know it.

If you do not see David's project, you may need to download and install a "Java Runtime Environment" (aka "Java Virtual Machine" or "JVM"). To do so, follow the link to **Java** at http://cs50.net/software/, follow any on-screen instructions, then return to MIT's website.

Note, though, that you can't actually play David's project within your browser because it requires a Scratch Board. Go ahead, then, and download the project's "source code" (*i.e.*, its .sb file). Click the link labeled **davidwu** in the page's top-right corner, just below **Download this project!** If told by a pop-up to log in, click the link labeled **Login** toward the page's top-left corner and log in with the username and password that you created earlier for MIT's website, then click **davidwu** again. If prompted to open or save the file (called davidwu.sb), go ahead and save it to your desktop so that it's easy to find.

Then launch the non-browser version of Scratch (*i.e.*, the one you downloaded and installed earlier) by clicking its own icon on your desktop, in your Applications folder, or wherever you installed it. Click **Open** toward Scratch's top-left corner, and navigate your way to David's project, wherever it ended up on your hard drive.

Once David's project has loaded, click Scratch's green flag! Move your Scratch Board's slider back and forth and see if the monkey responds. If not, wait a few seconds (albeit at the risk of being stunned) while Scratch scans your computer for a Scratch Board. If the monkey remains unresponsive (when not stunned) or you get tired of waiting, click **Sensing** toward Scratch's top-left corner, then right-click (on a PC) or ctrl-click (on a Mac) the block labeled **sensor value** or the block labeled **sensor** toward Scratch's bottom-left corner, then select **show ScratchBoard watcher** in the contextual menu that appears. A diagnostic window should appear that you can drag anywhere on Scratch's stage. If it reports that that your Scratch Board is **Off** or if all sensor values appear to be 0, right-click (on a PC) or ctrl-click (on a Mac) anywhere on the watcher and select **select serial/USB port** in the contextual menu that appears. You should then see a list of available COM ports (on a PC) or available device files (on a Mac). You can either try all possible options, testing each one to see if it works, or look for clues as to which one is right.

For clues on a PC, right-click **My Computer**, select properties, then pull up your computer's Device Manager. Expand the **Ports (COM and LPT)** subtree, if not expanded already, and look for a **Prolific USB-to-Serial Comm Port**. Ideally, the device's COM port should appear in parentheses. If not, right-click the entry, select **Properties** from the contextual menu that appears, and poke around the tabs in the window that then appears.

For clues on a Mac, select **About This Mac** from your Apple menu and click **More Info...** to pull up your computer's **System Profiler**. Expand the **Hardware** subtree, if not expanded already, click **USB**, and look for a **USB-Serial Controller**. That won't reveal the name of its device file, but its presence or absence should confirm or deny that your Scratch Board (or, at least, your serial-to-USB cable) has been detected.

If none of those tips get you on your way, also check out pages 8 and 9 of PICO's own documentation at the URL below.

http://www.picocricket.com/pdfs/Getting_Started_With_PicoBoards.pdf

If you're still stuck, go ahead and email help@cs50.net describing your problem in detail. In particular, tell us what OS you're using, whether you have a Scratch Board or PicoBoard, and what you've tried already.

Once you do get your Scratch Board up and running, see how many bananas you can catch! Actually, call a roommate over to your computer, and see how many he or she can!

6. Read up on what you can do with your Scratch Board by skimming PICO's documentation at the URL below.

   http://www.picocricket.com/pdfs/Getting_Started_With_PicoBoards.pdf

   If you'd like to see some additional projects that utilize Scratch Boards, check out the galleries at the URLs below.

   http://scratch.mit.edu/galleries/view/21836
   http://scratch.mit.edu/galleries/view/5630

7. Now your own adventure begins. Your task for this problem is, quite simply, to have fun with Scratch and implement a project of your choice (be it an animation, a game, interactive art, or anything else), subject only to the following requirements.

   i.    Your project's filename must be username.sb, where username is your FAS (not MIT) username in all lowercase.
   ii.   Your project must have at least two sprites, at least one of which must resemble something other than a cat.
   iii.  Your project must have at least three scripts total (*i.e.*, not necessarily three per sprite).
   iv.   Your project must use at least one condition, one loop, and one variable.
   v.    Your project must use at least one sound.
   vi.   Your project should be more complex than most of those demonstrated in lecture (many of which, though instructive, were quite short). In fact, it should probably be about as complex as, say, IceMonkey, Oscartime, or Raining Men (all of which were made by staff). Better yet, outdo us!
   vii.  Your project must use a Scratch Board for some form(s) of input.

   Feel free to peruse additional projects online or those that come with Scratch for inspiration, but your own project should not be terribly similar to any of them. Try to think of an idea on your own, and then set out to implement it. If, along the way, you find it too difficult to implement some feature, try not to fret; alter your design or work around the problem. If you set out to implement an idea that you find fun, you should not find it hard to satisfy this problem set's requirements. If you suspect your program might fall short of our expectations, feel free to ask a member of the staff for an opinion prior to submitting.

Alright, off you go.  Make us proud!

If you have questions or want a hand making your project even better, do take advantage of office hours, the schedule for which can be found at http://cs50.net/ohs/.   Alternatively, drop us a note at help@cs50.net.

8.      Once finished with your project, upload it to your account on MIT's server by clicking the **Share!** button toward the top of Scratch's window.   Provide "your Scratch website login name" (*i.e.*, username) and password that you chose earlier, along with a name for your project and some notes (*e.g.*, some instructions or a description).   Then click the **OK** button.  Assuming you're informed that "Your project is now online at scratch.mit.edu," head on over to the URL below.[4]

   http://scratch.mit.edu/login

   Log in (if you aren't still logged in) with your username and password.  Once logged in, click **my stuff** toward the page's top-right corner.  You should see the project you just uploaded among **My Projects**.  Go ahead and click its name or icon.  Your project should be embedded (and start playing) in the window that appears.  Take note of the URL in your browser's address bar.  That's your project's URL on MIT's website, and you'll need to know it later.

9.      When done admiring your work, head on over to the URL below.

   http://cs50.net/galleries/2008/fall/scratch/

   Make sure that you're still logged into MIT's website.  (If you see "Welcome" followed by your username atop the page, you are.)  If not, click **Login** to log in again.

   Toward the page's right-hand side, click **add my projects**.  In the window that appears, click your own project's name, wait for a checkmark to appear to in the box to the left of it, then click **Accept**.  If you return to the URL above, you should find that your project has been added to the course's Fall 2008 gallery for others to enjoy.  If not, try once more or contact the staff for assistance.

   If you really, really don't want your work included in the course's gallery, you may opt out of this particular step.  But you must still upload your project to MIT's server (by clicking **Share!**), per the previous step.  And you must still "submit" your project to us, per the next step.

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[4] If informed that your project is  larger than 10 MB (and thus too large to be uploaded), try to decrease its size by clicking **Extras** atop Scratch's window followed by **compress sounds** and/or **compress images**.  You may need to experiment with different levels of compression in order to get your project below 10 MB.

10. When you're ready to "submit" your project to us, surf on over to the URL below to answer some questions.

    http://cs50.net/surveys/psets/0/

    Be extra-sure that your FAS username and your project's URL are correct, else we may overlook your submission!  Then click **Done** to "submit" this, your first CS 50 problem set.

11. kthxbai

# Consent to Borrow

I affirm that I have borrowed the following items from Computer Science 50:

- 1 Scratch Board (aka PicoBoard)
- 4 alligator clips
- 1 serial-to-USB adapter cable

I agree to notify help@cs50.net within 24 hours of signing this document if I find any of the borrowed hardware to be damaged or defective. I agree that, after 24 hours, I will be held fully responsible for the condition of this hardware.

I agree to return all of the above hardware to Computer Science 50 within 7 days of Problem Set 0's deadline in a sealed plastic bag that also contains a slip of paper on which I will have printed my first and last name, my 8-digit Harvard ID number, and my FAS username. If I fail to return on time all of the above hardware as prescribed herein in working condition or if any of the hardware I return appears to be damaged, I agree to allow SEAS Accounting to add a charge of $65.00 to my term bill.

I understand that signing this Consent to Borrow is not a requirement for participating in Computer Science 50. I acknowledge that I have signed this release voluntarily as an instrument under seal on

_____  _____ , _____ .

month                                      day                    year


_____

Printed First and Last Name


_____

Signature


___  ___  ___  ___  ___  ___  ___  ___

8-Digit Harvard ID Number


_____

FAS Username