

Lab Assignment 2: Hapkit Handle 3D Printing

In this week's lab assignment, you will 3D print the handle of a Hapkit – your personal, one-degree-of-freedom kinesthetic haptic interface. You'll get the rest of the Hapkit parts for Lab 3. You can keep the Hapkit after the course, although you may wind up modifying or deconstructing it to use the parts in your course project.

We will give you all the Hapkit components except the handle that you will 3D print, and you will use the instructions to be provided to assemble it. (You will show your assembled Hapkit to Allison for check-off next week.)

In class today, we will discuss the 3D printing process and how you can personalize your handle design before printing. For the next week, a Makerbot 3D printer will be available in the lab for you to print your Hapkit Handle. **Sign up for a print time (on the google doc linked below).** Note that it takes up to **1.5 hours** to print your handle. Stay in the lab while your part is printing, to ensure that you can stop the print job if something goes wrong. (Alert Allison by email right away if it does!)

The deliverable for this lab is a personalized, 3D printed Hapkit handle, which you must bring to class on Tuesday, Oct. 10.

HAPKIT HANDLE PERSONALIZATION

In class, we will show you how to use Solidworks to modify the Hapkit handle shape and add your name or other text/drawing to the surface.

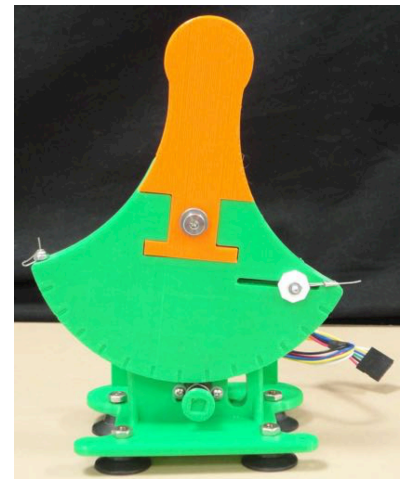
You can download the original Solidworks file here: <https://goo.gl/WDJMyU>.
You can download the STL (3D printer) file here: <https://goo.gl/gKy3Vm>.

To download Solidworks onto your own laptop, go to the Terman Engineering Library and ask for the "Solidworks 2017-2018 Installation Thumb Drive". You can also use Solidworks on the cluster computers at the Terman Library. (See <https://library.stanford.edu/englib/technology/software> for details about both installation and using the cluster computers.)

3D PRINTER RESERVATIONS

Sign up for a 3D printing time slot on this google sheet: <https://goo.gl/7t6B8R>. Make sure you sign up for a time *after* you will have completed creating your personalized Hapkit handle.

The sign-up times avoid periods when there are other classes in the room and try to keep reasonable hours in case the printer is not working and you need to contact the instructors.



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HAPKIT 3D PRINTING INSTRUCTIONS

- Log in to the laptop with the password “Feedback01”
- Add your customized Hapkit handle print file to on the desktop folder named “ME 20N”
- Open the Makerbot Print software from the desktop shortcut, if it is not already open. The computer is a little slow and the software will take ~2 min to open, please be patient.
- Start a new project (CTRL + SHIFT + N). If a warning sign appears that you have an unsaved project, confirm that you want to start a new project regardless.
- Open your customized handle print file (CTRL + O) and rotate so the correct face is contacting the build plate. It is important that the flat face is contacting the build plate.
- Click “print” on the bottom right corner. A screen will appear with a loading bar that will give you an estimate of how long your print should take. A handle should take about 1 hour and 20 min to print.
- If there is some filament hanging out of the extruder before your print, do not worry about it. You do not have to remove it; it will eventually fall off on its own when the filament is being heated.
- The print should start. Stay with the machine during printing! Watch your print and if you have any questions or concerns, please don’t hesitate to contact the teaching staff.
- If the laptop pops up any warnings or updates (not having to do with the Makerbot Print software), just close these pop-ups.
- If something goes wrong, click on the “Knob” button and cancel the print. What could go wrong? For example, the filament may not extrude because the build plate is too close to the extruder or there is a clog in the extruder. If this happens, email aokamura@stanford.edu immediately, so we can arrange for it to be fixed. Also, leave a note on the Makerbot build plate so the next student knows that it cannot be used. If we have downtime for repairs, we will add print sessions to the schedule as needed.
- When the part is finished printing, it will be hard to remove it from the build plate. You can use a flathead screwdriver/fingernails to carefully pry off the part, but be careful not to damage the build plate (and more careful not to damage your own part). Please try to not put too much force on the build plate, to remove a part it is more about wedging a flat screwdriver under the print, rather than prying it with strength.
- The parts print with a raft, which is the thin layer of disposable material upon which your part is printed. Remove the rafts with your fingernails or screwdriver.

Note: It is very important that you do not shut down the Makerbot, especially if it is hot. And as a courtesy to the next student, please do not shut down the laptop either. Of course if there is a connectivity issue between the Makerbot and the computer and you cannot print, restarting the computer will fix it.