NextEngine 3d Scanner Guide:

To get the software from NextEngine’s website:
http://www.shapetools.com/start

Here is your personal account info (you'll need this to sign in):

Account: ianroy@brandeis.edu
Password: red351

Contents:
(add in later)

1. First steps
   a. The program that Nextengine scanner uses is called ScanStudio HD and is located on the desktop.

   b. Before opening ScanStudio HD make sure that the scanner is connected to the computer.

   c. On first opening the program, the following screen will appear:
To start using the scanner hit the Scan button in the upper left hand corner.

2. Will it scan?
   a. Before starting your scan you have to make sure that your object will actually be able to be scanned. Make sure that the object you have meets the following criteria.
   b. **Size**: If the object does not fit in the preview of the scan it won’t create a scan that is usable. Always try to have an object that fits well within the preview. A good guideline for the size of scanable objects is anything with a diameter of 3 inches or less and a height of 4.5 inches or less (as shown later).
   c. **Symmetry**: Does the object possess any planes symmetry? The more symmetrical an object, the easier the scanning process will be.
   d. **Material**: Take a look at the object you want to scan, is the material is reflective or shiny? If so you have will to coat the object using the brush including in the scanning box at the workstation (this procedure will be detailed later in the guide). **DO NOT SCAN 3D PRINTED OBJECTS**. 3d printed object do not scan well due to the layers created by 3d printing and anything that is printed has come from a source file making any scan of a printed object redundant. Instead of trying to scan a 3d printed object to make a copy just print using the original file.

3. Scanning Prep:
   a. The platform that the scanner uses to position and work on objects comes with two attachments, a smaller pedestal that work great for smaller objects:
And a larger, more adjustable rod that works well for larger scans.

b. For the rubber duck that we are using in this guide, the smaller pedestal would be more appropriate due to the size of the duck. You can attach the smaller pedestal by screwing clockwise into the central hole in the platform with the scanner unplugged.

c. In order to make sure that the duck will stay stationary on the platform during the scan, the adhesive pads in 3d scanner supply box should be mounted on the pedestal like so.
Make sure to clean the platform that the adhesive will be put on with an alcohol prep wipe to clean off any residue that may be left from the scanner.
d. Next, place the object on the platform making sure to try and center it as much as possible. The better centered on the platform the object to be scanned is, the easier the editing of the scan will be later on. Once you have your object centered, remove the green covering on the adhesive and adhere it to the platform. Here is an example of what I would consider good object placement.
4. The Scanning interface:
   a. Upon hitting the start scan button you will be brought to the following screen, which allows for control over the scan settings and a preview of what you will be scanning (in this case a small rubber duck will be used).

   ![Image of Scanning interface with rubber duck]

   b. Interface overview:
      i. The Model input allows for you to choose the name of the model.
      ii. The turn command controls the X plane rotation of the platform. You should fully rotate the platform at least once to make sure that your object stays in the scanning zone at every angle.
      iii. The Tilt command controls the Y plane rotation of the platform. You can use play with this to find a good tilt to scan the object at.
      iv. The monochromatic image to the right off all of the controls is the preview of the scan zone. You should click and drag in this window to create a box around the object that you're scanning. This box is the area in which the scanner will focus on so it's very important that the Tbox that you create is around the object at all angles, not just the initial position.
      v. The Positioning setting allows for you change the to options of how many sections of the object will be scanned. Leave this at the default (360) to scan the entirety of the object.
vi. The Division slider allows you to choose the amount of sections of that the scan will be split into. Increasing this amount increases the scan time, accuracy of the shape of the object, and the editing time after the scan is complete. I find that a good general setting to use is 8-10 for most objects. If an object is very symmetrical (ie a sphere or cylinder) you can reduce the divisions to slightly, but never do a full scan with less than 6 divisions. If the object is very complex and possesses poor symmetry, you should increase the divisions slightly.

vii. The Start slider controls the x plane rotation start point. In general you shouldn’t have to adjust this for your scan unless the larger adjustable rod is in the way of the initial scan.

viii. The Tilt slider controls the y plane rotation of the scan platform. You should set this at value between 5 and 15 in order to capture the structure on the top of the object while still being able to details on the bottom of the scanner.

ix. The Points/IN.² slider controls the amount of points that laser scans per square inch on the object. In other word this controls the how detailed each scan of the object will be. Moving the slider to the right will increase the detail of the scan, but also increase the time and memory required to perform the scan. I find that the standard setting works fine but you might want to either increase or decrease this value based on the level of detail that you want.

x. The Target option controls the color hue that scanner will target. You should set this based on the primary color of the object. For the pink duck that I’ve been using as the example I used the Neutral setting.

xi. The range option can’t be change currently on the scanner, so that will remain by default at macro.

xii. The Time and Memory meters give an estimate of the memory and the time that the scan will take. These are automatically adjusted based upon the other setting that you can control.

c. Once you’re satisfied that the setting are all in order hit the start button to start your scan. It should take about the estimated time given in the preview plane. If done correctly then scanner will first calibrate and then scan each division.

d. After the scan finishes you’ll be left with a 3d model that will probably look very rough. Don’t worry, this can all be fixed with editing in ScanStudio HD. Here’s
what the original scan of the duck looked like.
5. Editing: Trimming and Alignment
   a. Object manipulation:
      i. Zoom: Scroll
      ii. Rotate: Middle mouse button
      iii. Pan: left and right mouse buttons together
   b. The Thumbnail Bar:
      i. The bar at the bottom of the ScanStudio HD is the representation of all of the different scans that the scanner has taken in the current project.

      ![Thumbnail Bar](image1.png)

      ii. Double clicking on this one scan will then take you into the sub folder consisting of all of the different scans for the project. Any scans in the green section of the tool bar will automatically be combined into one model while any scans without the green background will stay separate. The highlighted scan is the current scan that you are manipulating.

      ![Highlighted Scan](image2.png)

      iii. In order to edit components individually, you have to drag them out of the green portion of the thumbnail preview page so they are not rendered together. You can either do this by have or simply right click on the green area and hit detach. After doing this you’re screen should now be showing
you each separate scan of the duck, which will look like this:

c. Trimming:
   i. Before aligning all of the individual scans to put together, it's a good idea to trim off anything that you did not mean to scan from that model. A good example of this is the part of the pedestal that scanned in the model above.
   ii. To begin trimming a scan select the Trim tool from the upper toolbar. Doing so will make a backup copy of the model and then bring into the
iii. You should either select the circle or square selector to use and make sure that the plus button is selected to allow you to highlight parts of the model. You should then highlight the parts that you want to trim using the circle. Any highlighted part will appear in red. If you accidently highlight something that you didn’t mean to, simply select the minus button and
deselect the parts that you do not want to be trimmed.
iv. After you have everything that you want to trim highlighted, hit the trim button to remove them.

v. You should repeat this for every division of the scan that needs trimming. For the pink duck, I ended up with individual divisions that looked like this:
6. **Alignment**

a. To begin object alignment, click on the alignment button located on the top toolbar. This will bring you into the alignment interface.

b. **Alignment interface**
   
i. The alignment interface splits the preview of the object into two views; one for both each of the two divisions that you are aligning.
   
ii. The left view is always the current division in the green section of the thumbnail toolbar.
   
iii. The right view is the division that you are currently aligning for attachment to the combined model in the green section.
   
iv. The red dot in the upper right hand is the pin source for the alignment.

c. To begin alignment, make sure that the two divisions that you are aligning are from adjacent division (ie A1 and A2 as shown in the interface).

d. First, you should locate a common point shared between the two divisions. Once you've identified a point, drag the pin to that point on left view of the model. Scanstudio HD will automatically zoom into the point at which the pin was placed. A different color pin will automatically appear at the pin source for the next
e. Next, repeat the same pin placement for the division in the right window (dragging the red pin from the source in the right viewer). Make sure that you have the two pins as close to being in the same spot as possible.

f. You should then repeat this process for two additional points. Try to put the pins far apart from each other in order to get a more accurate alignment.
Once you are satisfied with the placement of the three pins, drag the preview of the model on the right into the green section of the thumbnail preview to show the two newly aligned divisions. The next division should automatically be selected in...
the viewer on the right.

h. Repeat steps c-g for the remaining divisions. After doing this you should end up with a properly aligned model.

i. Hit the align button to finalize the alignment
7. **Polishing**

a. The polishing button consists of three main tools:

b. **Fill**
   i. (demonstrate later, no holes in duck)

c. **Buff**
   i. In general, the buff tool should be used to try and create a flat surface for the object to print on. Using the selection tool to select the base of the model and highlight it like so.
ii. Next click on the buff button and make sure to use the following setting to make the base as flat as possible (this will make it print more easily).

![Buff Settings](image)

- **Buff Weight**
  - Less Smooth
  - More Smooth
  - 0.25
  - 0.5
  - 0.75
  - 1.0
- **Deviation Tolerance (inches)**: 0
- **Max Iterations**: 10
- **Smooth Boundaries**: checked
- **Preserve Sharp Edges**: unchecked

![Buff button](image)

iii. Hit buff to smooth the bottom of the model.

**d. Simplify**

i. This tool is used for the same reason as the buff tool; to create a smooth base to print. Just highlight the base like you did with the Buff tool.
ii. Then hit simplify to finish the model.

8. Export to .STL
   a. To begin the export process click on the export button from the toolbar. You’ll be brought to these options.

   b. Click on STL and choose a filename and location. Make sure that you keep the units in millimeters and have both the “save finished scans only” and “save as a
c. Hit save and you’ll be brought to the following menu

STL Format Selection

Format

- Binary
- Ascii

[OK]

d. Select Binary and hit OK. Your finished file will be exported to wherever you specified (in this case the desktop).