TreeSoft Topo

Topo was written by Paul Rowntree, who retains all copyright control over the program and its sources. Although Rowntree believes it works well, no guarantees are given for its use in any application.

Change Log

January 28 2013	- Squashed Bugs in Long/Lat display, cleaned code - Added exact long/lat entry for selection of map area
January 2013	- Increased capacity for SRTM-1 files for USA maps - Fixed inverted normal bug - Improved visibility of outline box - Added status bar to show long/lat coordinates of mouse
June 2011	- Binary STL version support added
January 2011	- Original version written for SRTM-3 files, debugged

Disclaimer

By downloading, installing and using this program you are accepting full responsibility for any and all consequences. CNC machinery is potentially dangerous, and the user is 100% responsible for ensuring that the output of **Topo** is safe to use on any CNC equipment, and that it will have the desired effects.

As always with CNC equipment, think many times before running code, and doing air cuts is often a good idea with new files. In Mach3, verify the Z limits of the loaded files before cutting to ensure that you are not going to destroy your table top, or spindle, or both.

Play safely.

What is Topo ?

Topo is a simple program that reads binary elevation data and outputs a standard STL file for use in CNC applications. The data was measured by the SRTM shuttle mission STS-99 in 2000. Most of the data is for the N60-S60 latitudes. The US government provides the high resolution SRTM-1 data for the US territories, and lower resolution SRTM-3 data for the entire world (Thank you!). 'High resolution' means ~30 m per pixel, and 'Lower resolution' means ~90 m per pixel. The elevation resolution is 1m in all files. There are also SRTM-30 data available, but **Topo** will not read these correctly.

These data files are available for free download from **http://dds.cr.usgs.gov/srtm/version2_1/**

Topo gives a visual map in false colours, and lets the user select a rectangular region for output in STL format. Mouse positions over the image are mapped to the exact longitude, latitude and elevation of the SRTM data file. You select the dimensions of the output file, offsets for the X,Y and Z coordinates, and **Topo** makes the STL file in either ASCII or binary formats.

TreeSoft Topo

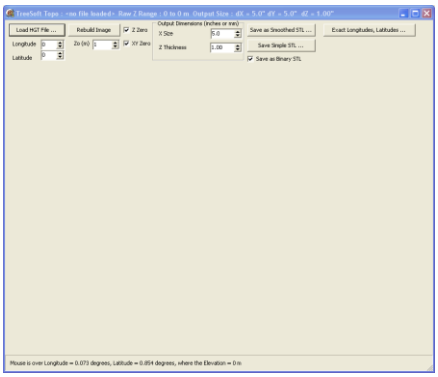
Topo is available for free download from PaulRowntree.weebly.com, and may be used for any personal and commercial applications. If you feel that the program is worthy of your support, donations from the web site will be gratefully accepted. These donations also demonstrate community interest, and encourage further developments and updates. Donations of $25 or more will remove the NagScreen, and you will be informed directly of updates.

Using Topo

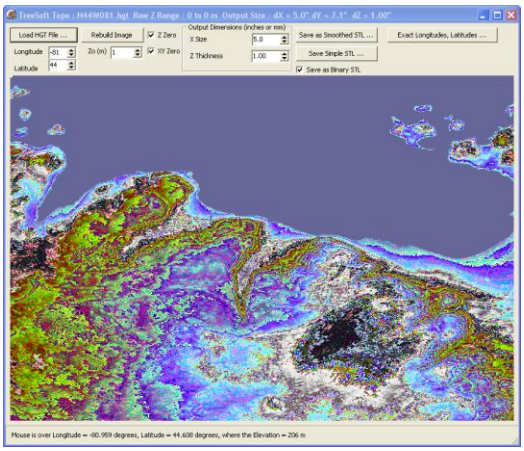
The **Topo** download package includes the Windows executable file (Topo.exe), this 'Manual', and some raw data files to get started with. All files are contained in a standard ZIP file, which can be extracted into the directory of your choice using 7-ZIP, a free decompression program. Please do a virus scan on the downloaded ZIP file and the unzipped contents before running **Topo**. There is no installation per se, and when you are done with the program you can simply delete the files. There are no Windows registry entries to worry about.

I suggest that you create directories SRTM_1 and SRTM_3 within the directory that you use for **Topo**. The companion program **BigTopo** (available soon) looks for files there, so you might as well do that now.

When ready to go, run the Topo.exe, and after the nag screen you should see a screen that looks like this.

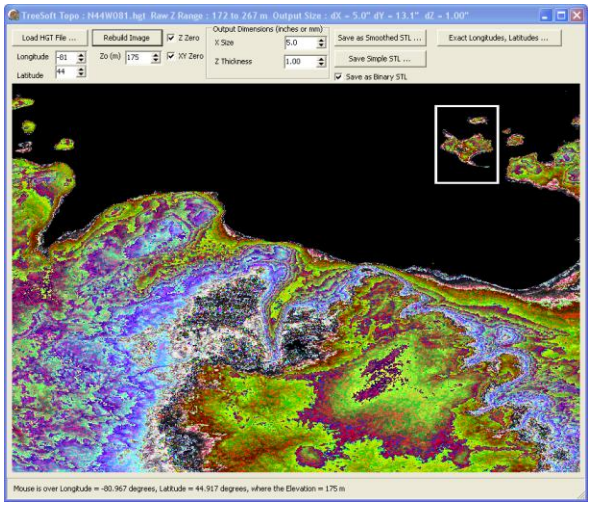


Press the 'Load HGT file …', and select a previously downloaded data file from the NASA and JPL sites. In this example, the file is for the Georgian Bay area of Ontario. The maps are labeled by the Latitude and Longitude of the lower left corner of the map region, and they are always in 1 degree increments. The zone of interest here starts at N44, W81, so the file has N44W81.hgt in its title. When you load it up, it looks like this. The exact colours may not be the same due to graphic hardware differences.



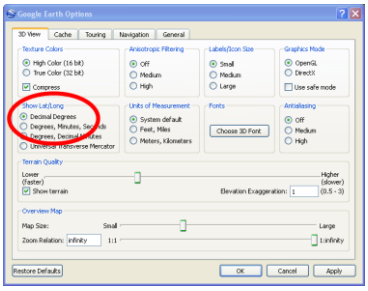
This is a good time to type in the longitude and latitude information in the two edit fields just below the 'Load HGT File …' button. This is important because it allows **Topo** to convert mouse coordinates to geographical coordinates (which are display below the image) and because it tells **Topo** how to distort the data to account for the earth's curvature as the latitude changes (the files are all 1 degree x 1 degree, but the East-West distance for each degree depends on the latitude). **Topo's** output STL files are all corrected for this effect.

Topo maps elevations to colours. The big, monotonic area is obviously the Bay area, and has a constant elevation of ~175 m above sea level. You probably want to consider this as the Z=0 for the output STL files, so type 175 into the edit field under the Rebuild Image button, and then press Rebuild to regenerate the image. Now the water is shown as pure black. The area I want to work up is Christian Island, in the upper right corner. To select this region, shift+left-click the mouse below and to the right of the island, then left-click above and to the left. A white frame will surround the region selected. The exact mouse coordinates of the moving mouse are seen below the image. 0.001 degrees corresponds to about 100m, which is about 1 pixel in my SRTM data set for Canada. You can keep adjusting this region until it matches the area you want. You can also expand the program window to get a better view.



NEW : Although it is easy to use the mouse to select coordinates for easy regions like this, inland zones without obvious features are more of a bother. For these cases, press

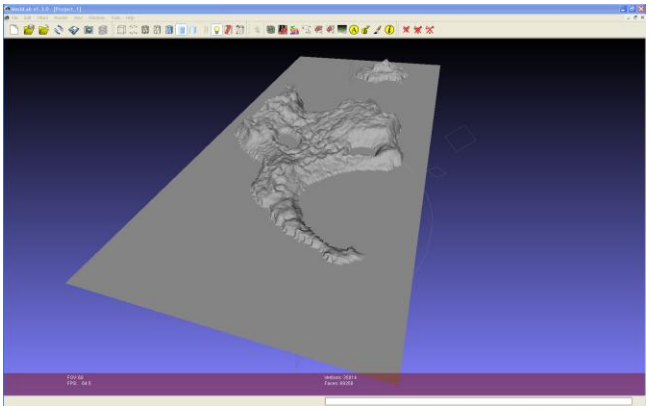
the 'Exact Longitudes, latitudes …' button, and you will see a dialog-type window appear in which you can enter precise coordinates. The best way to get these coordinates is to use a mapping program; I use Google Earth, and they show up at the bottom of the screen. You must use decimal degree format in Google Earth : go to Tools → Options, and select it from the dialog box.



Choose the X and Z dimensions of the STL file, either in inches or mm. This information changes the values saved to the file, but STL files do not contain scaling information or units, so these numbers are a bit arbitrary. **Topo** will calculate the correct Y dimension to maintain the correct proportions of the output file. Most CNC programs need to be told what units to apply to STL files.

When you are satisfied with everything, check (or uncheck) the Binary selector, then press the 'Save as Smoothed STL …' and **Topo** will request a filename and proceed with creating the STL file. Usually these files will be rather large, so the Binary format is usually the one you want. 'Save Simple STL …' does just about the same thing as 'Save as Smoothed STL …', but with a bit coarser output.

That is about it. I use the shareware MeshLab program to inspect the STL files. It can also filter, smooth, manipulate and convert the STL files into obj, ply (and many other) formats if you wish. The Christian Island file loaded into MeshLab looks like this. It can be rotated, zoomed and inspected in detail.



Tips for Using Topo

As neat as **Topo** is, it is inconvenient for looking at regions that span more than a single file, and you cannot control the size of the output file at all. **BigTopo** is a more sophisticated variant that does all this

and more, and will be bundled in with the **Topo** codes as soon as possible. Perhaps best of all, one Donation applies to both programs!

Noise in the elevation data may be distracting when converted to the 3D format of the STL file. Consider using the smoothing functions of MeshLab. 'Normals Smoothing' is a good first step.

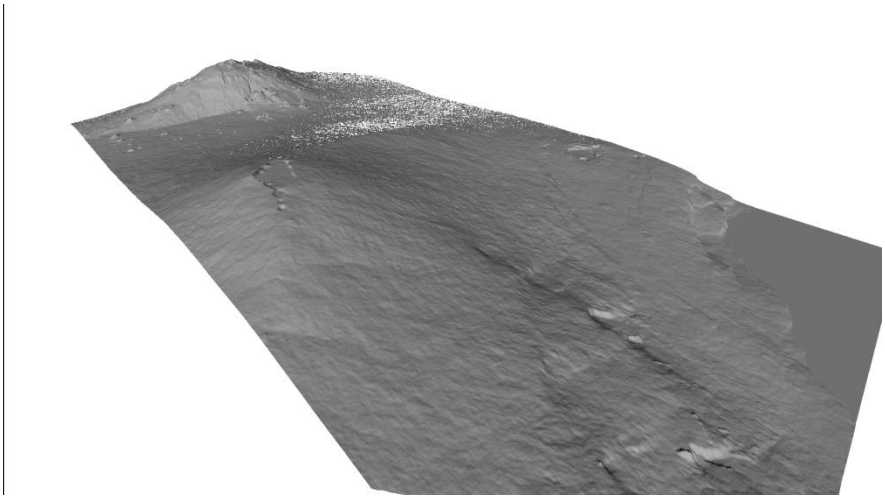
If you use **Topo** to produce something interesting, please consider posting photos on the appropriate Forums, giving appropriate credit. If you have any questions, I am frequently on the Vectric and CNCZone forums as PaulRowntree, or you can reach me via the PaulRowntree.weebly.com website that you downloaded the **Topo** package from. And of course, if you really like this or if it has helped you in a significant manner, please consider supporting **Topo's** continued development.

Cheers!

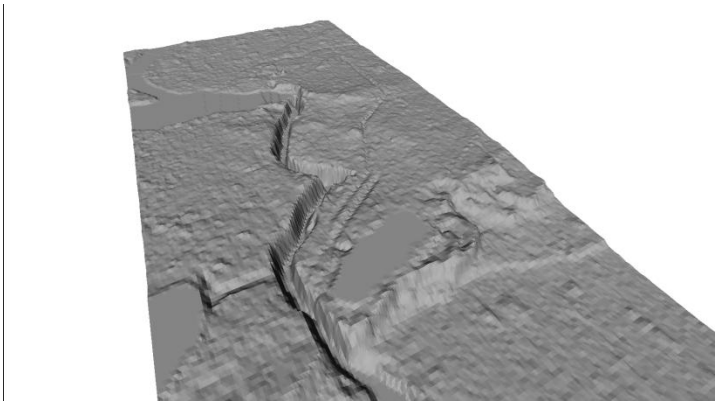
PR

Here are some images of STL files. Taken with MeshLab, no smoothing or edits applied.

Hawaii (N19W156)



Niagara River Gorge and Falls from the Lake Ontario side



Toronto Island and City, Ontario : The waterfront mountains are the tall buildings.