Geography

Mt St Helens 3D Terrain Printing

Using RapMan

BITS FROM BYTES

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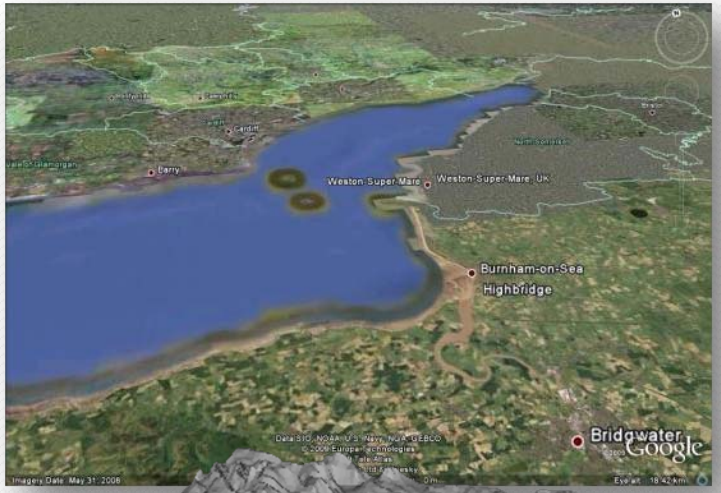
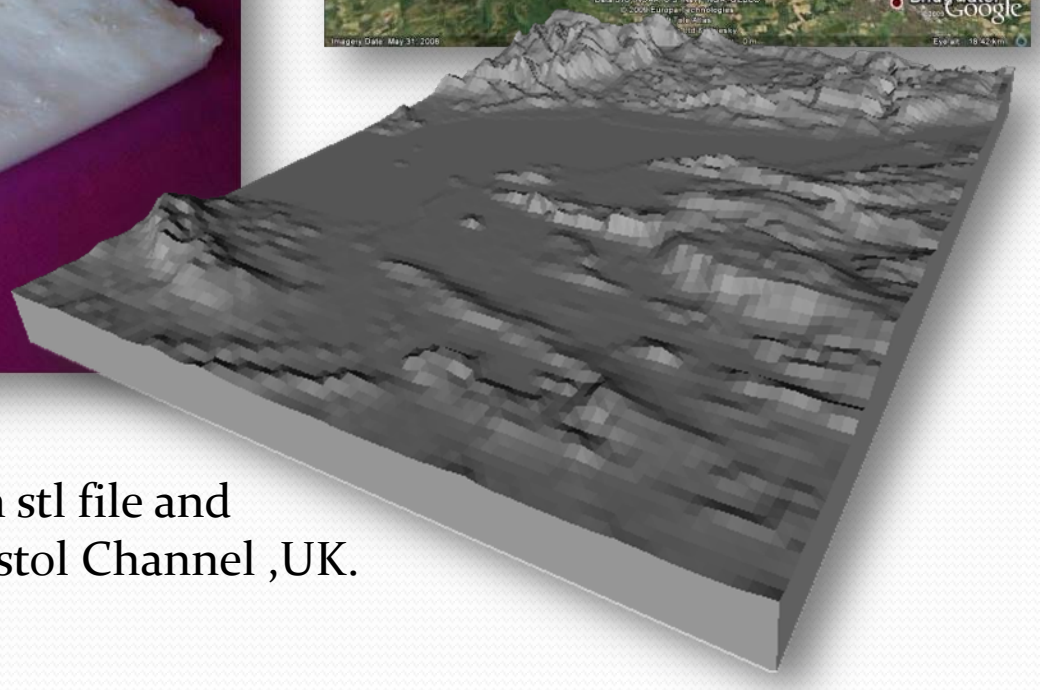
3D Terrain

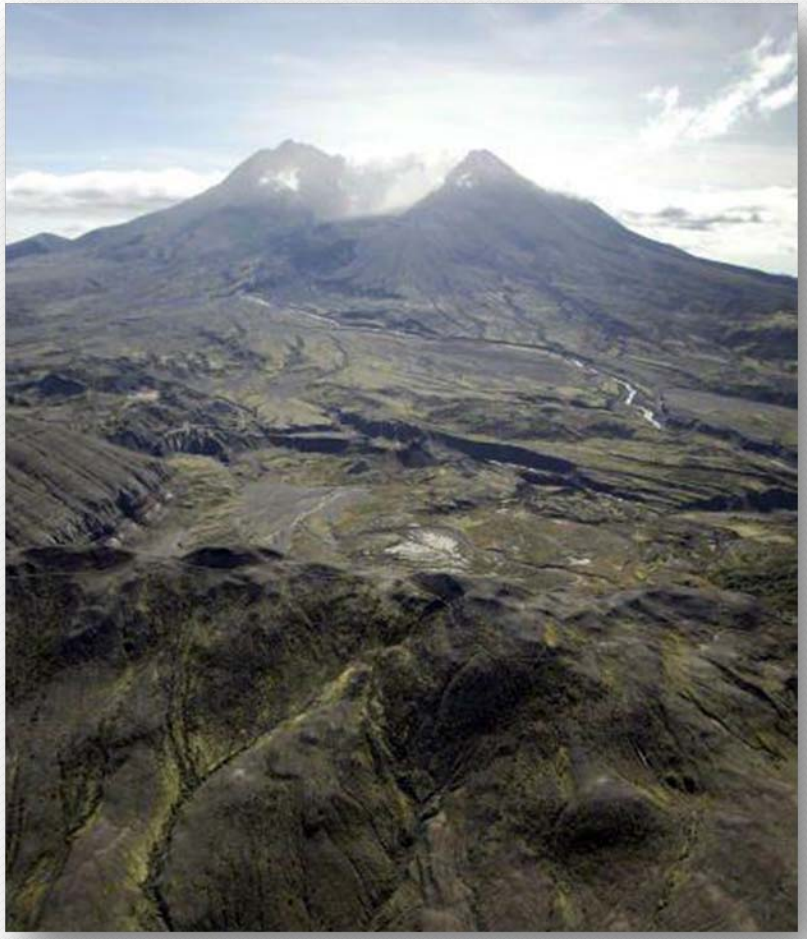




This page shows a 3D print, an stl file and
a Google Earth view of the Bristol Channel ,UK.

Mount Saint Helens

- MOUNT SAINT HELENS NATIONAL MONUMENT.
- In 1980, a huge eruption on Mount Saint Helens blew the top off the volcano and sent volcanic ash around the world. It also produced possibly the largest landslide ever recorded. The eruption wiped out an entire forest, and killed 57 people.



Animated video clip of eruption

Click the picture above to play the video

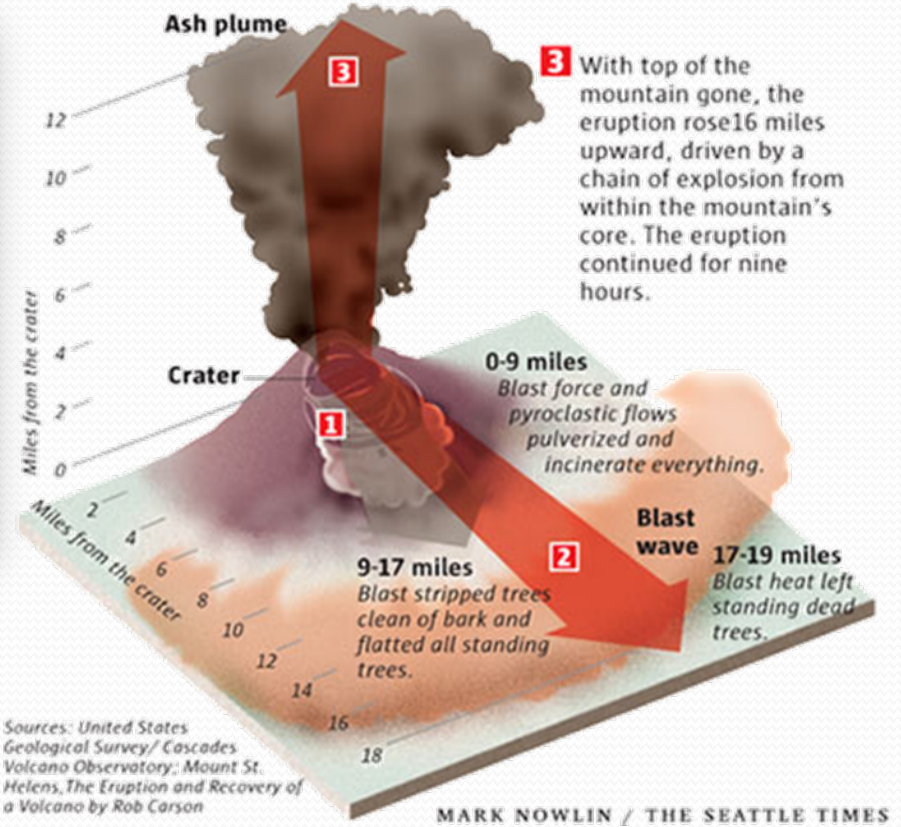
How it happened

May 18th, 1980

At 8:32 a.m. an earthquake signaled the begining of Mount St. Helens' eruption.

1. Magma rising inside the mountain over a period of weeks created a bulge on the northside. At 8:32 a.m., a 5.1 magnitude earthquake broke the bulge loose, causing the northside to dissovle into a massive avalanche.

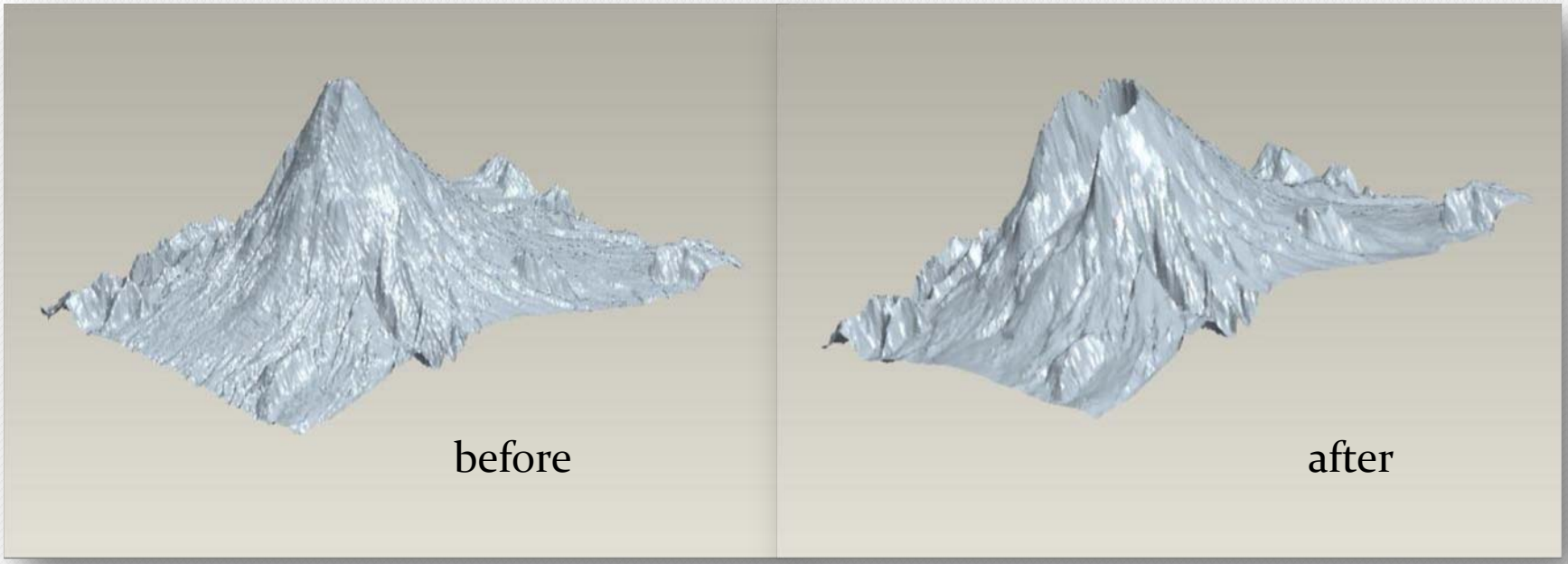
2. The avalanche released built up pressure from magmatic gases, resulting in a northern lateral explosion. The blast created a 17-18 mile fan-shaped path of destruction.



Destruction

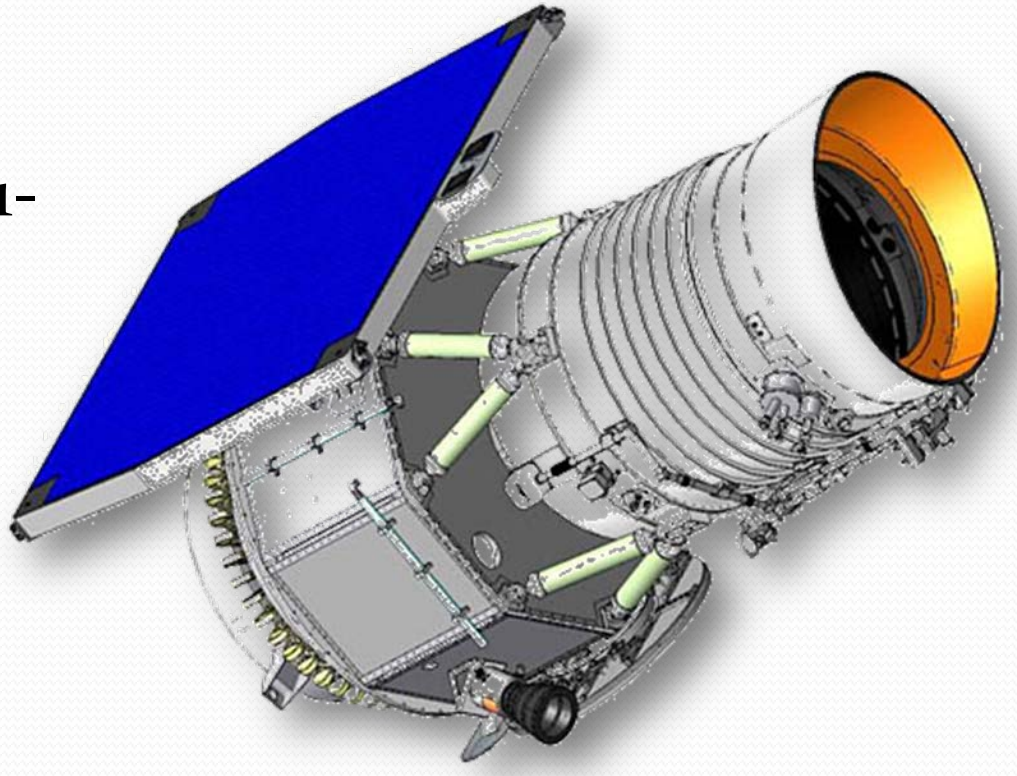
Before and after

Using satellite data from before and after the eruption it is possible to produce 3D models comparing the mountain terrain.



Satellite data

- GeoEye-1, a typical mapping satellite, is capable of shooting 41-centimeter black and white images and 1.65 meter colour images. The measurements refer to the size of the smallest thing that it can see from its orbit 681 kilometres above the Earth's surface.



Getting the data

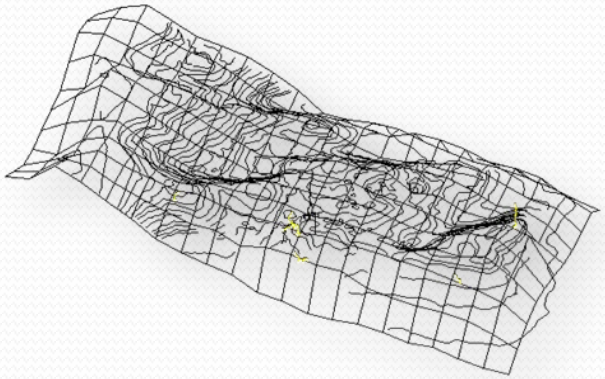
- To start producing the 3D map you need to download a file containing the 3D data. Depending which part of the world you want to cover you may need to search the internet.
- You will need a **digital elevation model** (**DEM**). This is a digital representation of ground surface topography or terrain. It is also widely known as a **digital terrain model** (**DTM**). A DEM can be represented as a raster (a grid of squares) or as a triangular irregular network. DEMs are commonly built using remote sensing techniques, but they may also be built from land surveying. DEMs are used often in geographic information systems, and are the most common basis for digitally-produced relief maps.
- Data can be found at http://emrl.byu.edu/gsda/data_dem_obtain.html

http://www.webgis.com/srtm30.html

There are many different formats of DEM, for these examples GTOPO30 was used.

DTM Data

- DTM data is really just a huge file containing 3D coordinates of the earth's surface.
- The coordinates create a mesh of triangles that define the surface.



after.dem - Notepad

File Edit Format View Help

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MOUNT SAINT HELENS, WA                          DEM GENERATED WITH LT4X
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730.00005     RMMC      2      1      1     10    0.000000000000000D+00
 0.000000000000000D+00    0.000000000000000D+00
0.000000000000000D+00    0.000000000000000D+00
0.000000000000000D+00    0.000000000000000D+00
0.000000000000000D+00    0.000000000000000D+00
0.000000000000000D+00    0.000000000000000D+00
0.000000000000000D+00    0.000000000000000D+00      2      1      4
0.557945011821135D+06    0.510799133930676D+07
0.557813813954234D+06    0.512188002782573D+07
0.567449420312719D+06    0.512197873876247D+07
0.567602487473603D+06    0.510809006742194D+07
0.223100000000000D+04    0.836700000000000D+04
0.000000000000000D+00     10.100000E+020.100000E+020.100000E+01
 1    979     00    401198319961 5 0 2 1    1    0 1 1 1 1    3.70

                                                1     1     66      1
0.557820000000000D+06    0.512123000000000D+07
0.000000000000000D+00    0.292200000000000D+04
0.298900000000000D+04   2989  2988  2987  2986  2986  2984  2984
2983  2983  2983  2982  2981  2981  2982  2981  2980  2979  2979
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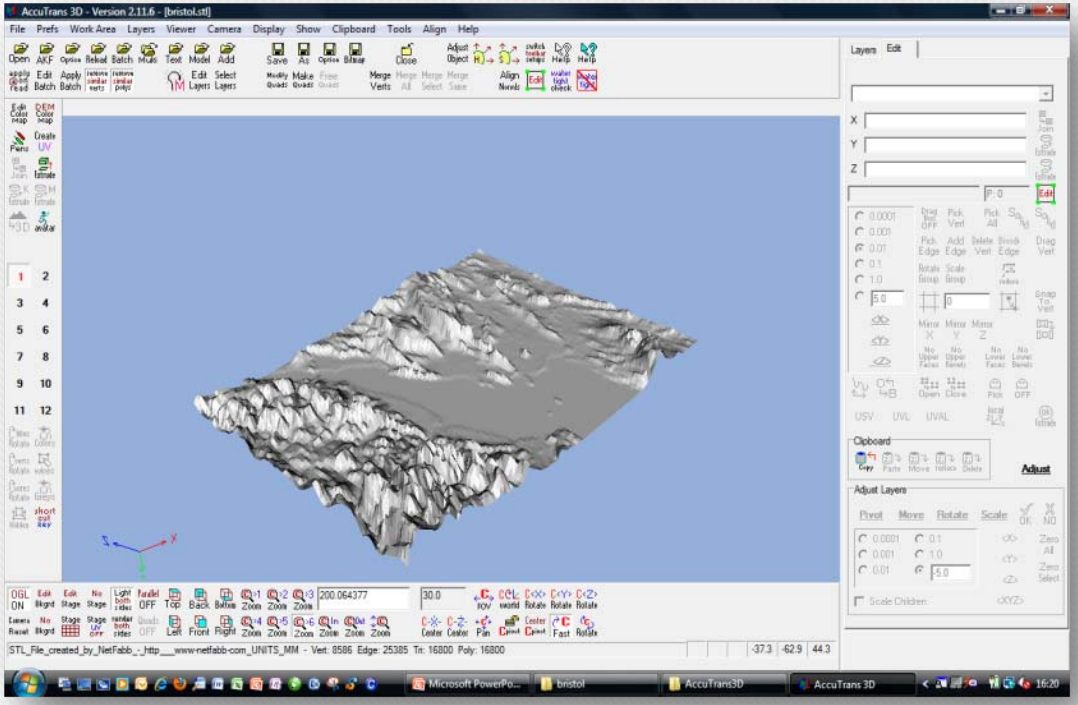
                                                1     2   172      1
0.557830000000000D+06    0.512017000000000D+07
0.000000000000000D+00    0.292400000000000D+04
0.331400000000000D+04   3314  3311  3310  3310  3312  3311  3313
```

Software.

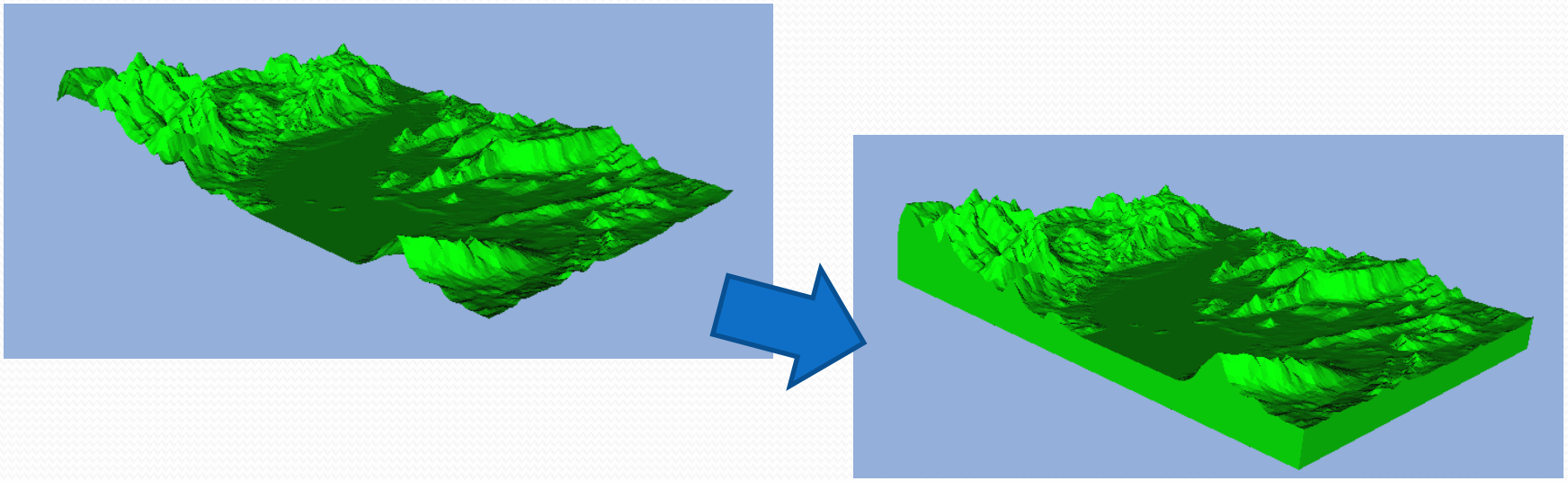
To open and edit the DEM file you need an appropriate software program.
AcuTrans3D is available as a 30 day trial and will allow you to select a small part of the map, scale it to a suitable size and to show heights better exaggerate the verticals.
AccuTrans 3D can be downloaded from
http://www.micromouse.ca/



AccuTrans3D looks very complicated at first but it is not too difficult to learn!

Convert and Extrude

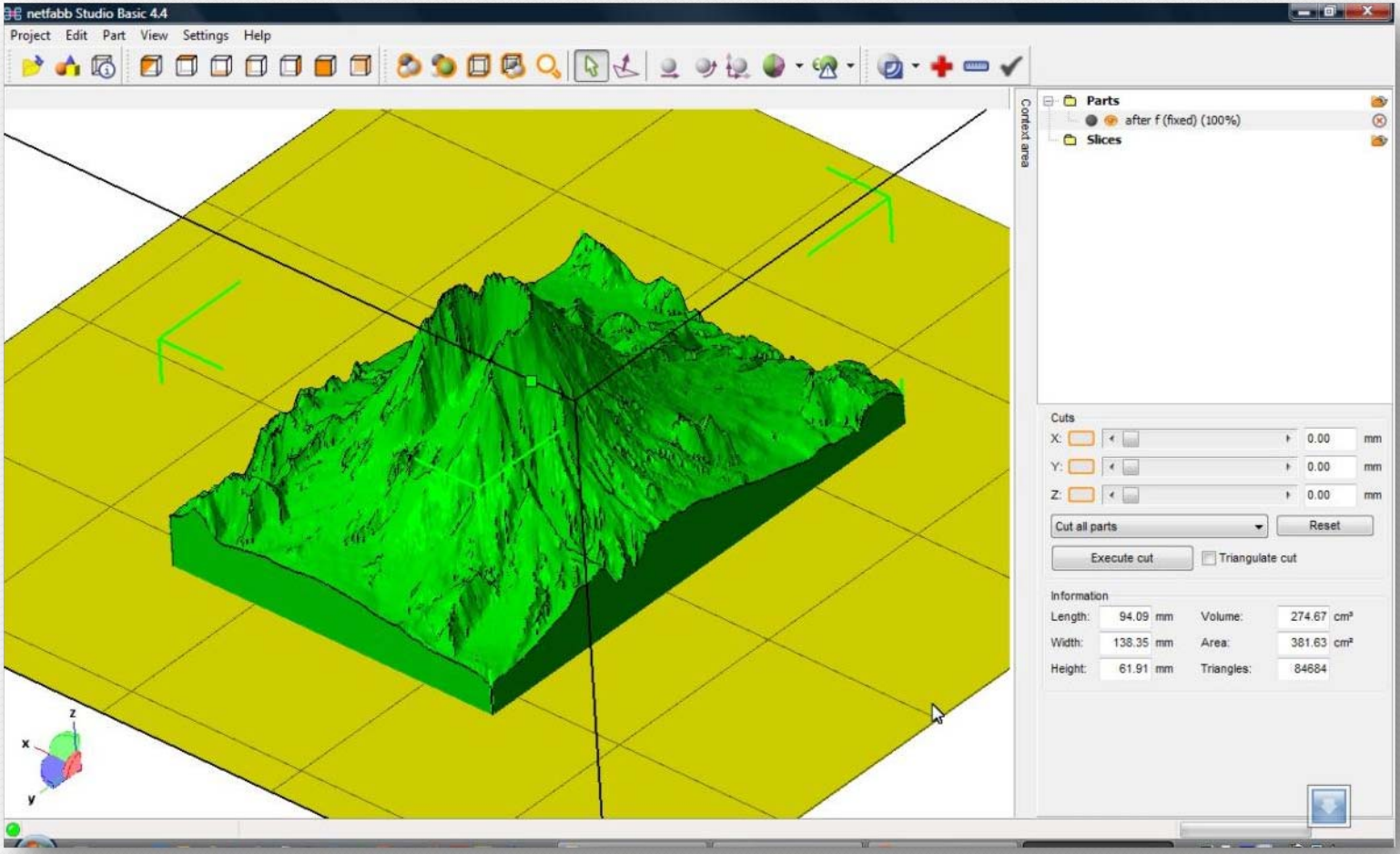
- The DEM has to be converted to a triangle mesh called an .stl (Stereo Lithography) file and as it is just a surface it has to be “extruded” to make a solid with a flat bottom.



Scale and origin

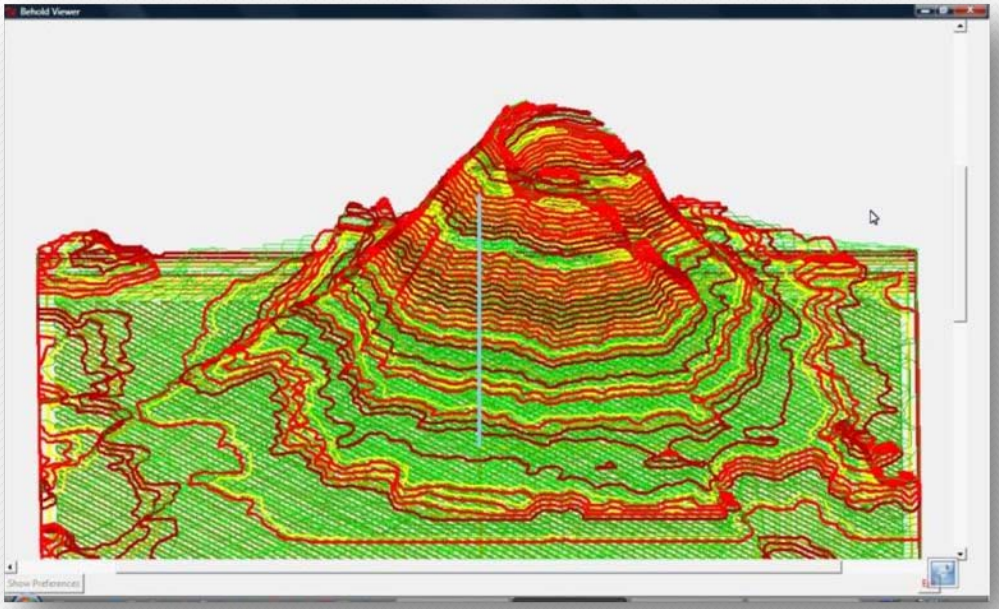
- The file needs to be scaled to an appropriate size for printing on the RapMan.
- The size depends on the material being used. If you are using ABS then 50mm – 80mm are considered to be the maximum as this material has a tendency to warp. PLA is more suitable for larger models.
- You should check that the stl file will print in the centre of the machine.
- A useful program for doing both of these is called NetFabb Studio. This free software can be downloaded at http://www.netfabb.com/

Scale and origin in NetFabb



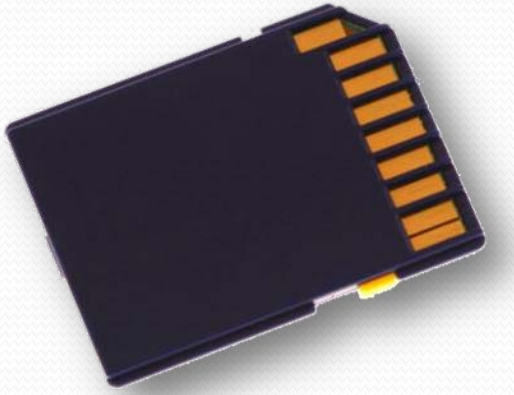
Convert to g-code and print.

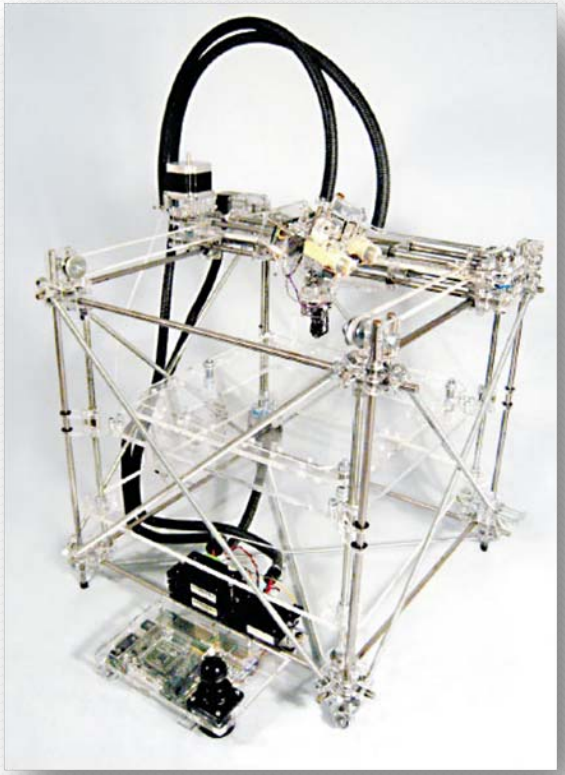
- From here on the process is the same as for any other 3D printing with RapMan. The .stl file is converted to g-code using the Skeinforge or NetFabb program.



Printing

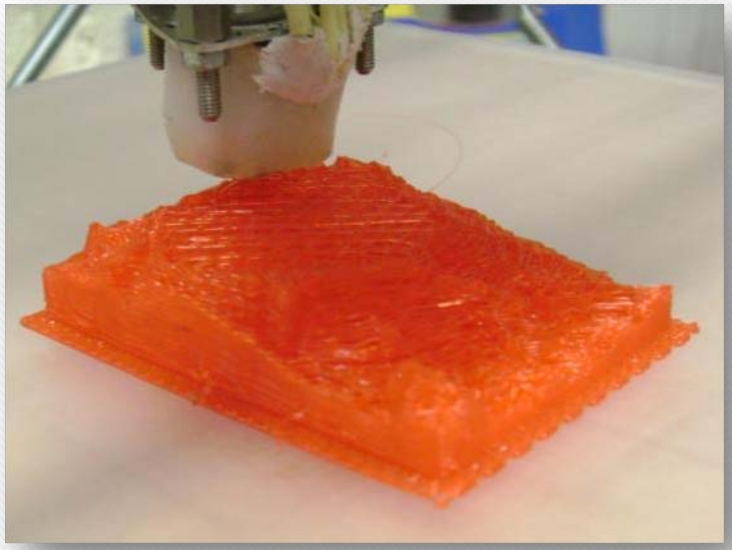
- The file is copied to a SD card and inserted into the machine.

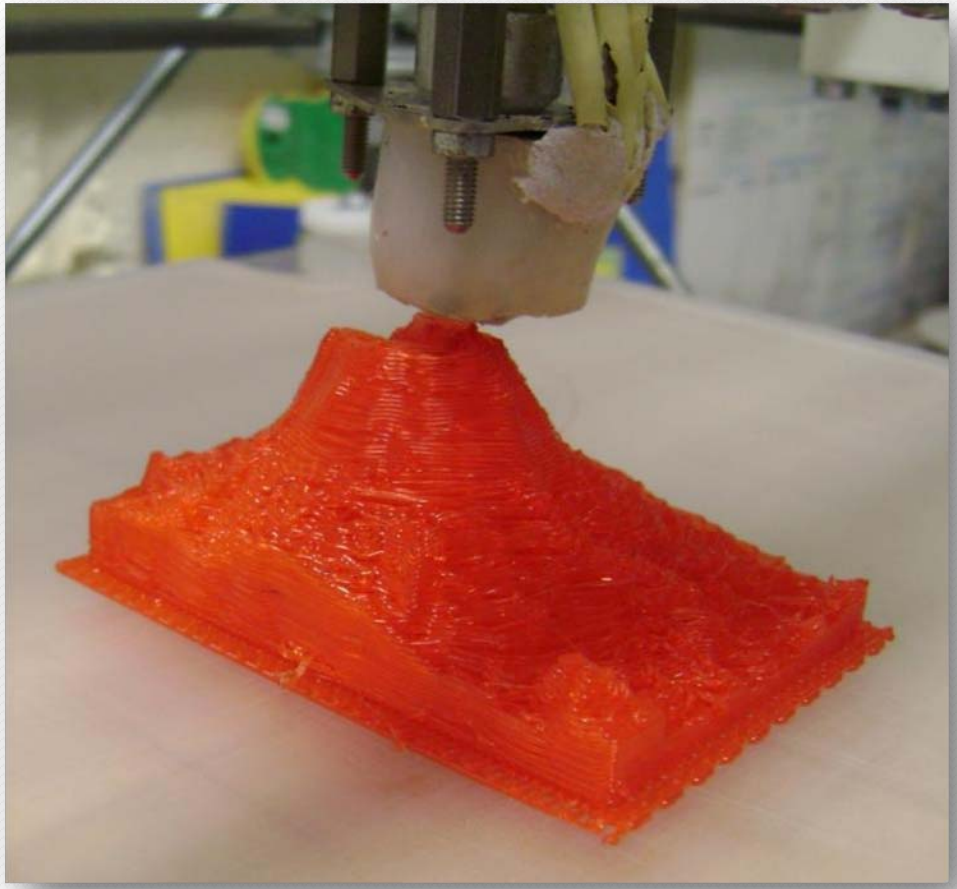




Printing

- 3D Print using PLA Polylactic Acid – a biodegradable polymer.





RapMan

- RapMan is a low cost 3D printer available from Bits from Bytes www.bitsfrombytes.com

- Further assistance can be found on the BfB forum and wiki.

Forum
http://www.bitsfrombytes.com/fora/user/index.php

Wiki http://www.bitsfrombytes.com/wiki