Manual

STLNormalSwitcher: A program to switch normal vectors in STL-files

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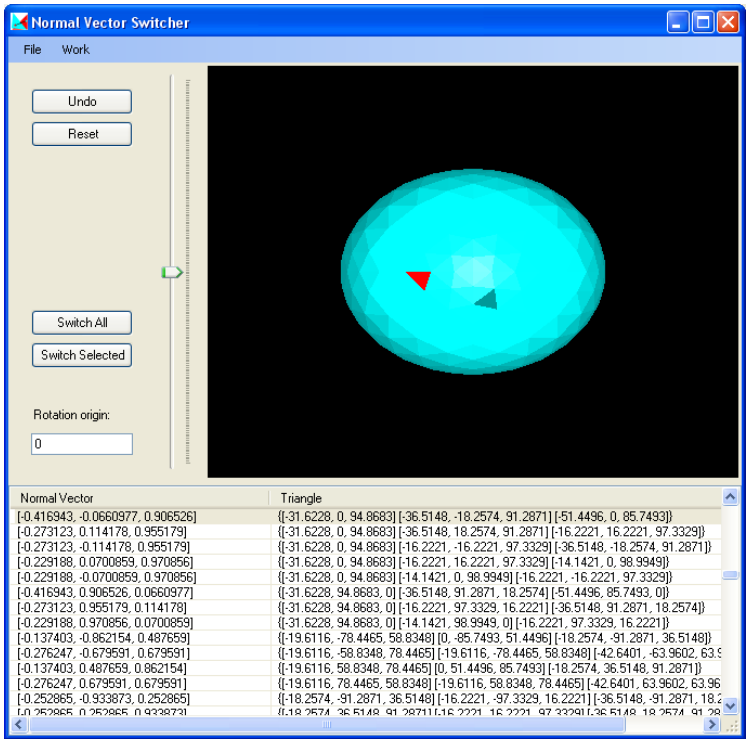
2 Introduction

STLNormalSwitcher is a small program to view STL-files (see chapter 5) and to switch the normal vectors of the triangles contained in it. Switching a normal vector (x, y, z) means to negate the normal vector to $(-x, -y, -z)$, so that it points the opposite way. STL-files opened in STLNormalSwitcher should not contain more than 16777214 triangles for STLNormalSwitcher to work.

It allows picking the triangles whose normal vectors are to be switched either from a list displaying the numerical values or directly in the graphical representation.

The STLNormalSwitcher can also be used to convert STL-files from ASCII to Binary or vice versa.



3 The Menu

3.1 The File Menu

3.1.1 Open

Closes a previously opened file and opens a new one.
The file has to be a valid STL-file (see chapter 5).

3.1.2 Save

Saves changes to the currently opened STL-file in the current format (ASCII or Binary) overwriting the old file.

3.1.3 Save As...

Saves changes to the STL-file chosen in the displayed dialogue in the chosen format (ASCII or Binary).

3.1.4 Close

Closes the current STL-file asking the user whether he wants to save changes and resets the STLNormalSwitcher window.

3.1.5 Exit

Ends the program, asking the user to save changes.

3.2 The Edit Menu

3.2.1 UnDo

Reverts the last switching operation.

3.2.2 Reset

Reverts all switching operations since the STL-file was opened.

3.2.3 Switch Selected

Switches the selected normal vectors.

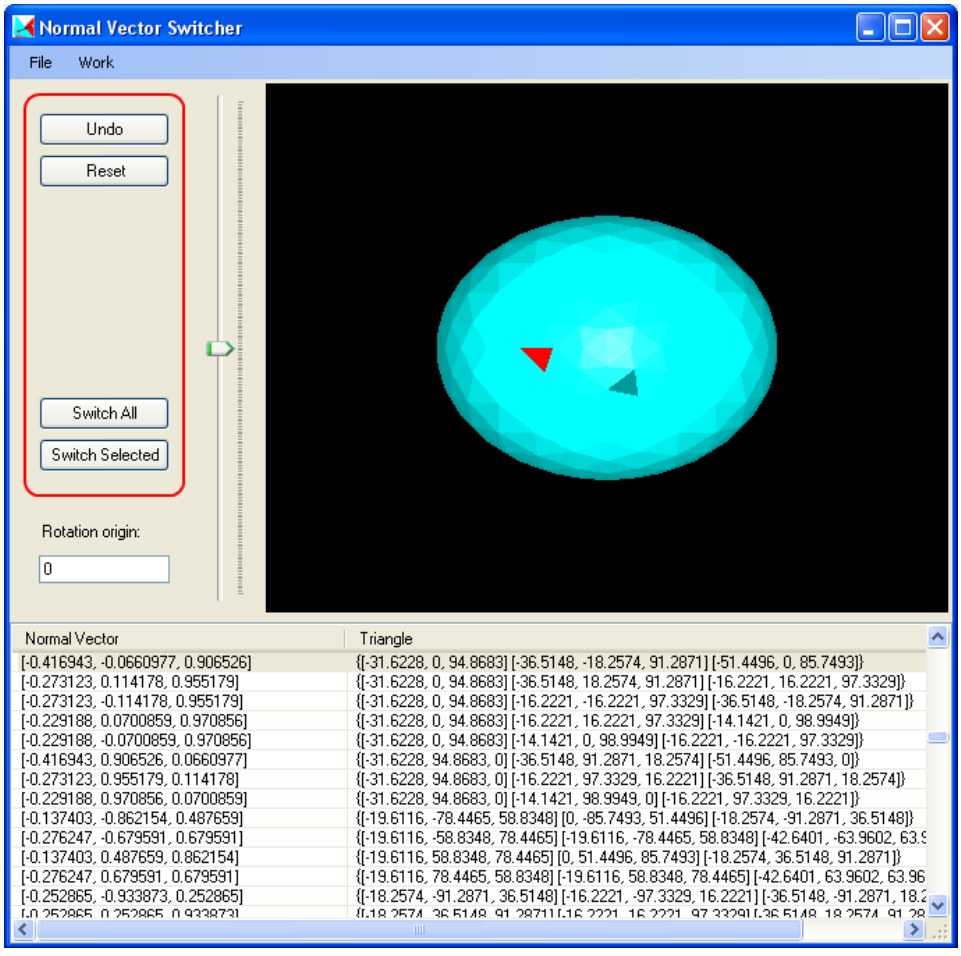
3.2.4 Switch All

Switches all normal vectors.

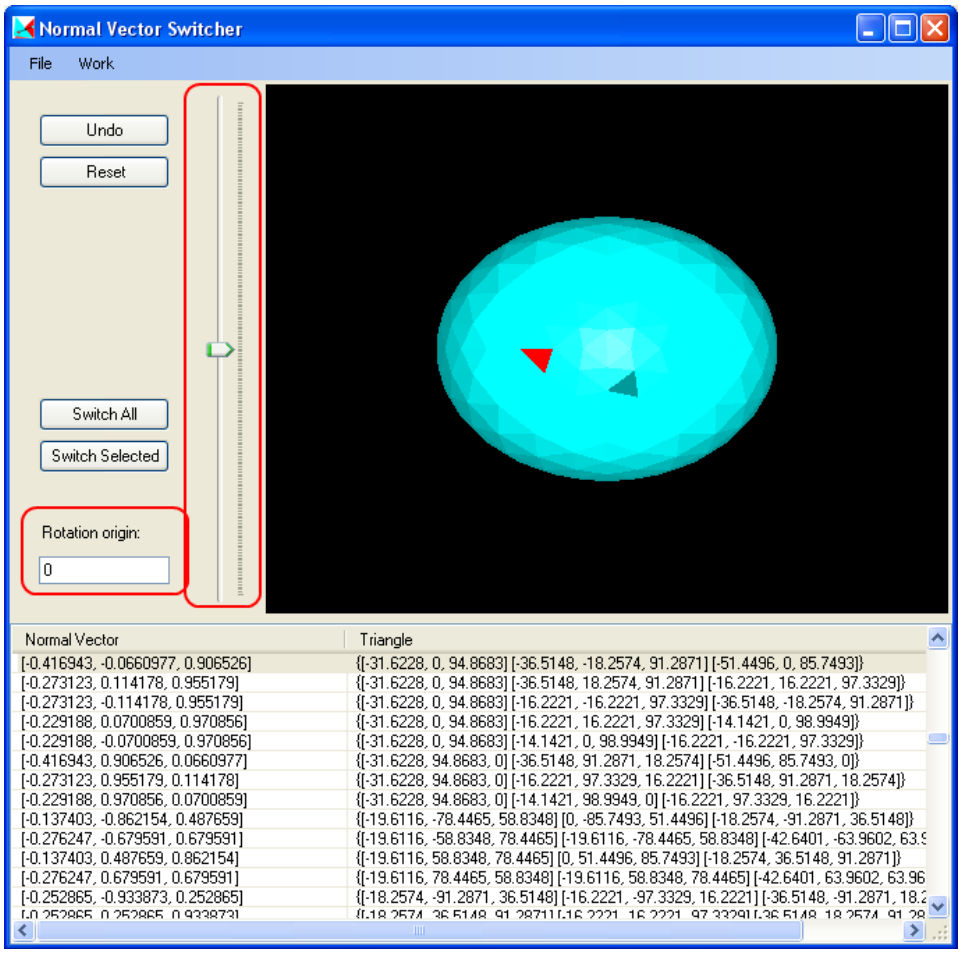
4 The Window

4.1 The Controls

The buttons "‘UnDo"’, "‘Reset"’, "‘Switch Selected"’ and "‘Switch All"’ do just the same as the corresponding menuitems.

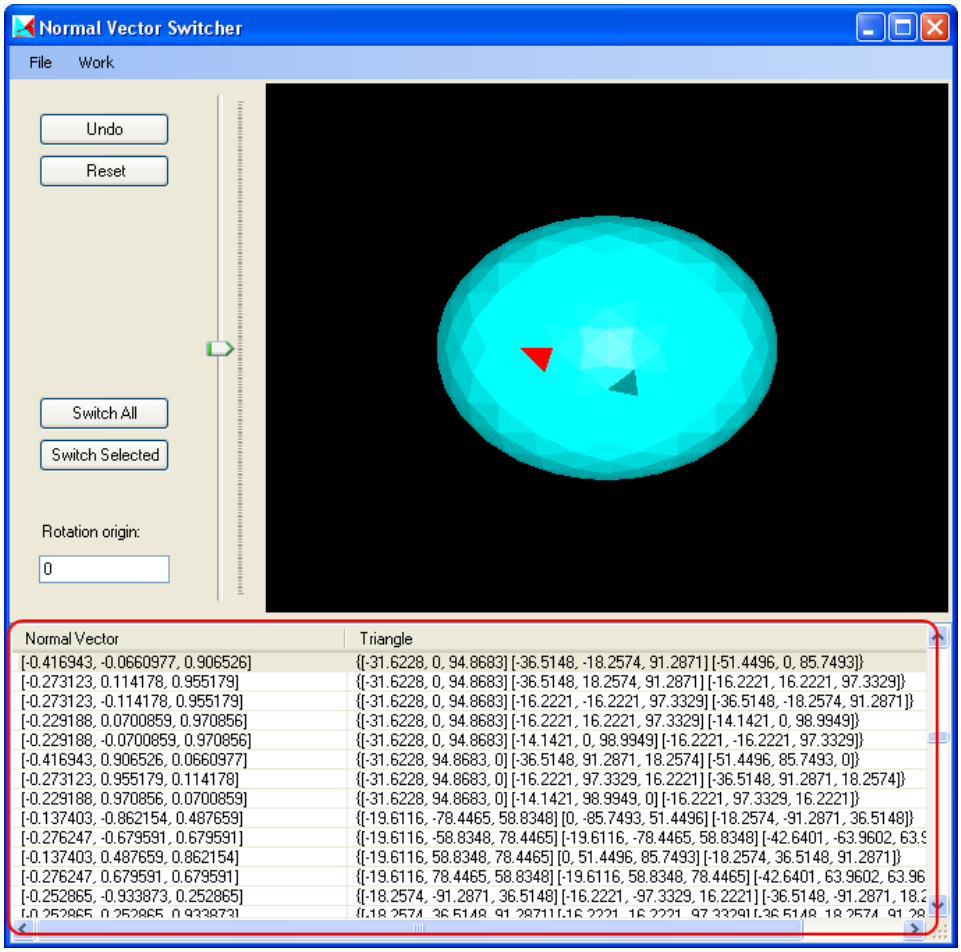


The slider allows a change of the origin of rotation along the z-axis. That value can also be set using the "‘Rotation origin"’ textbox. The value has to be an integer value. The limits for that value will be set according to the values of the vertices in the STL-file. A valid value is accepted when the "‘Return-key"’ or the "‘Enter-key"’ is pressed. If the entered value is not valid the rotation origin will be set back to the previous value.



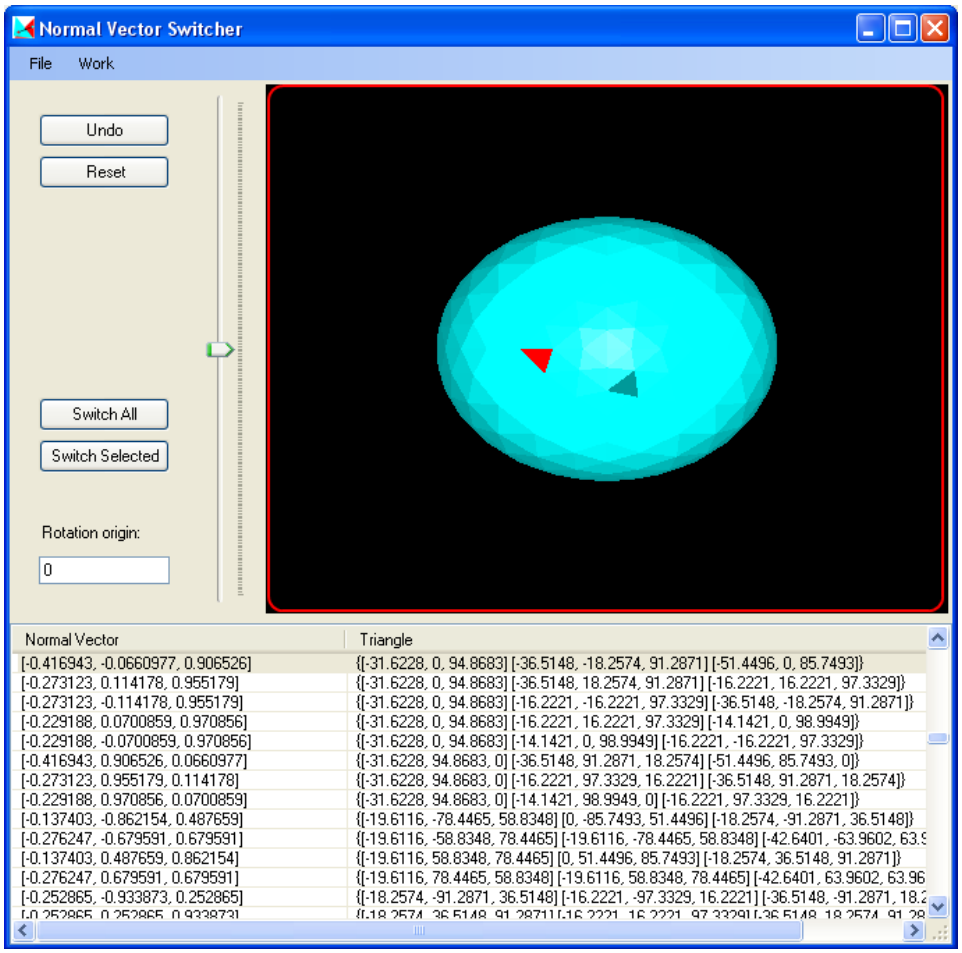
4.2 The List

In the list at the bottom of the window two columns are displayed. The first column shows the normal vectors and the second column shows the triangles represented by their vertices. Clicking on a column header will sort the items in the list as strings. Items can be selected as usual clicking on them using the left mouse button, pulling a rectangle over the left column with the left mouse button pressed to select neighboring items or clicking individual items with the Ctrl-key pressed to selected items that are not direct neighbors. The selected triangles will be marked red in the Display-Area (see section 4.3).



4.3 The Display-Area

In the Display-Area the workpiece represented in the STL-file is shown. It can be rotated by pressing the right mouse button and dragging the mouse. Zooming is done using the mouse wheel. A single triangle can be picked by clicking it with the left mouse button. Several triangles are picked clicking them with the left mouse button individually and holding down the Ctrl-key. Selected triangles are marked red. Selecting a triangle twice will deselect it. Clicking on the background with the left mouse button will deselect all selected triangles. Triangles with normal vectors pointing away from the viewer can be easily recognised. They don't reflect the light and appear darker as can be seen in the picture below.



5 STL file format

STL (SurfaceTesselationLanguage) is a file format native to the stereolithography CAD software created by 3D Systems. This file format is supported by many other software packages. It is widely used for rapid prototyping and computer-aided manufacturing. STL files describe only the surface geometry of a three dimensional object without any representation of color, texture or other common CAD model attributes. The STL format specifies both ASCII and binary representations. Binary files are more common, since they are more compact.

An STL file describes a raw unstructured triangulated surface by the unit normal and vertices of the triangles using a three-dimensional Cartesian coordinate system.

5.1 ASCII STL

An ASCII STL file must start with the line:

```
solid name
```

where name is an optional string. The file continues with any number of triangles, each represented as follows:

```
facet normal n1 n2 n3
  outer loop
    vertex v11 v12 v13
    vertex v21 v22 v23
    vertex v31 v32 v33
  endloop
endfacet
```

and concludes with:

```
endsolid name
```

White space (spaces, tabs, newlines) may be used anywhere in the file except within numbers or words. The spaces between 'facet' and 'normal' and between 'outer' and 'loop' are required.

5.2 Binary STL

Because ASCII STL files can become very large, a binary version of STL exists. A binary STL file has an 80 character header (Which will be ignored by this program - but should not contain 'vertex' or 'facet'. In contrast to many other programs STLNormalSwitcher can handle headers beginning with 'solid'.). Following the header is a 4 byte unsigned integer indicating the number of triangular facets in the file. Following that is data describing each triangle in turn. The file simply ends after the last triangle.

Each triangle is described by twelve floating point numbers: three for the normal and then three for the X/Y/Z coordinate of each vertex - just as with the ASCII version of STL. After the twelve floats there is a two byte unsigned 'short' integer that is the 'attribute byte count' - in the standard format, this should be zero because most software does not understand anything else.

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