STL to DSP CONVERSION

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INTRODUCTION

These notes illustrate how to move from a Solid Edge model to a facetted model that can be used with the Constraint Modeller.

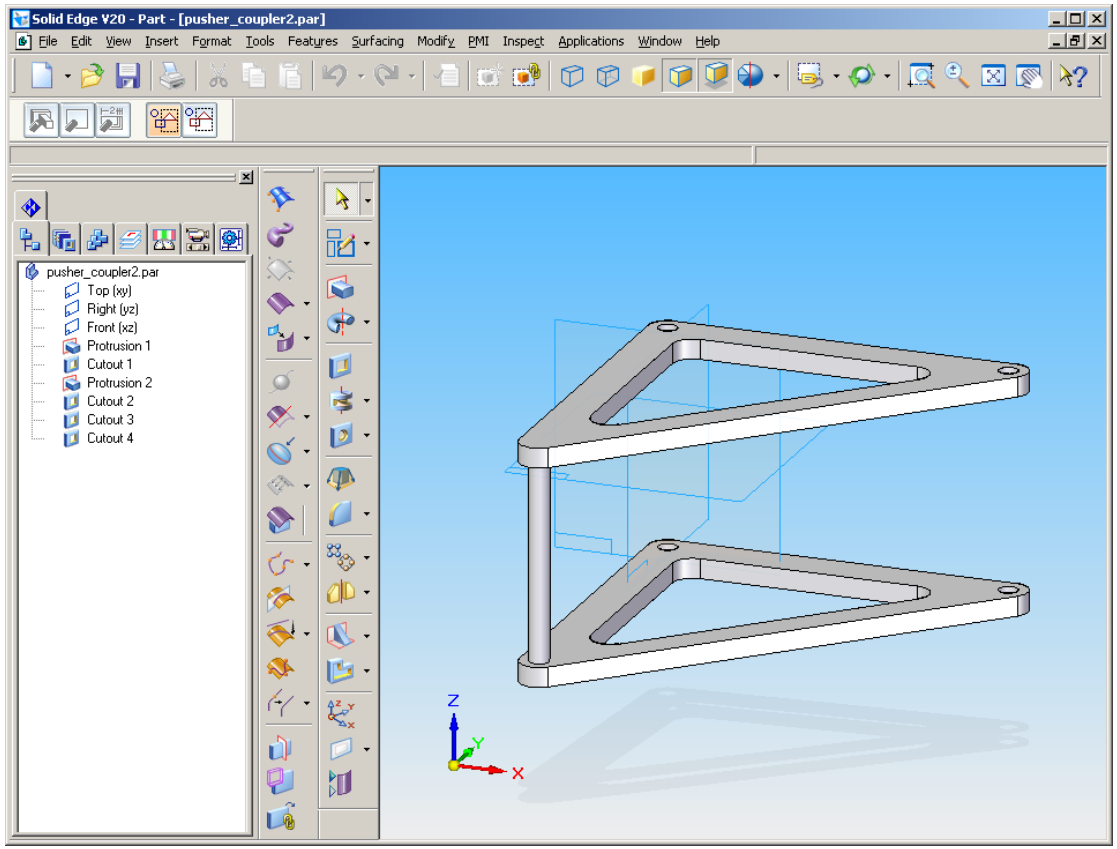
The approach is to make use of the STL output facility that is available with Solid Edge. The STL output can be an ASCII file which essentially contains a collection of triangles which form the outer surface of the part. A conversion program, STL2DSP, is used to convert the file into the display (DSP) format used with the Constraint Modeller.

As with any DSP file, it can be read into the Constraint Modeller and associated with a model space.

The notes also give the form of commands for a DSP file.

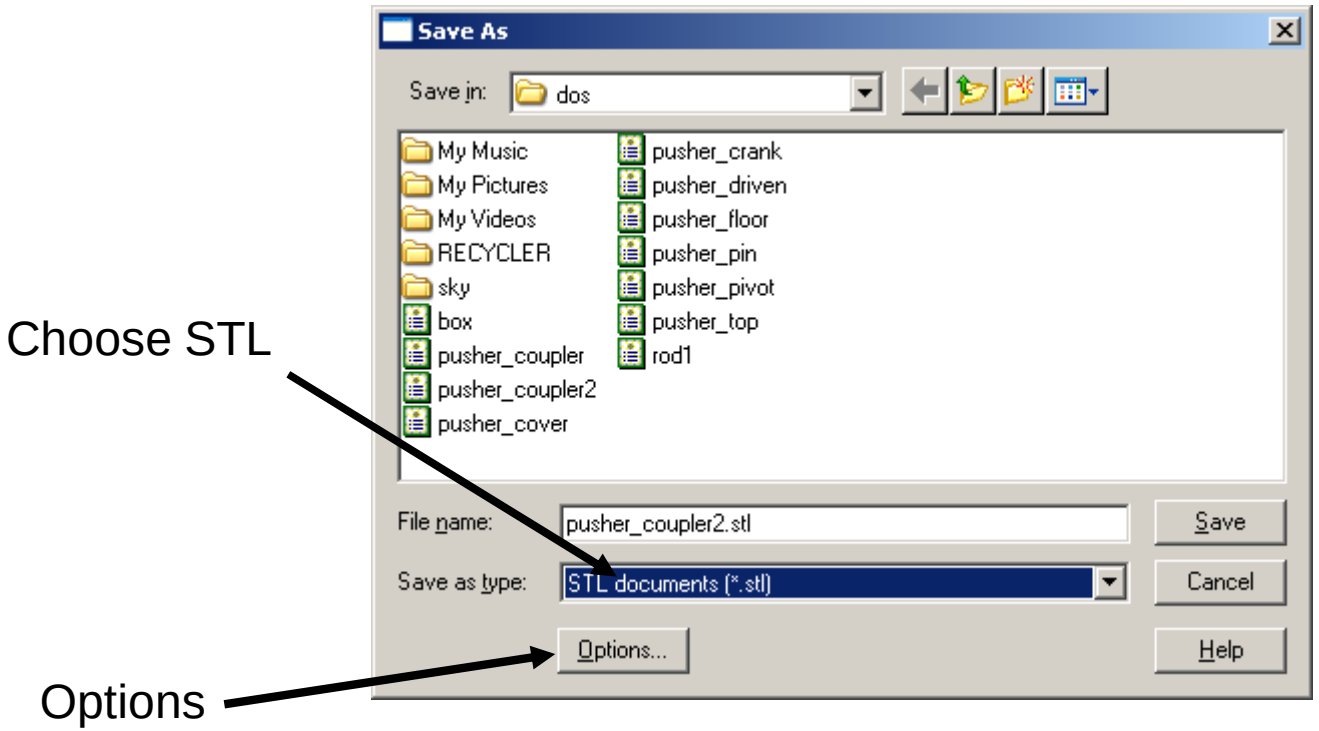
STAGE 1: CREATE THE SOLID EDGE MODEL

This is done in any convenient way. It is probably best to arrange that the origin and coordinate system are in the position and orientation required for the Constraint Modeller. This is likely to be that determined by the local model space coordinate system.



STAGE 2: SAVE AS AN STL FILE

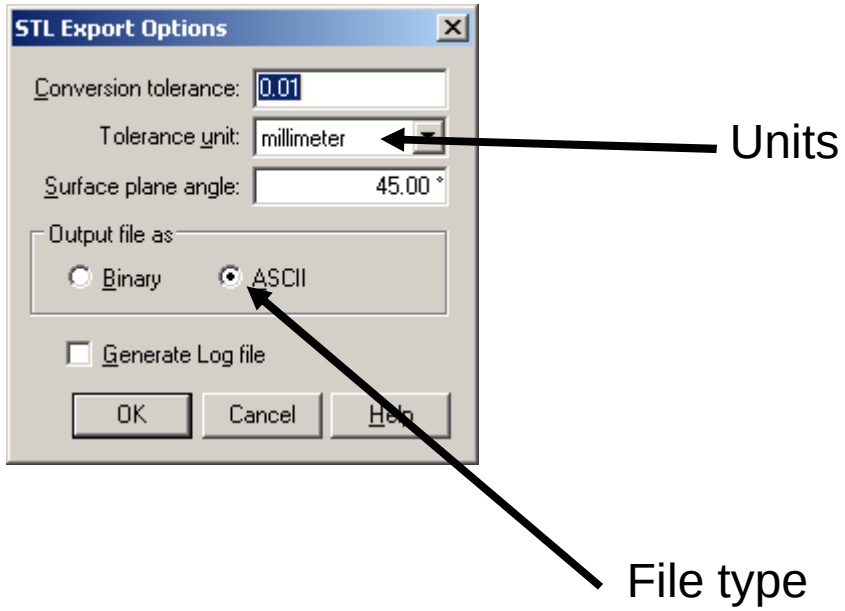
The SAVE command in Solid Edge has the option to save as an STL file. Select the “Save as type” and then press “Options” .....



STAGE 3: SET THE OPTIONS

The “Options” within the STL save command in Solid Edge need to be set along the lines shown here. Select the units as “millimetres”, and the file as “ASCII”.

These settings seem to be remembered for future saves.



STAGE 4: CONVERT TO DSP FORMAT

There is a stand-alone program to perform the conversion to the display format of the Constraint Modeller. This is called STL2DSP. To use it, give the following command (at DOS or UNIX level):

stl2dsp <filename> numb

This is assumes that the input file has the file extension “stl” and creates an output file of the same name with the extension “dsp”.

STAGE 5: INCORPORATE INTO CONSTRAINT MODELLER

The following lines give the form of commands required within the Constraint Modeller macro in order to read in a DSP file and associate the “object” with a model space.

```
dec geom  dsp2;
dec mod2  m1, m2, m2a;

m1 = mod2( 0,0,0 );
m2 = mod2( 0,0,0, m1 );
m2a = mod3( 0,0,0, 0,0,0, m2 );

dsp2 = readdsp( "pusher_coupler2.dsp" );
dsp2:m = &m2a;

ccol( green(), dsp2 );
```

Declarations

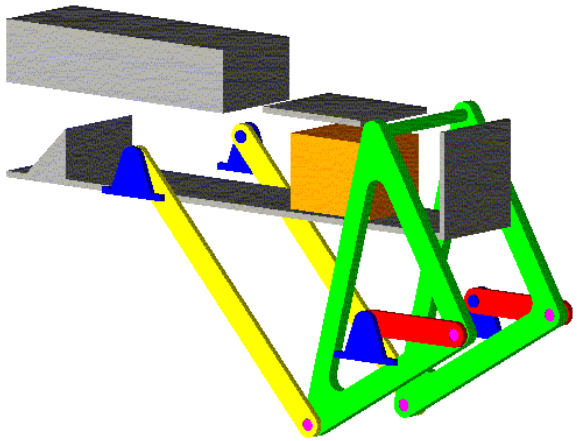
Set up model spaces

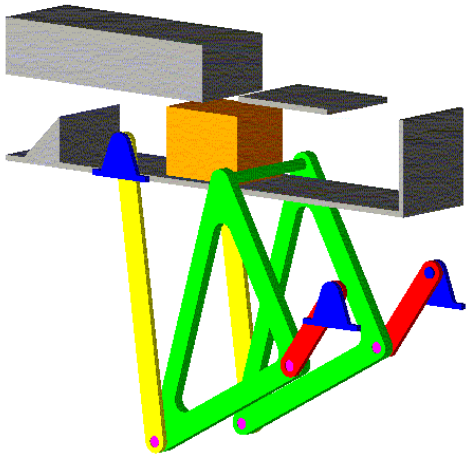
Read DSP file

Assign to model space

NOTE: In the example, the DSP object represents the coupler of a four bar mechanism. This is associated with model space m2. The DSP object is embedded into a space called m2a which itself lies in m2. It could be embedded directly into m2. The only reason to use m2a is if one wanted to move the DSP object relative to m2.

IMAGES of coupler component (green) within the full model in the Constraint Modeller





Form of typical STL file (ASCII output) from Solid Edge

```
solid ascii
  facet normal 9.980267e-001 6.279052e-002 0.000000e+000
    outer loop
      vertex   5.000000e+000 -1.723900e+002 -5.000000e+001
      vertex   4.960574e+000 -1.717633e+002 -5.000000e+001
      vertex   4.960574e+000 -1.717633e+002 5.000000e+001
    endloop
  endfacet
  facet normal 9.822873e-001 1.873813e-001 0.000000e+000
    outer loop
      vertex   4.960574e+000 -1.717633e+002 -5.000000e+001
      vertex   4.842916e+000 -1.711466e+002 -5.000000e+001
      vertex   4.842916e+000 -1.711466e+002 5.000000e+001
    endloop
  endfacet




  facet normal -9.980267e-001 6.279052e-002 7.377247e-018
    outer loop
      vertex   1.773506e+002 -6.266662e-001 6.000000e+001
      vertex   1.773900e+002 -1.224606e-015 6.000000e+001
      vertex   1.773900e+002 0.000000e+000 5.000000e+001
    endloop
  endfacet
endsolid
```

Form of corresponding DSP file

```
$ File: pusher_coupler2.stl
$ Date: Wed Sep  3 10:48:21 2008
$ Created by: STL2DSP - Version 1.0 - September 2008

5 0.998027 0.062791 0.000000
4 5.000000 -172.390000 -50.000000
5 0.998027 0.062791 0.000000
4 4.960574 -171.763300 -50.000000
5 0.998027 0.062791 0.000000
4 4.960574 -171.763300 50.000000

5 0.982287 0.187381 0.000000
4 4.960574 -171.763300 -50.000000
5 0.982287 0.187381 0.000000
4 4.842916 -171.146600 -50.000000
5 0.982287 0.187381 0.000000
4 4.842916 -171.146600 50.000000


5 -0.998027 0.062791 0.000000
4 177.350600 -0.626666 60.000000
5 -0.998027 0.062791 0.000000
4 177.390000 -0.000000 60.000000
5 -0.998027 0.062791 0.000000
4 177.390000 0.000000 50.000000

$ nfacet = 2220

$ End of file
```

Format for DSP files

The DSP file consists of a number of plotting commands. Each command is an integer followed by three real numbers. The commands are as follows.

1 x y z	Node (point) at (x,y,z)
2 x y z	Move to (x,y,z)
3 x y z	Plot (straight line) to (x,y,z)
4 x y z	Vertex of triangular facet at (x,y,z)
5 l m n	Outward normal at vertex in direction (l,m,n)
11 r g b	Change current foreground colour to (r,g,b)
12 r g b	Change current background colour to (r,g,b)

Notes:

The (r,g,b) components should lie between 0 and 1

Once three vertex commands have been read, it is assumed the facet is complete

The dollar sign is used to denote a comment