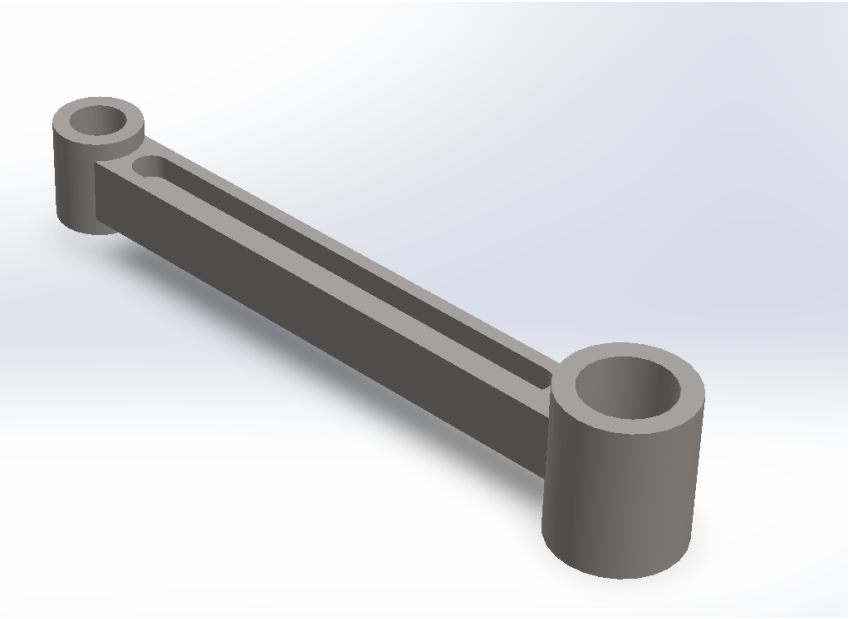
Assignment-03 CAD/CAM

Problem statement

Generate a model for 3D printing and save the file in.STL format. Also, generate ASCII code and calculate the number of triangles required to store the model in.STL.



Articulate Rod made using Solidworks.

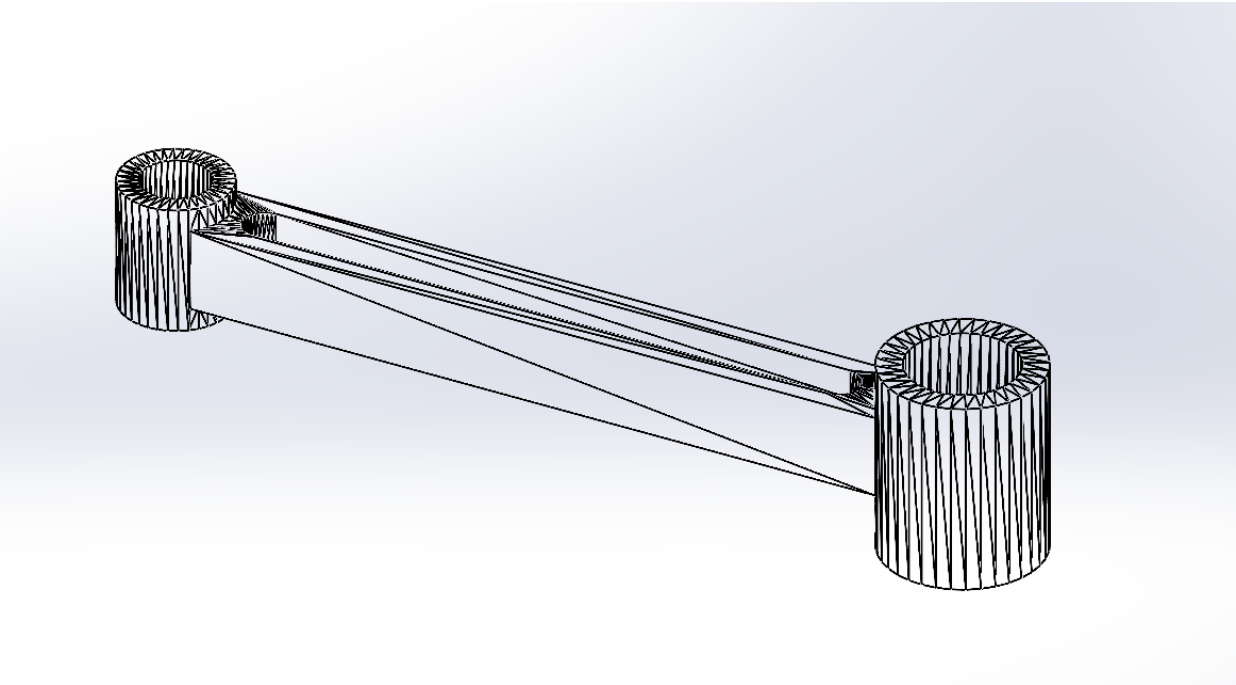
What are STL files?

STL is a file format native to the stereolithography CAD software created by 3D Systems. STL has several backronyms such as "Standard Triangle Language" and "Standard Tessellation Language".This file format is supported by many other software packages; it is widely used for rapid prototyping, 3D printing, 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 (ordered by the right-hand rule) of the triangles using a three-dimensional Cartesian coordinate system. In the original specification, all STL coordinates were required to be positive numbers, but this restriction is no longer enforced and negative coordinates are commonly encountered in STL files today. STL files contain no scale information, and the units are arbitrary.

First iteration :

In the first STL file that was created for the articulate rod shown above, tolerance was kept at **0.14901498** which gave the number of triangles on the CAD model as **964**. Some internal features in the image shown below are not very clear due to the lesser density and number of triangles used to define the geometry.

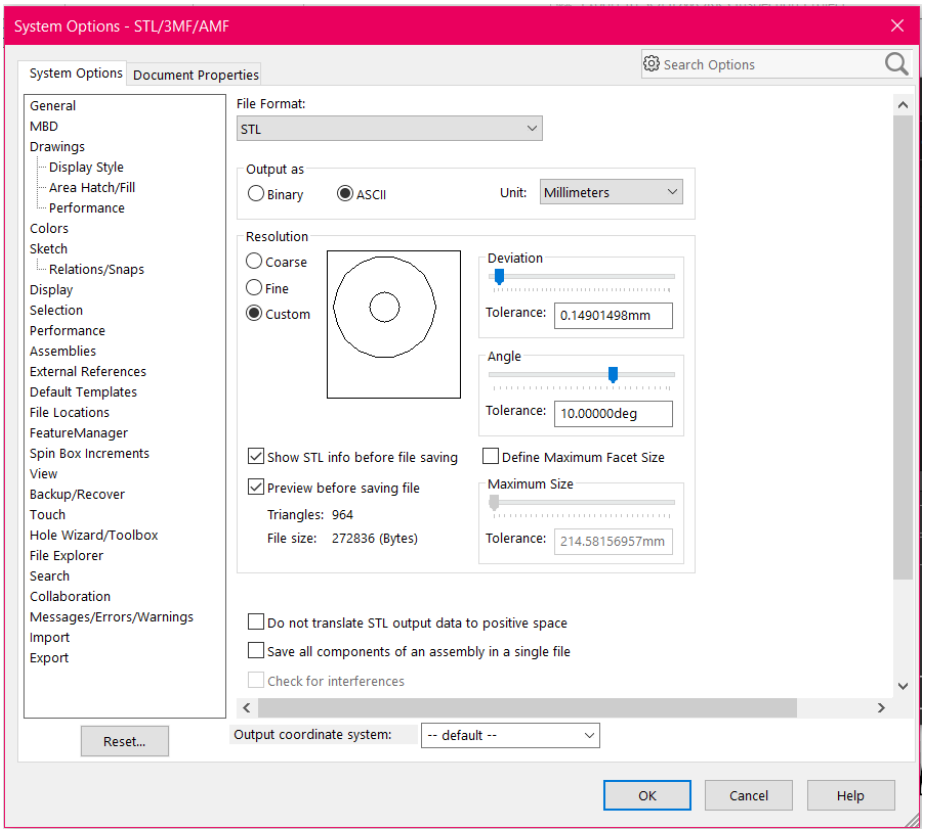


Settings and ASCII code:

articulate rod - Notepad

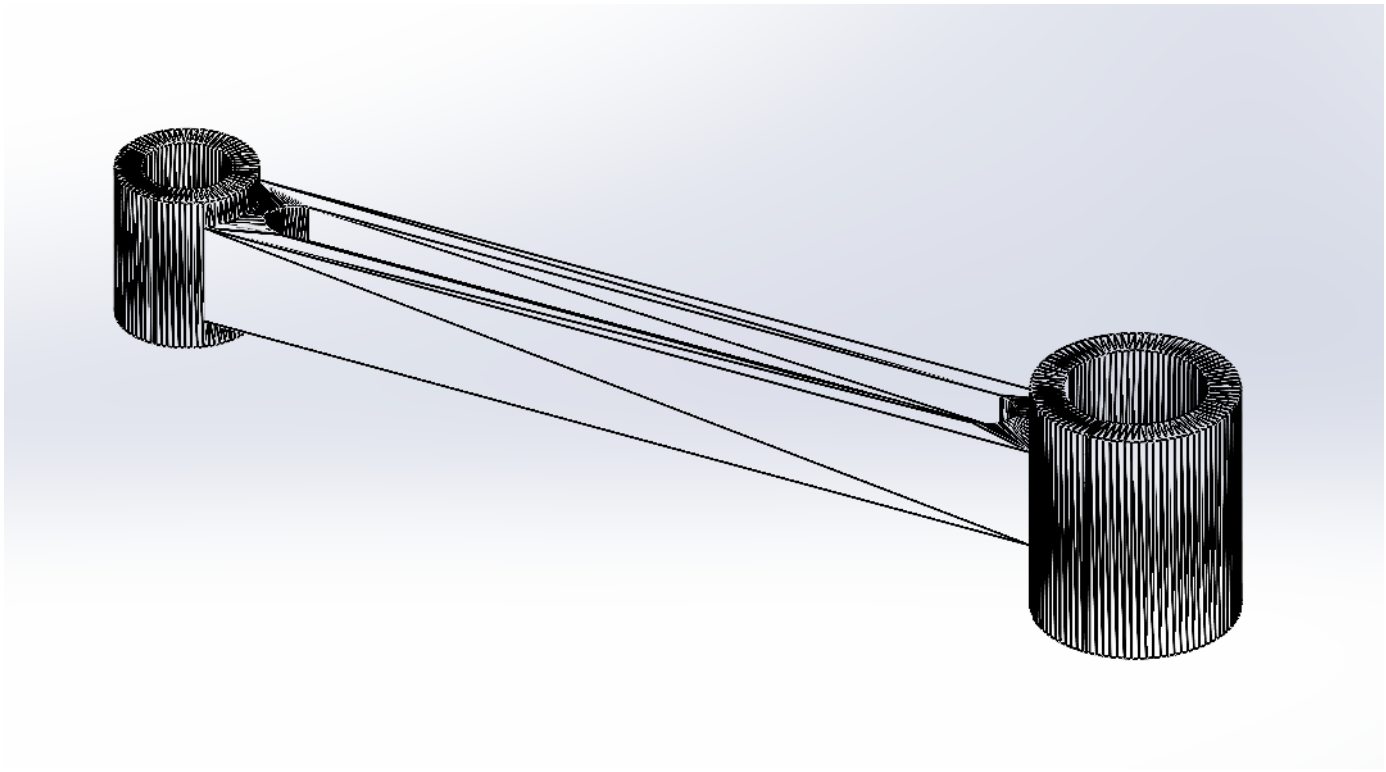
File Edit Format View Help

```
solid articulate rod
   facet normal 0.000000e+00 -1.000000e+00 -0.000000e+00
      outer loop
         vertex 1.645000e+02 1.200000e+01 1.316987e+01
         vertex 1.637101e+02 1.200000e+01 1.280154e+01
         vertex 1.749917e+02 1.200000e+01 8.500000e+00
      endloop
   endfacet
   facet normal -0.000000e+00 -1.000000e+00 0.000000e+00
      outer loop
         vertex 1.749917e+02 1.200000e+01 2.650000e+01
         vertex 1.993725e+01 1.200000e+01 2.650000e+01
         vertex 1.748446e+02 1.200000e+01 2.625000e+01
      endloop
   endfacet
   facet normal -0.000000e+00 -1.000000e+00 0.000000e+00
      outer loop
         vertex 1.748446e+02 1.200000e+01 2.625000e+01
         vertex 1.993725e+01 1.200000e+01 2.650000e+01
         vertex 1.735554e+02 1.200000e+01 2.348535e+01
      endloop
   endfacet
   facet normal 0.000000e+00 -1.000000e+00 -0.000000e+00
      outer loop
         vertex 2.119253e+01 1.200000e+01 9.786549e+00
         vertex 1.993725e+01 1.200000e+01 8.500000e+00
         vertex 2.816978e+01 1.200000e+01 1.428606e+01
      endloop
   endfacet
   facet normal 0.000000e+00 -1.000000e+00 0.000000e+00
      outer loop
         vertex 1.735554e+02 1.200000e+01 2.348535e+01
         vertex 1.658302e+02 1.200000e+01 2.071394e+01
         vertex 1.663301e+02 1.200000e+01 2.000000e+01
      endloop
   endfacet
   facet normal -0.000000e+00 -1.000000e+00 -0.000000e+00
      outer loop
         vertex 1.727659e+02 1.200000e+01 1.446116e+01
         vertex 1.666985e+02 1.200000e+01 1.578990e+01
         vertex 1.735554e+02 1.200000e+01 1.151465e+01
      endloop
   endfacet
   facet normal 0.000000e+00 -1.000000e+00 0.000000e+00
      outer loop
         vertex 1.735554e+02 1.200000e+01 1.151465e+01
         vertex 1.666985e+02 1.200000e+01 1.578990e+01
         vertex 1.663301e+02 1.200000e+01 1.500000e+01
      endloop
   endfacet
   facet normal -0.000000e+00 -1.000000e+00 -0.000000e+00
      outer loop
         vertex 1.735554e+02 1.200000e+01 1.151465e+01
         vertex 1.663301e+02 1.200000e+01 1.500000e+01
```



Second iteration :

In the second STL file that was created for the articulate rod shown above, tolerance was kept at **0.01064393** which gave the number of triangles on the CAD model as **1796**. Some internal features in the image shown below are now clearly visible due to the relatively larger density and a larger number of triangles used to define the geometry.

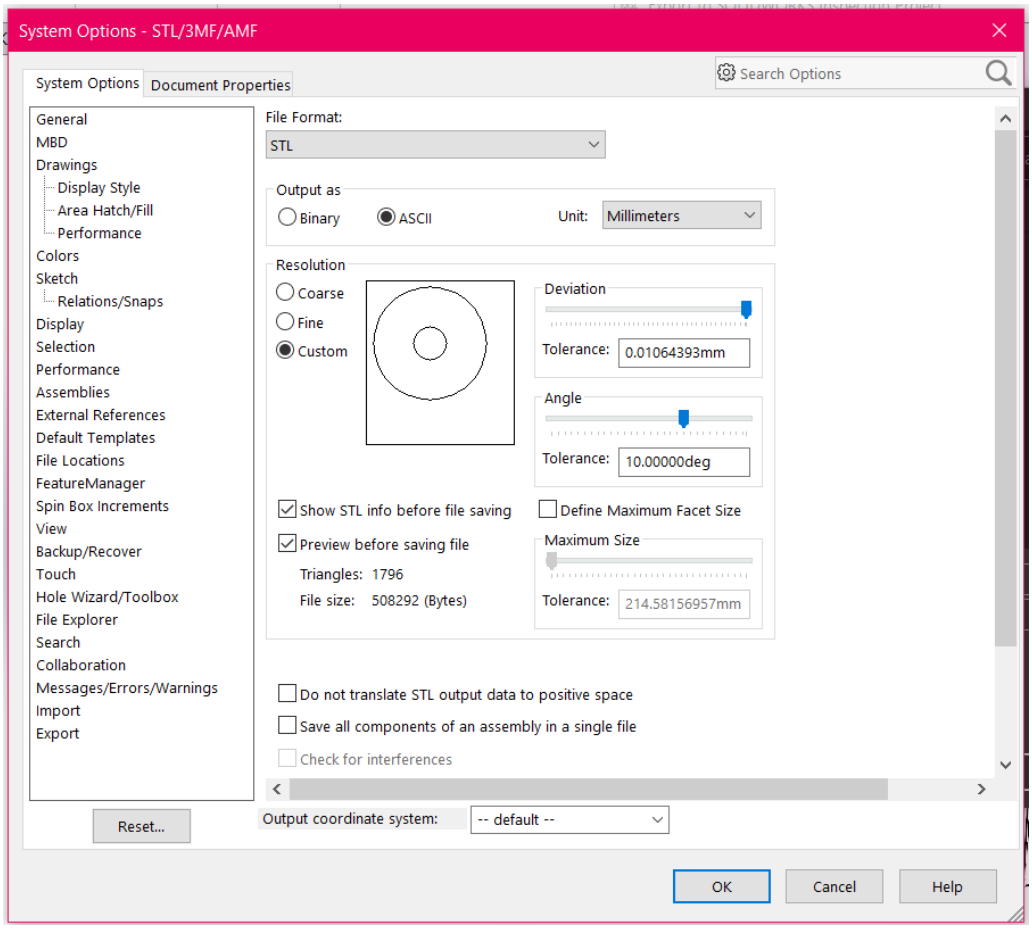


Settings and ASCII code:

articulate rod-2 - Notepad

File Edit Format View Help

```
solid articulate rod-2
  facet normal 0.000000e+00 -1.000000e+00 -0.000000e+00
    outer loop
      vertex 2.155836e+01 1.200000e+01 1.024481e+01
      vertex 2.091774e+01 1.200000e+01 9.470433e+00
      vertex 2.814743e+01 1.200000e+01 1.431288e+01
    endloop
  endfacet
  facet normal 0.000000e+00 -1.000000e+00 0.000000e+00
    outer loop
      vertex 1.749917e+02 1.200000e+01 8.500000e+00
      vertex 1.654227e+02 1.200000e+01 1.385516e+01
      vertex 1.649389e+02 1.200000e+01 1.345492e+01
    endloop
  endfacet
  facet normal 0.000000e+00 -1.000000e+00 0.000000e+00
    outer loop
      vertex 1.993725e+01 1.200000e+01 8.500000e+00
      vertex 3.137333e+01 1.200000e+01 1.253943e+01
      vertex 3.075655e+01 1.200000e+01 1.265708e+01
    endloop
  endfacet
  facet normal -0.000000e+00 -1.000000e+00 0.000000e+00
    outer loop
      vertex 3.075655e+01 1.200000e+01 1.265708e+01
      vertex 3.015938e+01 1.200000e+01 1.285112e+01
      vertex 1.993725e+01 1.200000e+01 8.500000e+00
    endloop
  endfacet
  facet normal 0.000000e+00 -1.000000e+00 0.000000e+00
    outer loop
      vertex 1.993725e+01 1.200000e+01 8.500000e+00
      vertex 3.015938e+01 1.200000e+01 1.285112e+01
      vertex 2.959123e+01 1.200000e+01 1.311847e+01
    endloop
  endfacet
  facet normal 0.000000e+00 -1.000000e+00 0.000000e+00
    outer loop
      vertex 1.993725e+01 1.200000e+01 8.500000e+00
      vertex 2.959123e+01 1.200000e+01 1.311847e+01
      vertex 2.906107e+01 1.200000e+01 1.345492e+01
    endloop
  endfacet
  facet normal 0.000000e+00 -1.000000e+00 -0.000000e+00
    outer loop
      vertex 2.091774e+01 1.200000e+01 9.470433e+00
      vertex 2.021457e+01 1.200000e+01 8.752377e+00
      vertex 2.814743e+01 1.200000e+01 1.431288e+01
    endloop
  endfacet
  facet normal 0.000000e+00 -1.000000e+00 0.000000e+00
    outer loop
      vertex 2.814743e+01 1.200000e+01 1.431288e+01
      vertex 2.021457e+01 1.200000e+01 8.752377e+00
      vertex 1.993725e+01 1.200000e+01 8.500000e+00
    endloop
  endfacet
  facet normal 0.000000e+00 -1.000000e+00 -0.000000e+00
    outer loop
      vertex 2.814743e+01 1.200000e+01 1.431288e+01
      vertex 1.993725e+01 1.200000e+01 8.500000e+00
      vertex 2.857726e+01 1.200000e+01 1.385516e+01
```



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