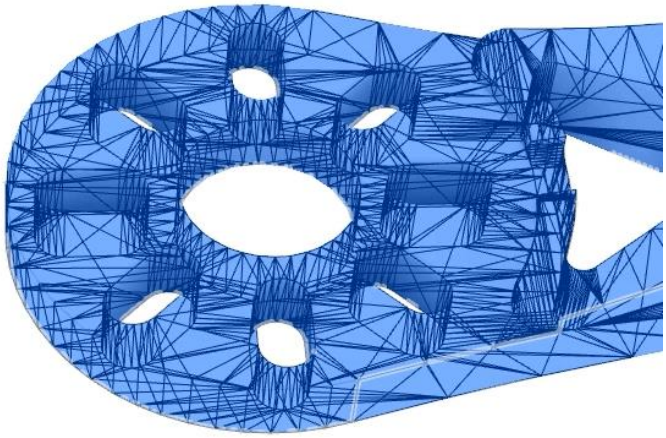
AUTODESK

Design for Additive Manufacture

In this module, you'll explore several 3D printing styles and learn how to export a model's geometry for 3D printing.

Learning objectives:

- Identify the various types of additive machines.
- Use Fusion 360 inspection tools to validate a model.
- Understand the principles of additive manufacturing and support requirements.



The completed exercise

1. Open the supplied *FFF Quad Copter Arm.f3d*, *FFF Quad Copter Assembly.f3d*, *and SLS Quad Copter.f3d* files. The geometry in these files is intended to be 3D printed. Two of the files are intended to be printed on a Fused Filament Fabrication (FFF) machine. This is the most common type of desktop machine. The third file is intended to be printed on a Selective Laser Sintering (SLS) machine.

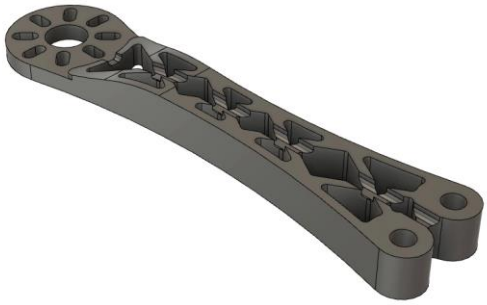


Figure 1. Open the supplied files

2. When designing geometry to be printed on a specific machine, you need to make sure it will fit inside the machine's print envelope. Click Inspect> Measure.

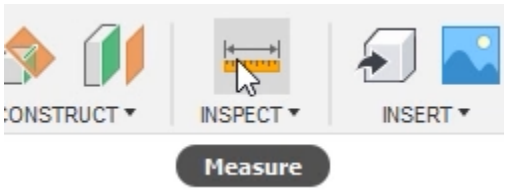


Figure 2. Open the Measure tool

3. Select the model's geometry and note its size. Close the dialog after you finish measuring the part.

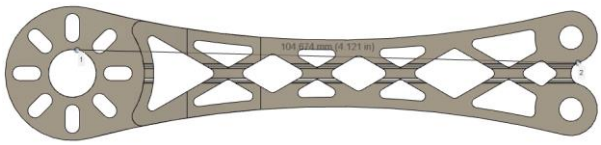


Figure 3. Measure the part

4. Some machines have better resolution than others; if your machine does not have very good resolution, it can be helpful to align your most important geometry vertically or horizontally. The vertical and horizontal slots on this arm could be options for mounting the more commonly sized motors while the diagonal slots could be options for mounting less commonly sized motors.

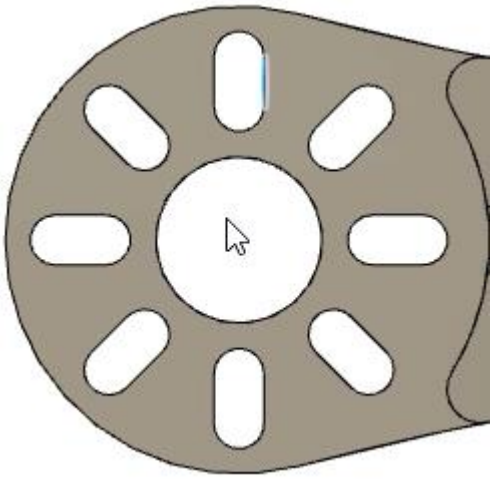


Figure 4. Choosing the geometry's orientation

5. Understanding your machine's overhang capabilities can be essential to designing and printing high quality parts. Printing geometry past a specific overhang angle will need to have support material. For example, if the quad copter arm is printed in the orientation shown in the image on the right, support material will need to be created to support the arm's end.

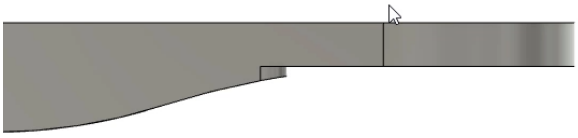


Figure 5. Inspect the part's overhang angles

6. Navigate to the FFF Quad Copter Assembly.f3d tab. This file has four instances of the quad copter arms and two instances of the base plates. Depending on the specific printer used to print the flat Base Plate components, the plates could warp and pull away from the printing plates. Creating test prints to test the geometry could save you a lot of wasted time.



Figure 6. Inspect the FFF Quad Copter Assembly file

7. Navigate to the SLS Quad Copter.f3d tab and notice that the quad copter's main chassis is one large 3D printed part. This geometry is intended to be printed on an SLS machine. SLS machines do not need to print support material because of the process they use to create the geometry.

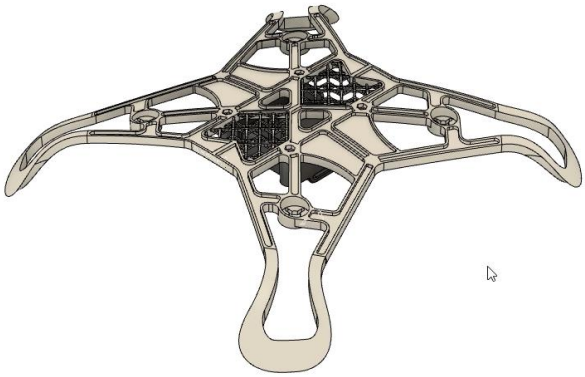


Figure 7. Inspect the SLS Quad Copter's geometry

8. Complex lattice structures can be created since support material does not need to be printed. In addition to FFF and SLS style machines, there are many other machine styles on the market. Understanding the unique benefits for each machine style will help you select the appropriate process for creating your parts.

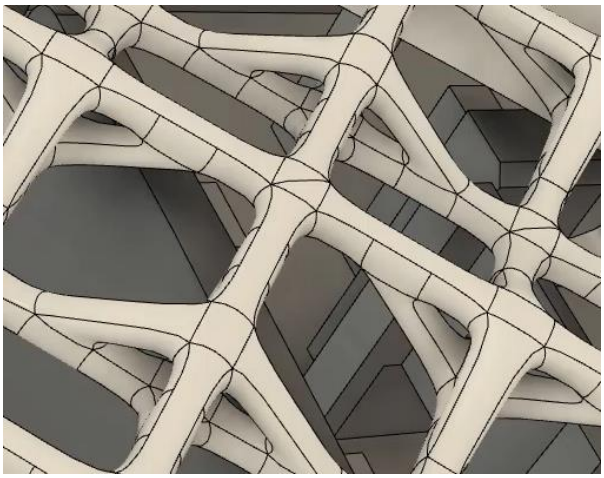


Figure 8. Inspect the model's geometry

9. Return to the FFF Quad Copter Arm tab and notice that there is a single body inside the Bodies folder.



Figure 9. Inspect the Browser's Bodies folder

10. Right-click Body1 and choose Save As Mesh.

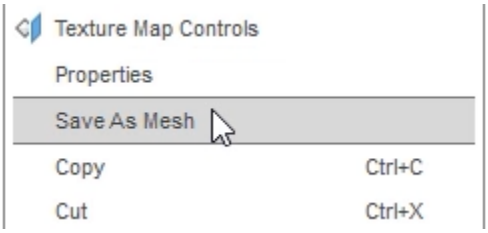


Figure 10. Save the body as a mesh

11. The various print utilities can use different file types. Choose the appropriate Format option from the dialog's Format menu.

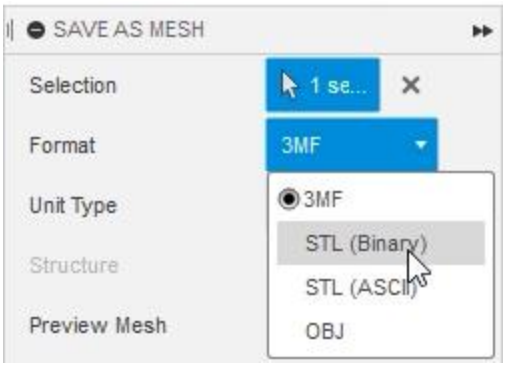


Figure 11. Change the Format type

12. Activate the dialog's Preview option to preview the mesh in the Canvas area.

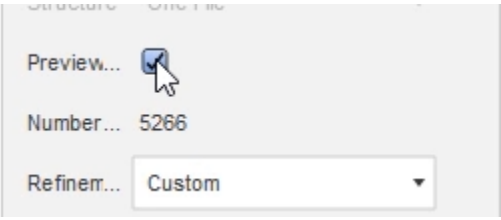


Figure 12. Preview the mesh

13. Explore the remaining options in the Save As Mesh dialog. For instance, the file could be sent directly to a specific print utility.

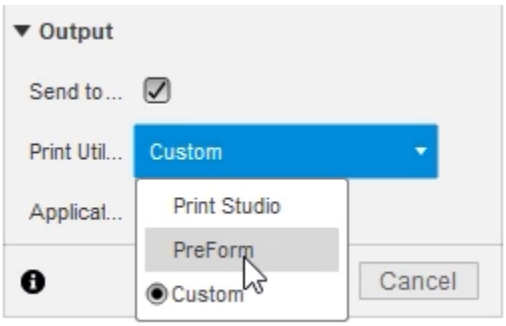


Figure 13. Explore the dialog's options

14. It's important to understand your specific machine's capabilities. There is no point in selecting a high refinement if your machine cannot resolve the extra detail. Cancel the dialog.

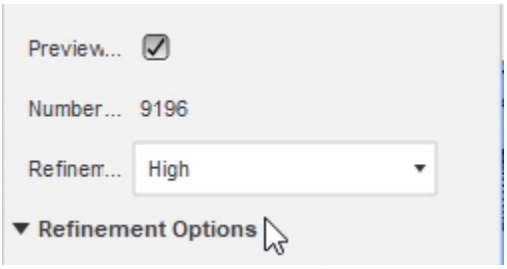


Figure 14. Select the dialog's Refinement option

15. Activate the Tools tab.



Figure 15. Activate the Tools tab

16. Click Make> 3D Print.

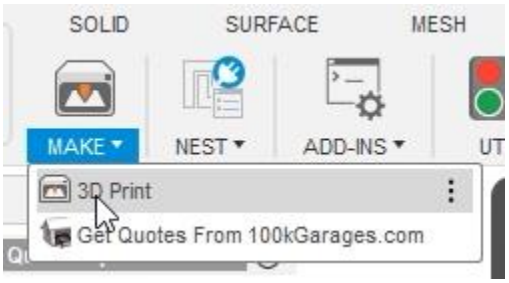


Figure 16. Open the 3D Print tool

17. Notice that the 3D Print dialog has the same options that you saw in Step 11. The only difference is that the Send to 3D Print Utility option is automatically checked. Cancel the 3D Print dialog.

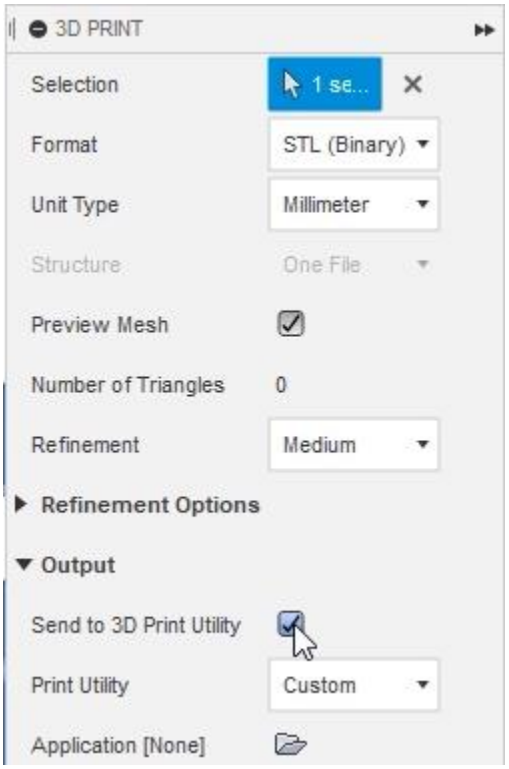


Figure 17. Inspect the 3D Print dialog

18. Click File> Export.

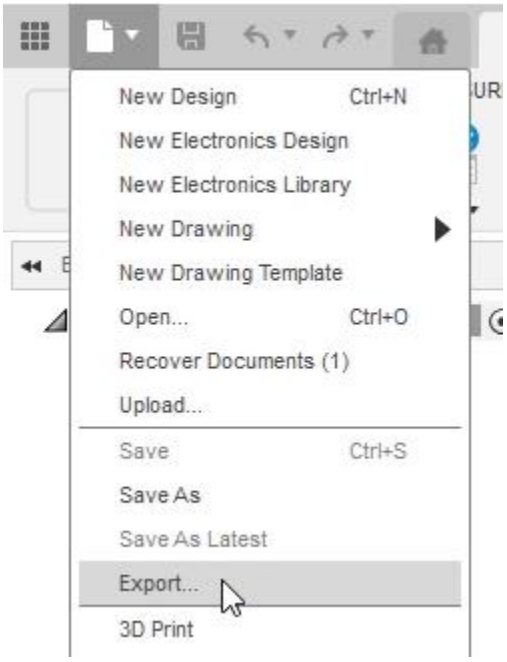


Figure 18. Click File> Export

19. Notice the various file types that you can use to export your geometry. Notice that this dialog does not have any control over the mesh's refinement. Cancel the dialog after you finish exploring its contents. Save any changes you have made to these three files, then continue to the next module.



Figure 19. Choose the export's file type