CAD and 3D Printing: The Digital Fabrication of Your Robot

A Guide on how to Get CADdy With It

by The Ponytail Posse

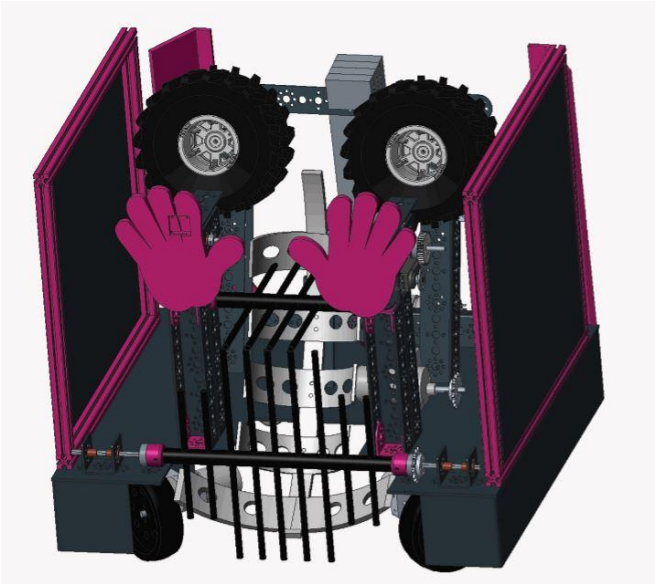
Outline

1. The Basics of CAD in FTC
2. Pointers on designing for 3D printing
3. Situations where 3D printing do and don't work

The Basics

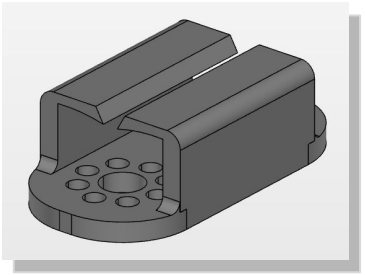
Why and How your team can use CAD

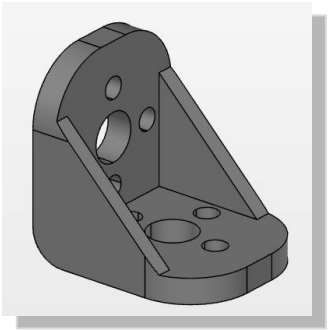
The Two Broad Functions of CAD

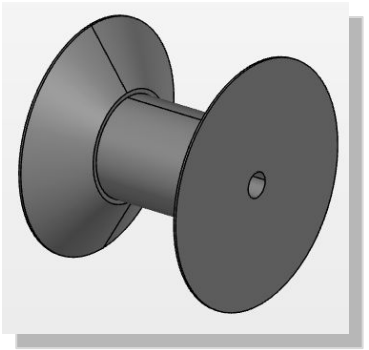


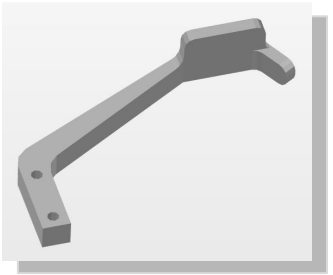
Assembling your robot, virtually testing it, etc.

OR





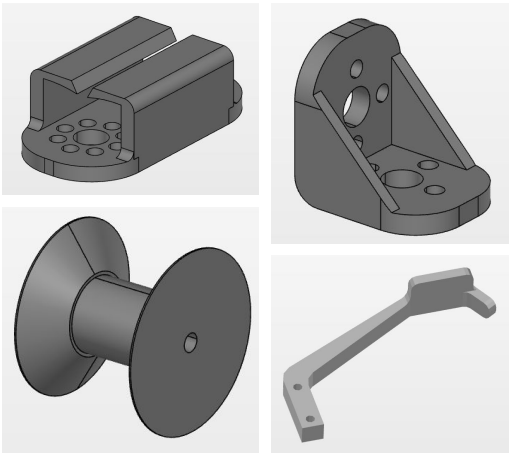




Designing custom parts for your robot's functions

Using CAD Effectively

- Utilizing the two broad functions of CAD with each other
- Custom parts are integrated into your kit of parts



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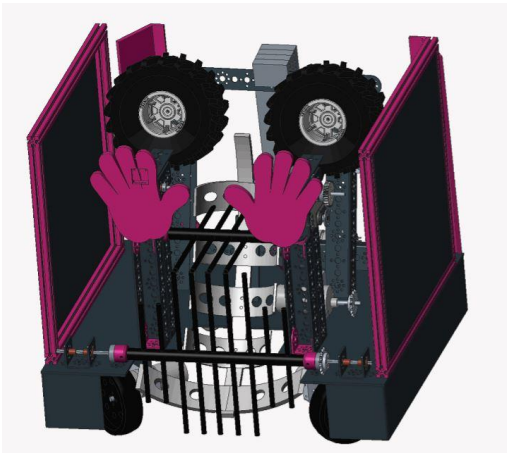

Ways to Use CAD Throughout the Season

- Planning out your entire robot beforehand
  - Works for teams who have experimented a lot with different mechanisms

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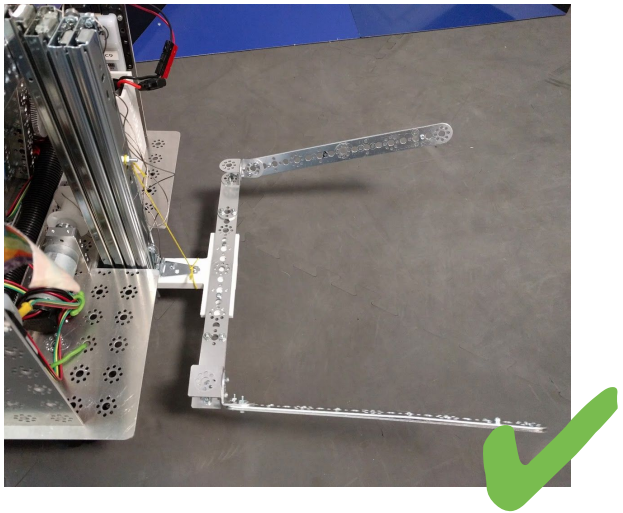
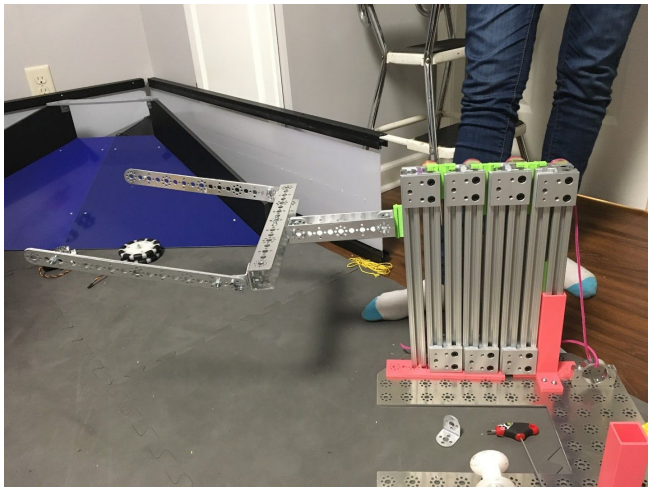




Ways to Use CAD Throughout the Season

- Planning out your entire robot beforehand
  - Works for teams who have experimented a lot with different mechanisms

OR

- Assembling your robot as you learn and experiment

Pointers for Designing for 3D Printing

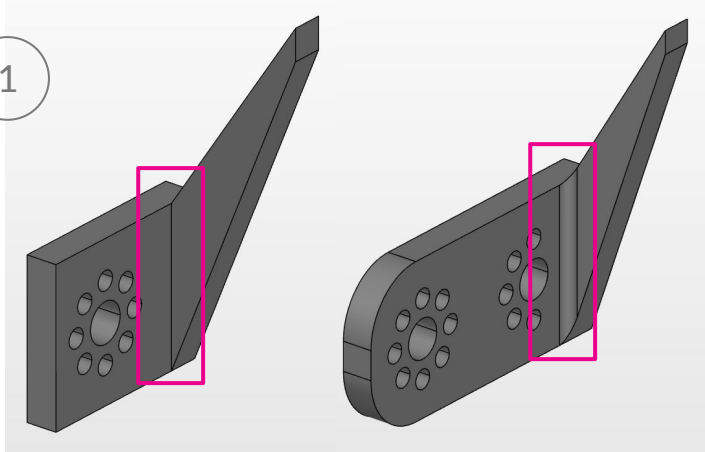
How to design smartly for 3D printed parts

Pointers

- Strengthening your part
- Minimizing your use of plastic
- General pointers

Strengthening your Part > Rounding edges

1



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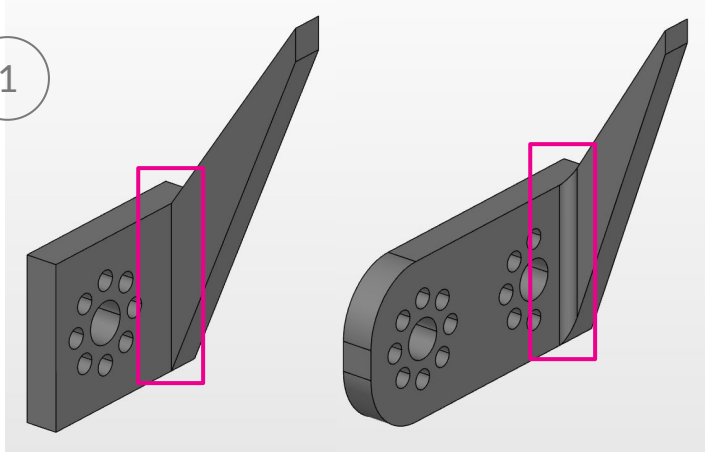

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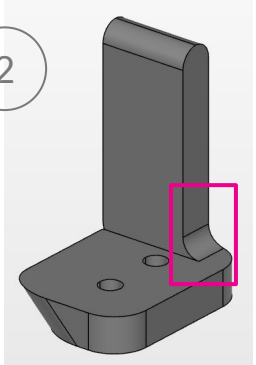

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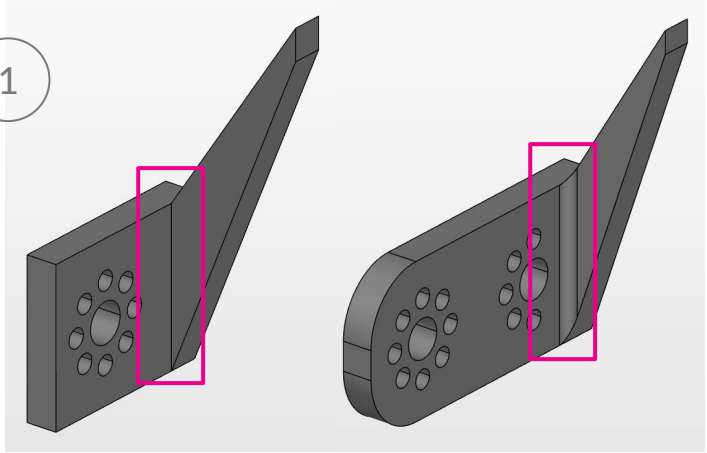

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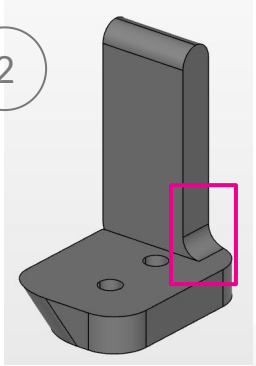

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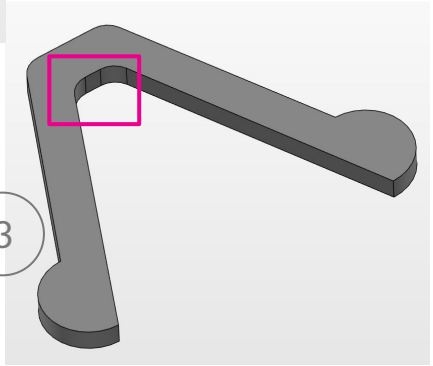

Strengthening your Part > Thickness of your Parts

- Adjust your part's thickness based on the function it will serve
- Minimum thickness for parts printed in PLA or ABS is 1/8"

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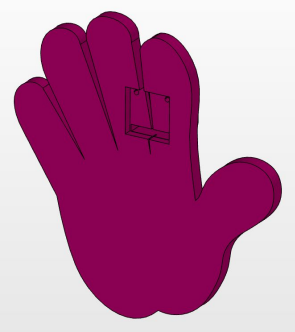

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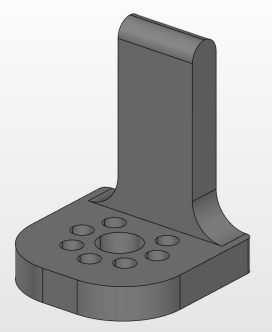
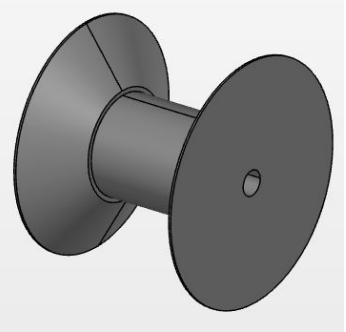
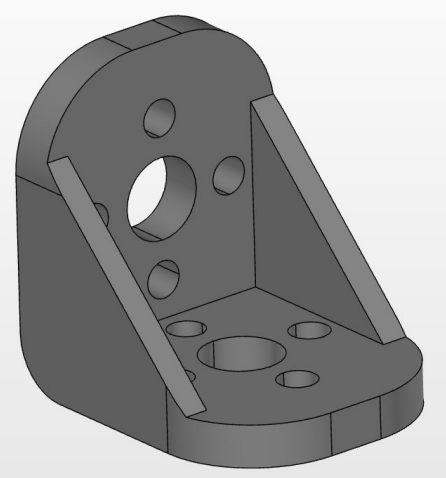


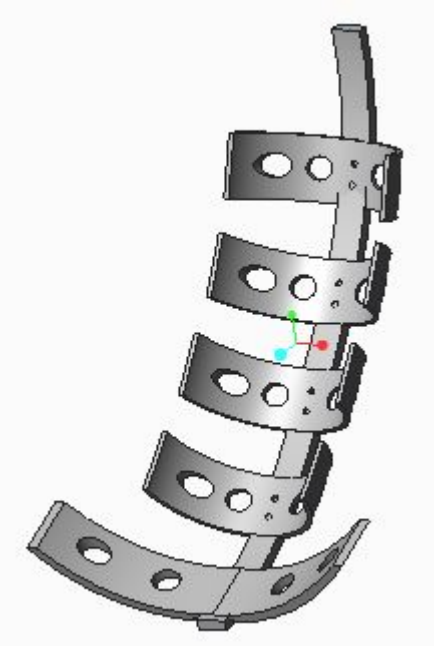


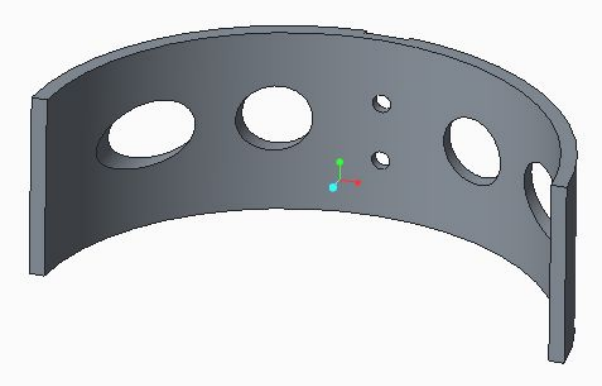
Strengthening your Part > Cross Braces

- Can be a substitute to rounding 90° angles on parts

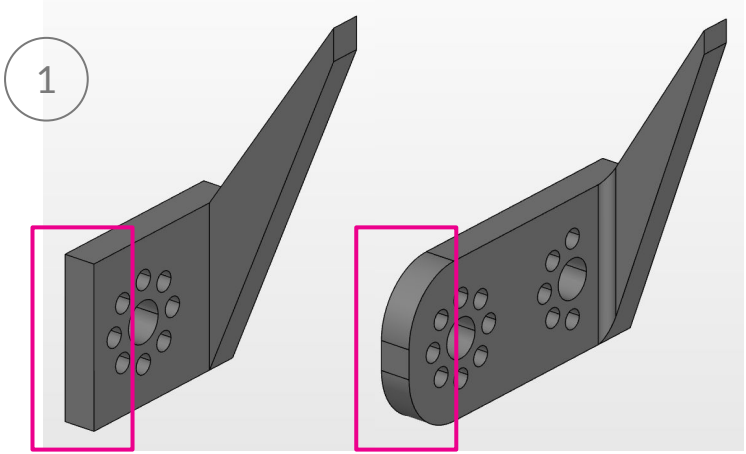


Minimizing your Use of Plastic > Putting Holes in your Parts





Minimizing your Use of Plastic > Rounding Corners



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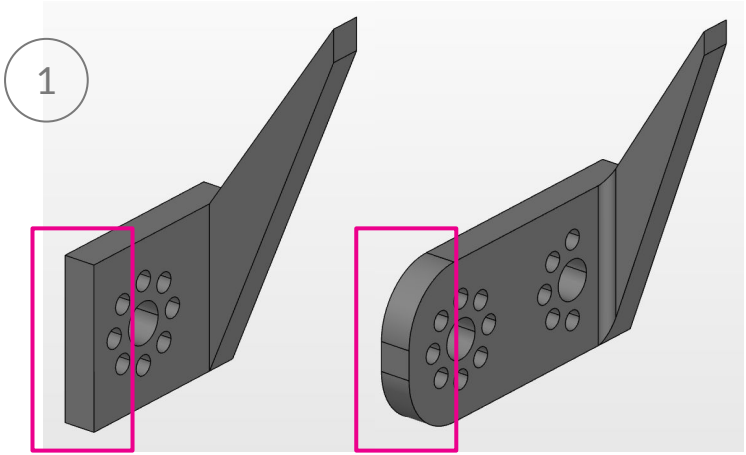
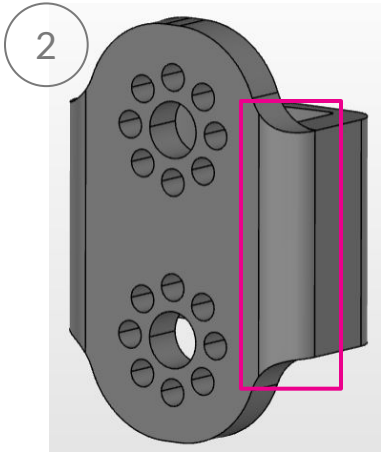
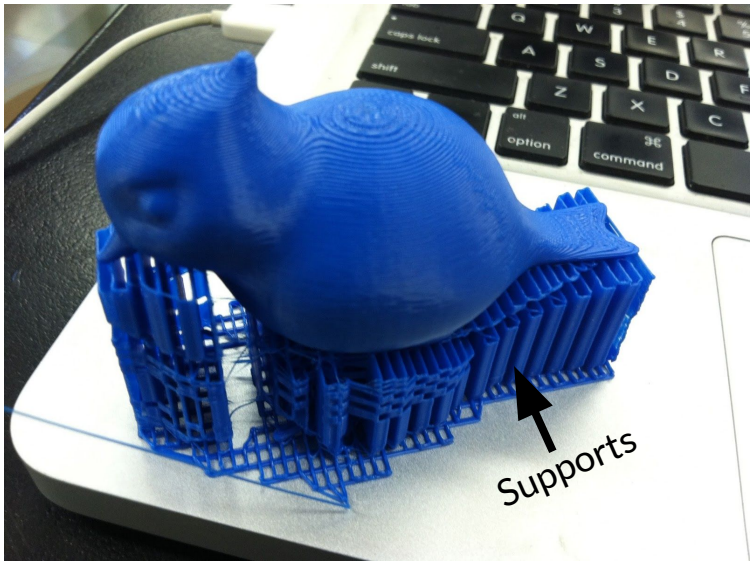




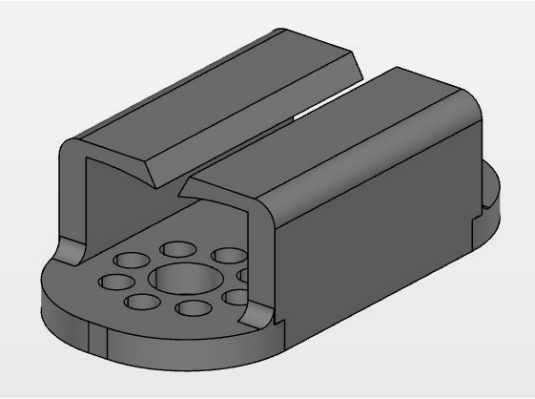
Minimizing your Use of Plastic > Orientation on Print Bed

- Think about the orientation of the print as you are modeling your part
- Choose the orientation that will take the least amount of time
- Choose an orientation that minimizes support material



General Pointers > Holes for Screws

- Not all holes that are intended to have screws in them have to be tight around the screw
- Making holes a little larger than the shaft diameter of the screw saves time when securing these 3D printed parts
- To ensure security in situations of high pressure, holes intended for screws should be 1/64” - 1/32” larger than the shaft diameter of the screw



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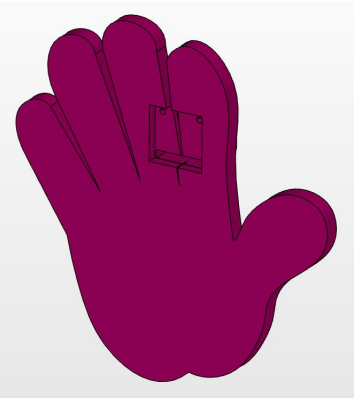
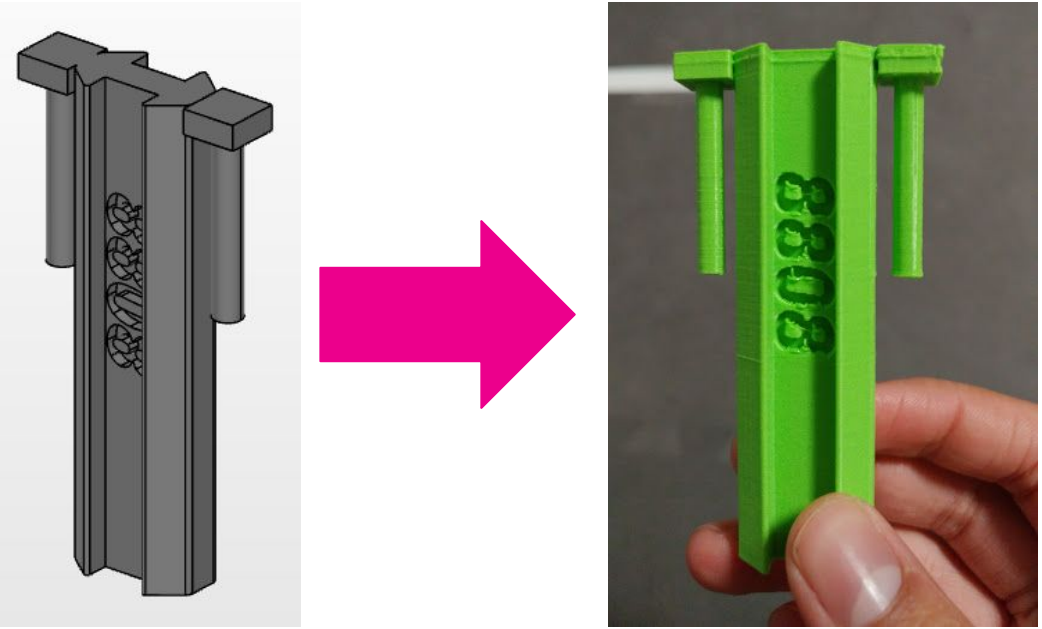


General Pointers > Adding Details to Prints

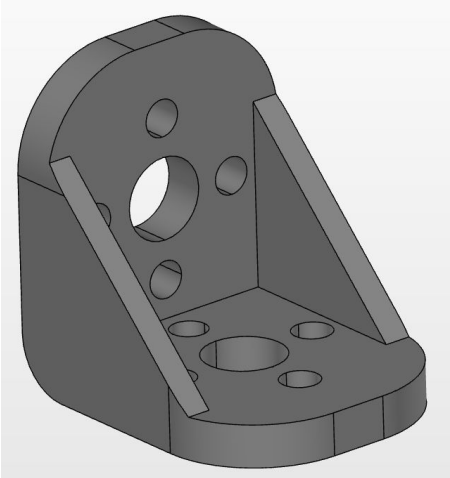
- Fine details (letters/numbers with a font size smaller than a square centimeter) will not show up



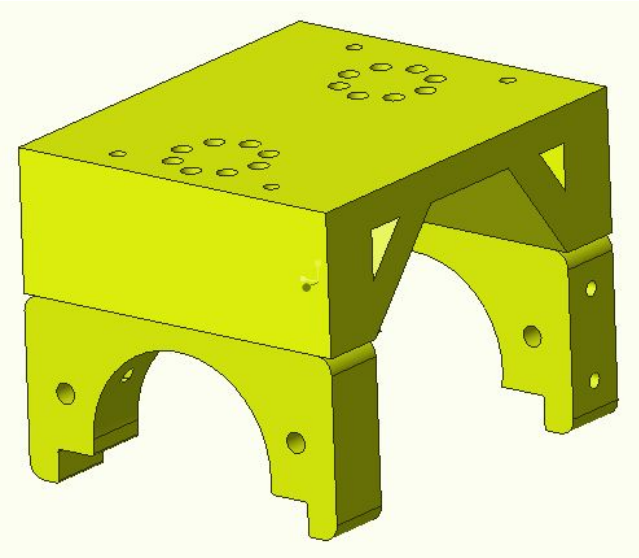
3D Printing and When You Should Use It

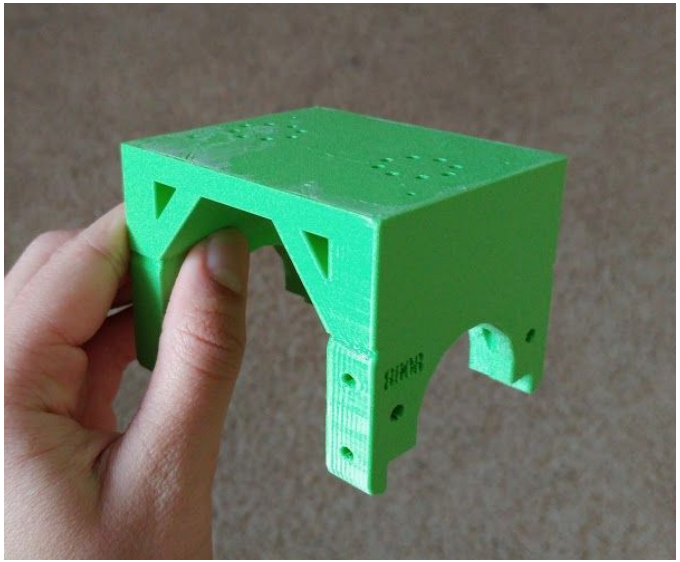
Example time

Custom Reinforced Tetrix Ls



Custom Motor Mount





Custom Funnel (Cascade Effect)

Handy Dandy Links

- GrabCAD: https://grabcad.com/library
- PTP's GrabCAD Profile: https://grabcad.com/ponytail.posse-2
- Download PTC Creo: https://www.ptc.com/en/academic-program/products/free-software/creo-download
- YouTube, a lifesaver

Thanks for listening!
Any questions?

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