

OpenSCAD

Rob Probin, May 2022

MINOS 2022, UKMARS.org robot conference

History

- CAD (2D, 3D, PCB)
- Blender
- 3D Printer
 - FreeCAD
 - Ended up switching to OpenSCAD

OpenSCAD - The Programmers Solid 3D CAD Modeller

- Write code, see results
- Sounds painful :-)
- But popular?!

OpenSCAD - The Programmers Solid 3D CAD Modeller

Alternatives with similar text based entry

(I haven't used!)

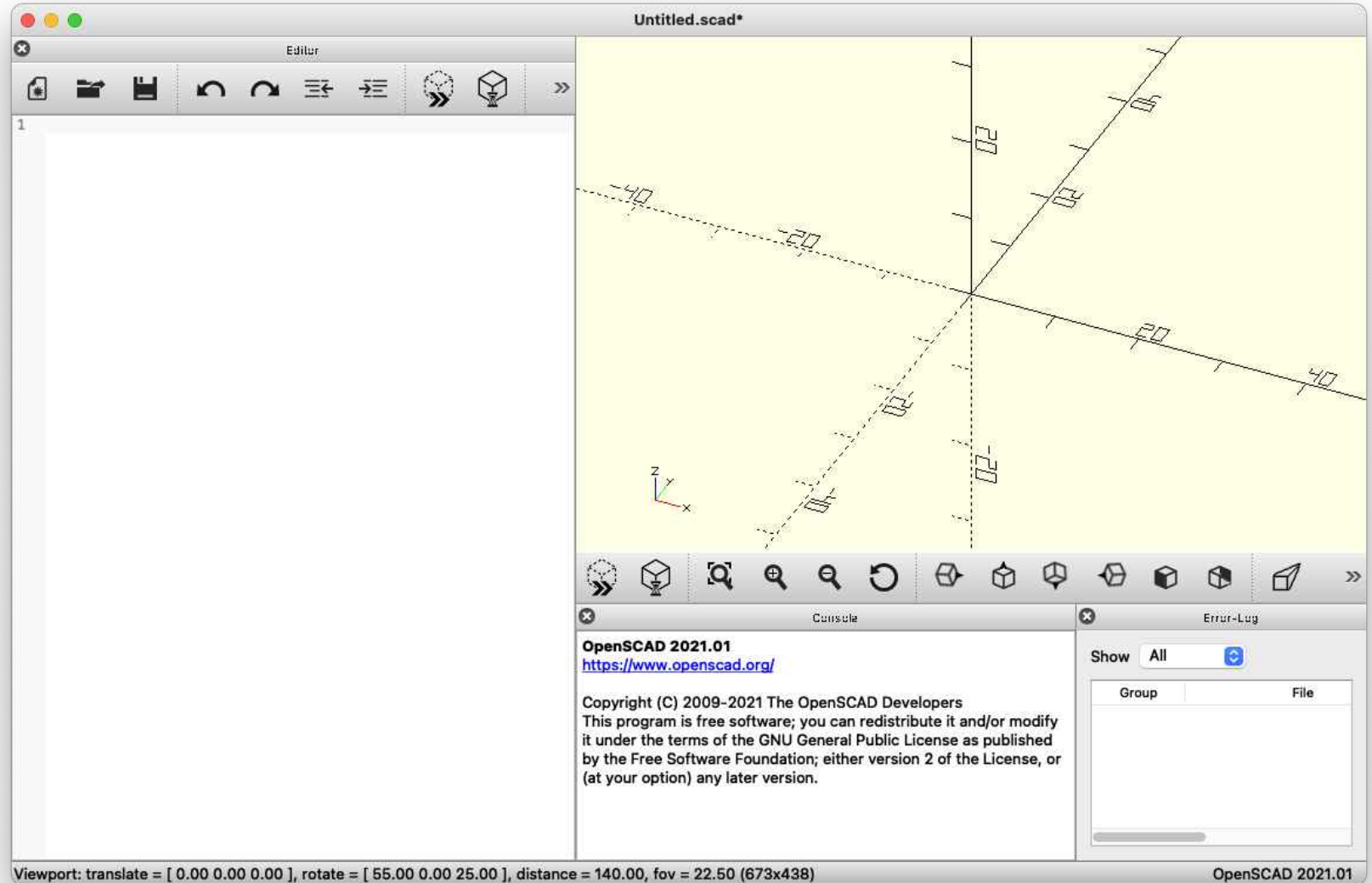
- OpenJSCAD – similar but online <https://openjscad.com/>
 - Support?
 - Web app :-(
- Fusion360??
- PLaSM???

How?

- Cheatsheet
 - <http://openscad.org/cheatsheet/index.html>
- Standard C-like language
- Functional not imperative programming language...
 - = can't modify variables
 - But less of a problem than you think
 - But it will catch you out :-)

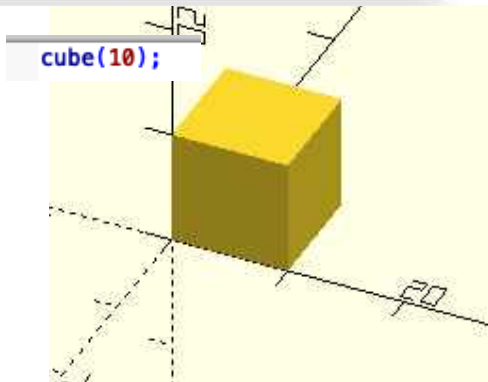
Examples

- Simple shapes
 - View / layout
 - cube, cylinder
 - Union, difference
 - \$fn
- Rounded corners
 - Bell holder, hobby box
- Spur gears / Gear trains
- Keyboard stand replacement
- STL files
- Inkscape

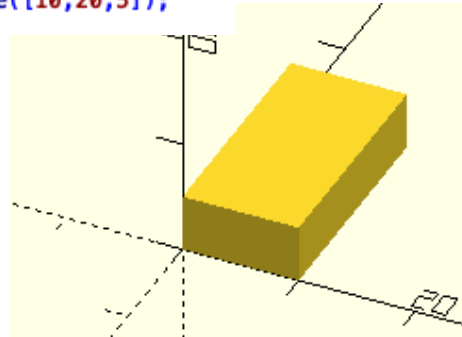


Simple Examples

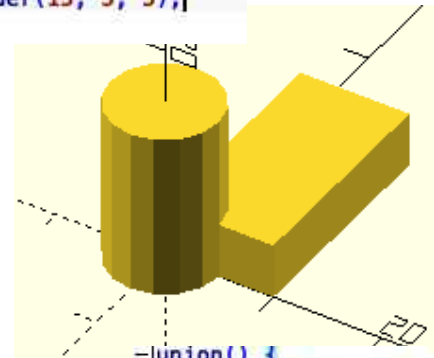
```
1 cube(  
  cube(size  
  cube([width, depth, height])  
  cube([width, depth, height], center = true)
```



```
cube([10,20,5]);
```

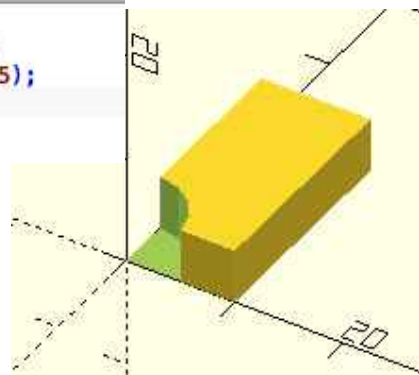


```
1 cube([10,20,5]);  
2 cylinder(15, 5, 5);
```

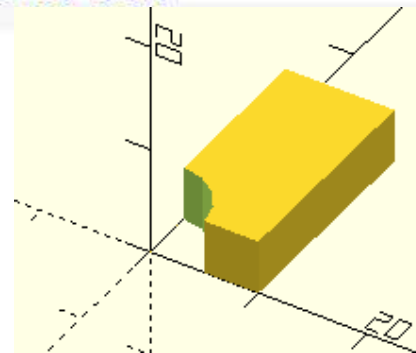


```
union() {  
  cube([10,20,5]);  
  cylinder(15, 5, 5);  
}
```

```
1 difference() {  
2   cube([10,20,5]);  
3   cylinder(15, 5, 5);  
4 }
```

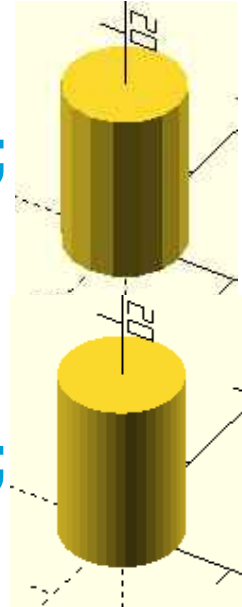


```
1 difference() {  
2   cube([10,20,5]);  
3  
4   // Without translation: The lower part is a infinitely thin face.  
5   translate([0, 0, -0.1]) cylinder(15, 5, 5);  
6 }
```

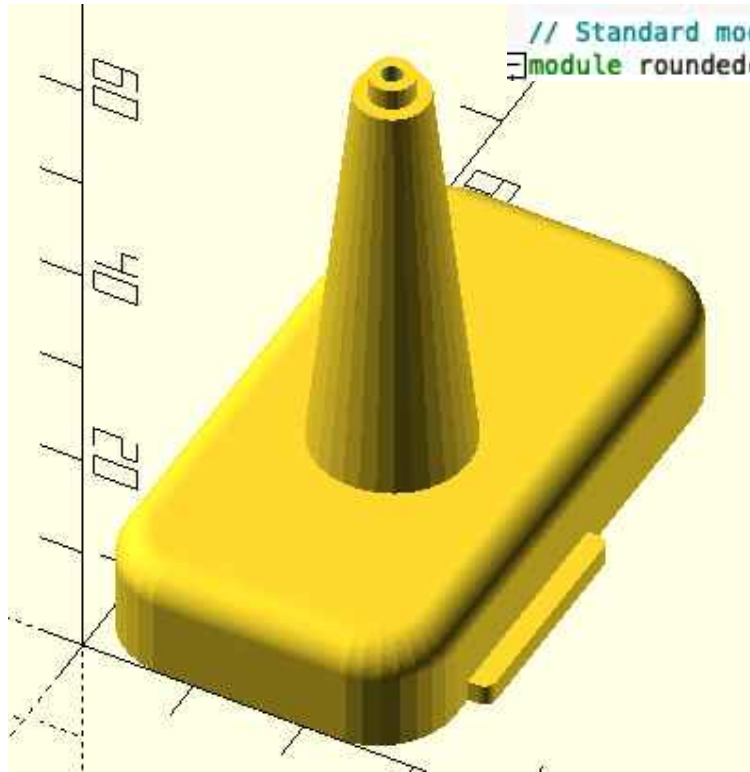



```
cylinder(15, 5, 5);
```

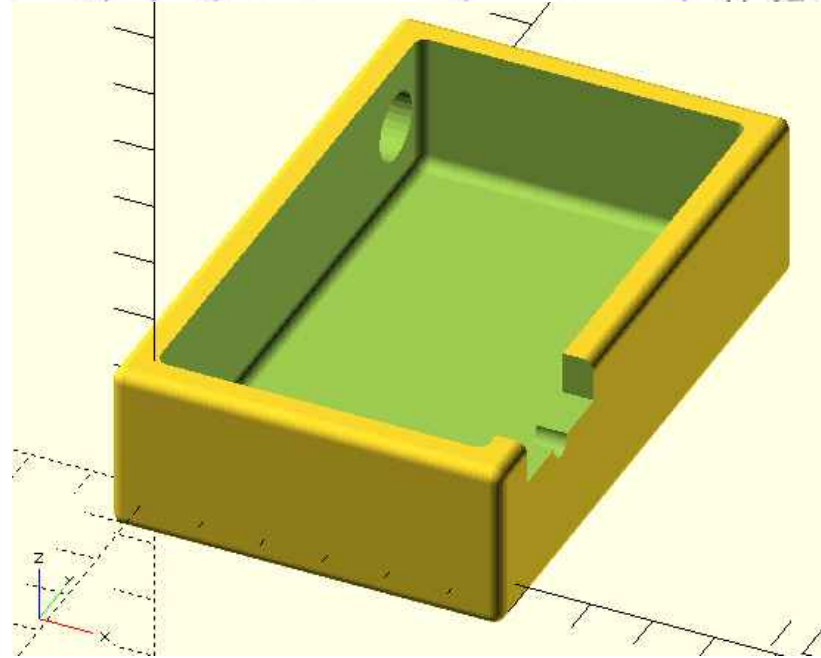
```
cylinder(15, 5, 5, $fn=40);
```



Round corners



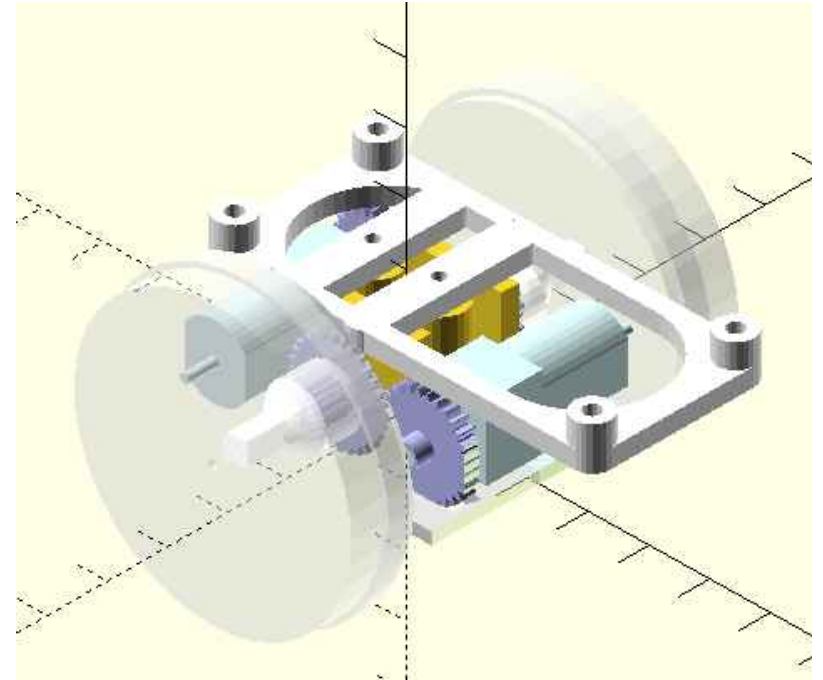
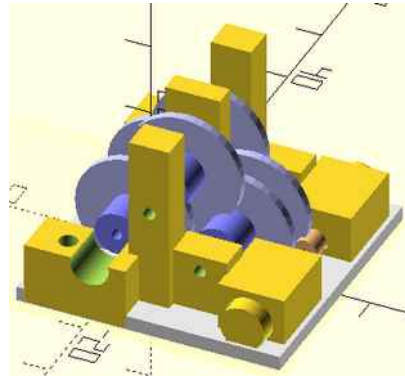
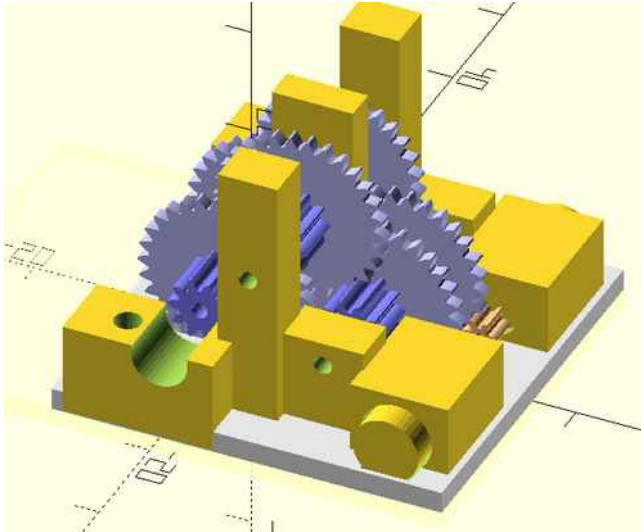
```
// Standard module for creating a rounded box  
module roundedcube(size = [1, 1, 1], center = false, radius = 0.5, apply_to = "all") {
```



Sometimes have to watch about rendering times...

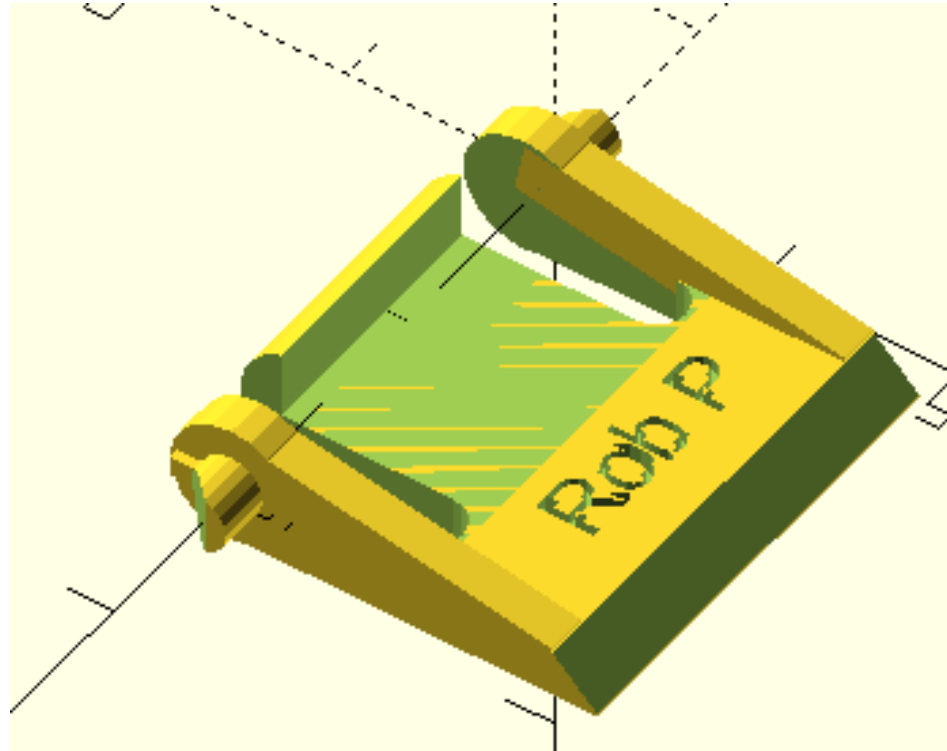
Spur Gears & Gear trains

Trivial to write an abstraction so you can render as cylinders for speed when previewing



```
use <pd-gears/pd-gears.scad>  
use <rpi ukmarsbot mount5.scad>
```

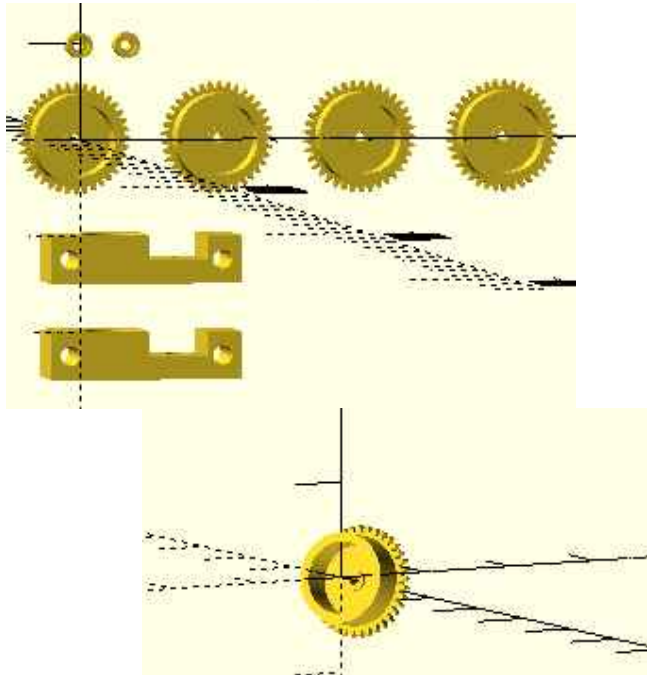
Keyboard Stand



1 page of code

Add / remove bits from STL files

By union/ difference



```

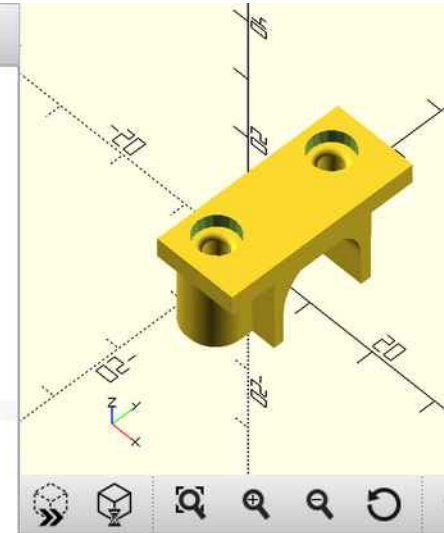
difference() {
  translate([0,0,-25]) import("DMMpartsZirconia.stl", convexity = 4);
  union() {
    translate([-7, -10, 7]) cube([20, 20, 20]);
    translate([7, -10, -7]) cube([50, 20, 20]);
    translate([-7, -10, -28]) cube([50, 20, 20]);
  }
}

```

```

1 import("pololu-gear-motor-bracket-standard.stl");
2
3 // stop up top holes
4 //translate([2,-11.5,10]) cube([5,23,2]);
5
6 module pegs(y_offset)
7 {
8   translate([4.25, y_offset, -2])
9   {
10    //
11    difference()
12    {
13      //cylinder(20, 1.5, 1.5, $fn=20);
14      translate([0, 0, 5])
15      {
16        cylinder(20, 3, 3, $fn=20);
17      }
18    }
19    // cutout clips
20    //translate([-5, -0.5, -0.01]) cube([10, 1, 2]);
21  }
22 }
23
24
25
26 difference()
27 {
28   translate([0, -14, 11]) {

```



```

Console
Parsing design (AST generation)...
Compiling design (CSG Tree generation)...
Compiling design (CSG Products generation)...
Geometries in cache: 39
Geometry cache size in bytes: 428784
CGAL Polyhedrons in cache: 0
CGAL cache size in bytes: 0
Compiling design (CSG Products normalization)...
Normalized tree has 4 elements!
Compile and preview finished.
Total rendering time: 0:00:00.085

```

Import Inkscape 2D vector drawing

