

The Universal OS: now making tabletop games and cookie cutters!

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The problem: I needed this



...and this



... and ...



Prerequisites

- ▶ 3D printer

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- ▶ joining the 3dprinter team (to package software for. . .)

Hardware

- ▶ Proprietary “consumer” devices (stay away!)
- ▶ Lulzbot (Respects Your Freedom certified)
- ▶ RepRap family

3D Printing Workflow

- ▶ modelling
- ▶ STL adjustment
- ▶ slicing
- ▶ printer control

Modelling: Blender

The screenshot displays the Blender 2.80 interface with a character rig for a rabbit. The 3D viewport shows a purple rabbit character with a complex skeleton and control rig. The left sidebar shows a list of bones and their corresponding control points. The bottom status bar shows the current frame is 104.

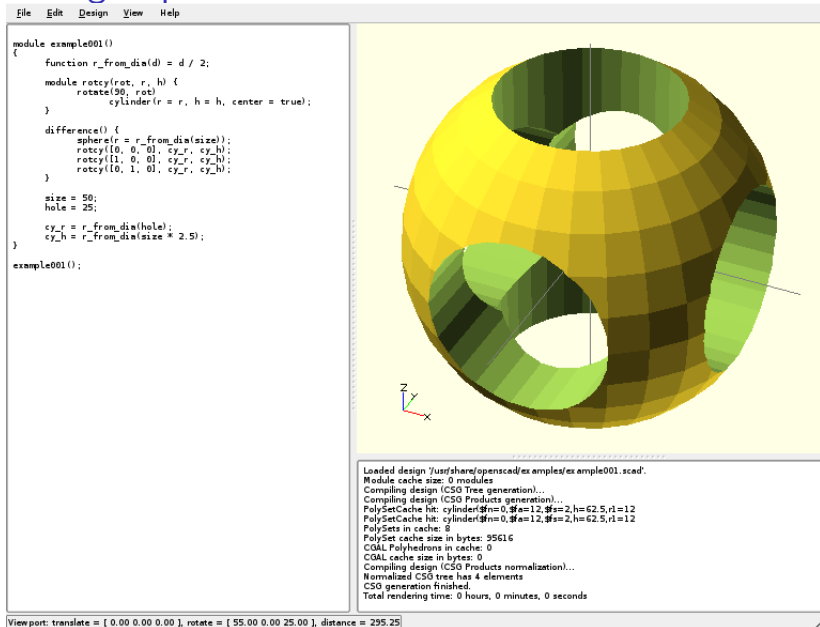
Left Sidebar (Bone List):

- CTRL_Pelvis
- CTRL_Spine1
- CTRL_Spine2
- CTRL_RibCage
- CTRL_Clavicle.L
- CTRL_Clavicle.R
- CTRL_Head
- CTRL_Foot.L
- CTRL_IFinger.L
- CTRL_PFinger.L
- CTRL_MFinger.L
- CTRL_Thumb.L
- CTRL_HandCurl.L
- CTRL_HandCurl.R
- CTRL_PFinger.R
- CTRL_IFinger.R
- CTRL_Thumb.R
- CTRL_MFinger.R
- CTRL_Foot.R
- CTRL_Neck
- CTRL_BKFK-Switch.L
- CTRL_BKFK-Switch.R

3D Viewport: A purple rabbit character is shown in a 3D viewport. The rig consists of a central spine, two clavicles, two hands with fingers, two feet, and a neck. Control points are represented by blue spheres connected to the bones by lines. A green line connects the spine to the neck. The rabbit is in a standing pose with its right hand pointing forward.

Bottom Status Bar: View Select Channel Marker Key ACJC3. Frame: 104. Playback controls are visible.

Modelling: OpenSCAD



```
module example001()
{
    function r_from_dia(d) = d / 2;

    module rotcy(rot, r, h) {
        rotate(90, rot)
        cylinder(r = r, h = h, center = true);
    }

    difference() {
        sphere(r = r_from_dia(size));
        rotcy([0, 0, 0], cy_r, cy_h);
        rotcy([1, 0, 0], cy_r, cy_h);
        rotcy([0, 1, 0], cy_r, cy_h);
    }

    size = 50;
    hole = 25;

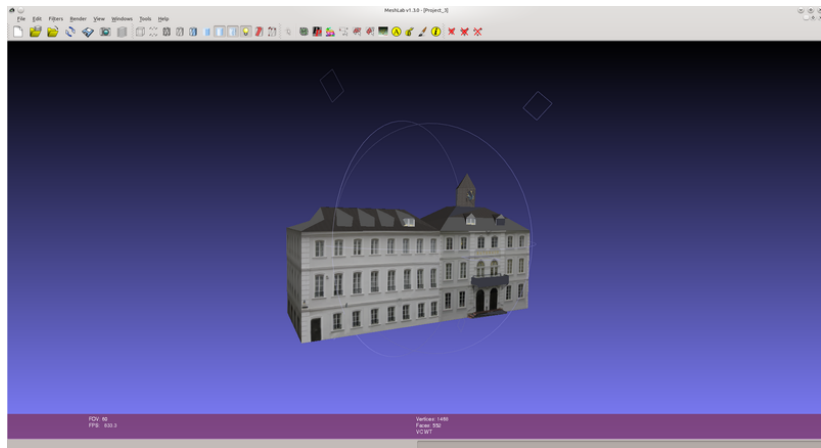
    cy_r = r_from_dia(hole);
    cy_h = r_from_dia(size * 2.5);
}

example001();
```

Loaded design 'J:\usr\share\openscad\examples\example001.scad'.
Module cache size: 0 modules
Compiling design (CSO Tree generation)...
Compiling design (CSO Products generation)...
PolySetCache hit: cylinder\$fn=0,\$fa=12,\$fs=2,h=62.5,r=12
PolySetCache hit: cylinder\$fn=0,\$fa=12,\$fs=2,h=62.5,r=12
PolySets in cache: 6
PolySet cache size in bytes: 55616
CGAL Polyhedrons in cache: 0
CGAL cache size in bytes: 0
Compiling design (CSO Products normalization)...
Normalized CSO tree has 4 elements
CSO generation finished.
Total rendering time: 0 hours, 0 minutes, 0 seconds

View port: translate = [0.00 0.00 0.00], rotate = [55.00 0.00 25.00], distance = 295.25

STL Adjustment

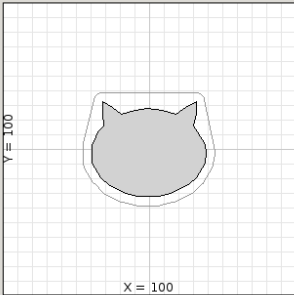


https://screenshots.debian.net/screenshots/m/meshlab/9538_large.png

Slicing

File Plater Window Help

Plater | Print Settings | Filament Settings | Printer Settings



Y = 100

X = 100

More Fewer 45° ccw 45° cw Rotate... Scale... Split

Name	Copies	Scale
cat.stl	1	100%

Add... Autoarrange Export G-code...
Delete Delete All Export STL...

Print settings: pendant.ini (modified) Filament: pendant.ini Printer: pendant.ini

G-code file exported to /home/valhalla/projects/3dprint/debian/pendants/cat.gcode

Printer Control

The screenshot shows the OctoPrint web interface in a browser window. The browser address bar shows the URL 192.168.1.51:5000. The page title is "OctoPrint". The user is logged in as "valhalla".

Connection

State

Machine State: **Operational**
File: **cat.gcode**
Filament: **1.48m / 10.49cm³**
Estimated Print Time: **00:31:51**
Timelapse: -
Height: **2.60 mm**
Print Time: **00:41:20**
Print Time Left:
Printed: **979.5KB / 979.5KB**

Print **Pause** **Cancel**

Files

Name	Size	Action
cat.gcode	979.5KB	
die-clubs-12.gc...	238.7KB	
die-diamonds-1...	210.2KB	
pyramid.gcode	34.5KB	
round_carved...	509.9KB	

Free: 143.4MB

1 2

Upload **Upload to SD**

Temperature **Control** **GCode Viewer** **Terminal**

X/Y **Z** **E** **General**

↑ **↑** mm **Motors off**

← **↺** **→** **↻** **Extrude** **Fans on**

↓ **↓** **Retract** **Fans off**

0.1 1 10 100

Status in Debian

- ▶ modelling: OK
- ▶ STL adjustment: OK
- ▶ slicing: Partial
- ▶ printer control: Partial

Modelling with Debian packages

In Debian:

- ▶ OpenSCAD
- ▶ Blender
- ▶ FreeCad
- ▶ ...

Missing:

- ▶ Something easy for casual users like Sketchup

STL adjustment with Debian packages

In Debian:

- ▶ meshlab

Slicing with Debian packages

In Debian:

- ▶ RepSnapper
- ▶ sfact
- ▶ cura-engine

Missing:

- ▶ slic3r (#689636)

Printer Control with Debian packages

In Debian:


- ▶ RepSnapper

Missing:

- ▶ octoprint (#718591)
- ▶ printrun (#695336)

3D-printing Team



<https://commons.wikimedia.org/wiki/File:> 

Questions?



Links

3D-printer team:

- ▶ alioth:
`https://alioth.debian.org/projects/3dprinter/`
- ▶ wiki page: `https://wiki.debian.org/3D-printer`
- ▶ mailing list: `https://lists.alioth.debian.org/mailman/listinfo/3dprinter-general`

Models:

- ▶ `https://gitorious.org/valhalla-3d`
- ▶ `http://www.trueelena.org/fantastic/feelies/3d_printed_piecepack.html`