Matt Keeter

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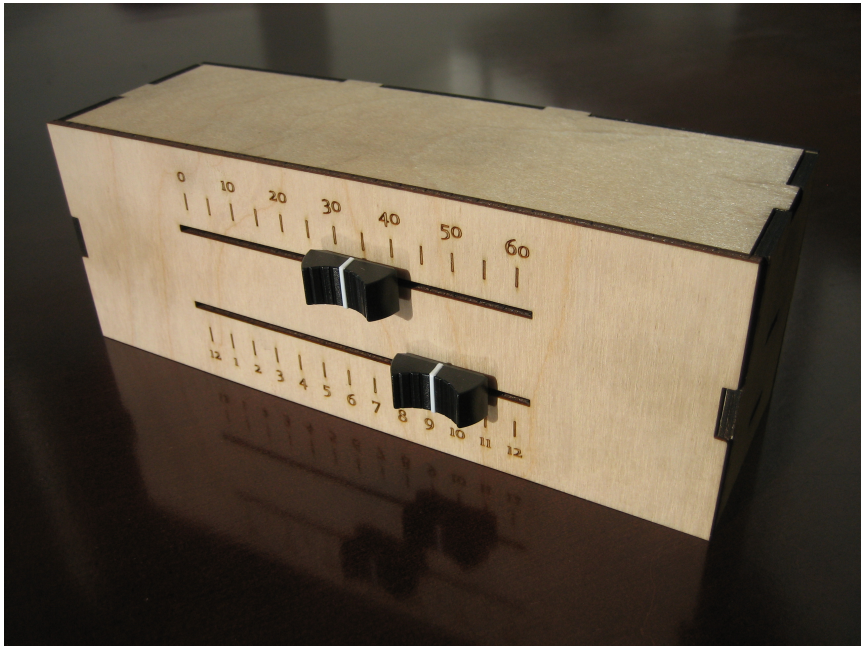
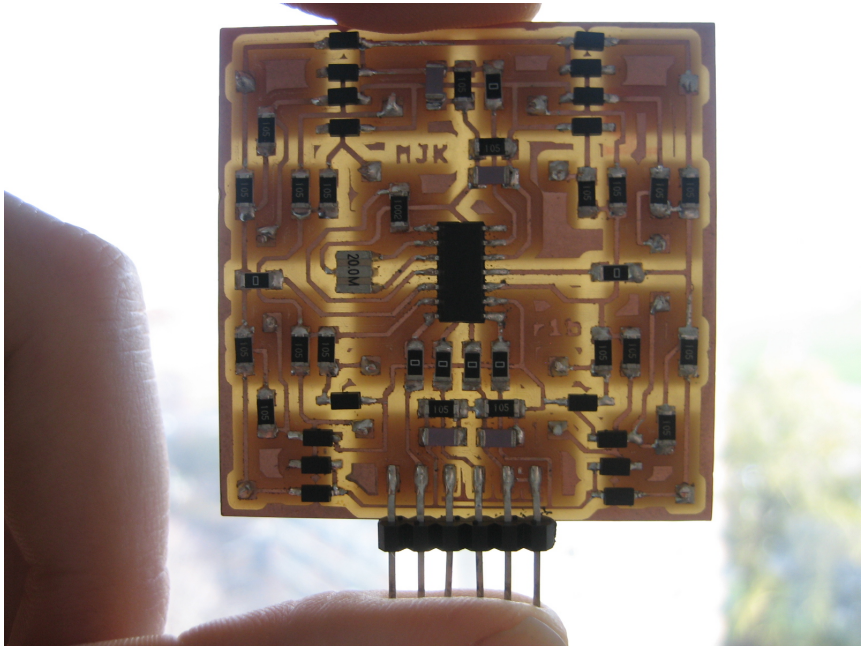
THE CENTER FOR BITS AND ATOMS
Massachusetts Institute of Technology



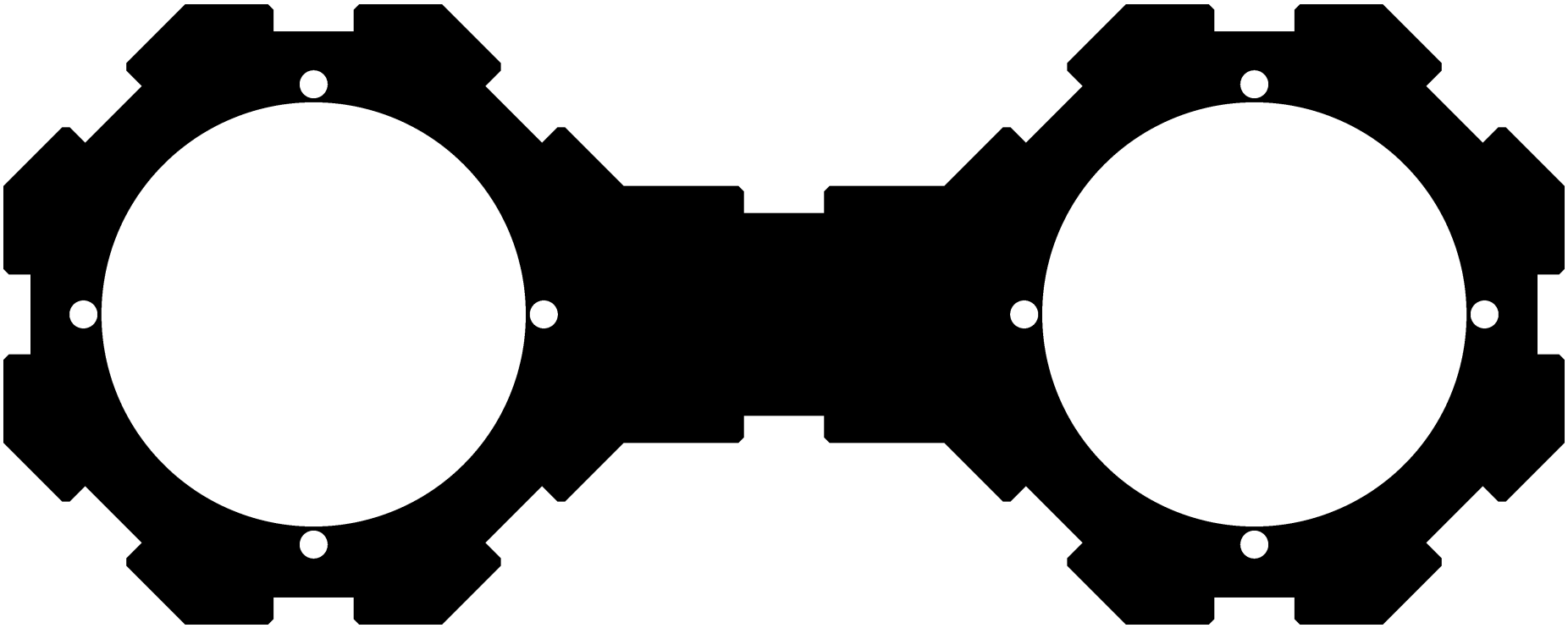


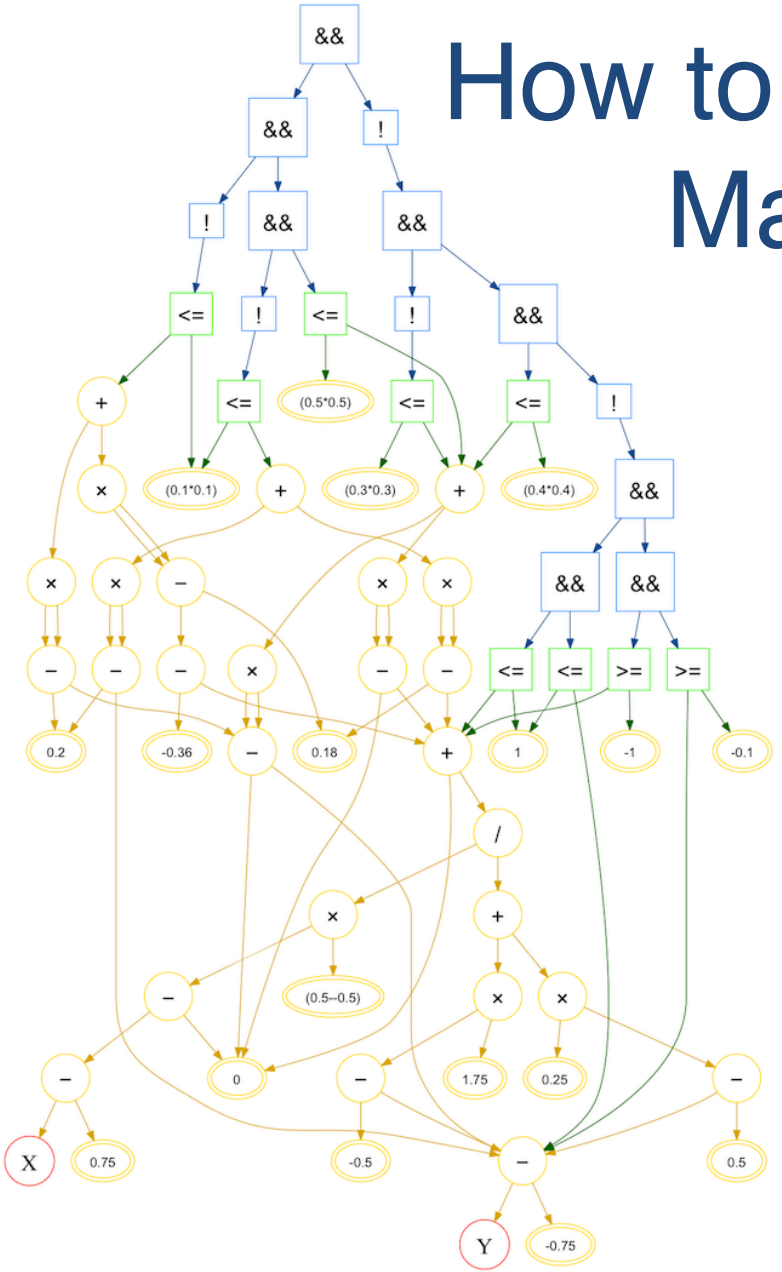
How to Make (Almost) Anything

Fall 2011

Fab Boombox

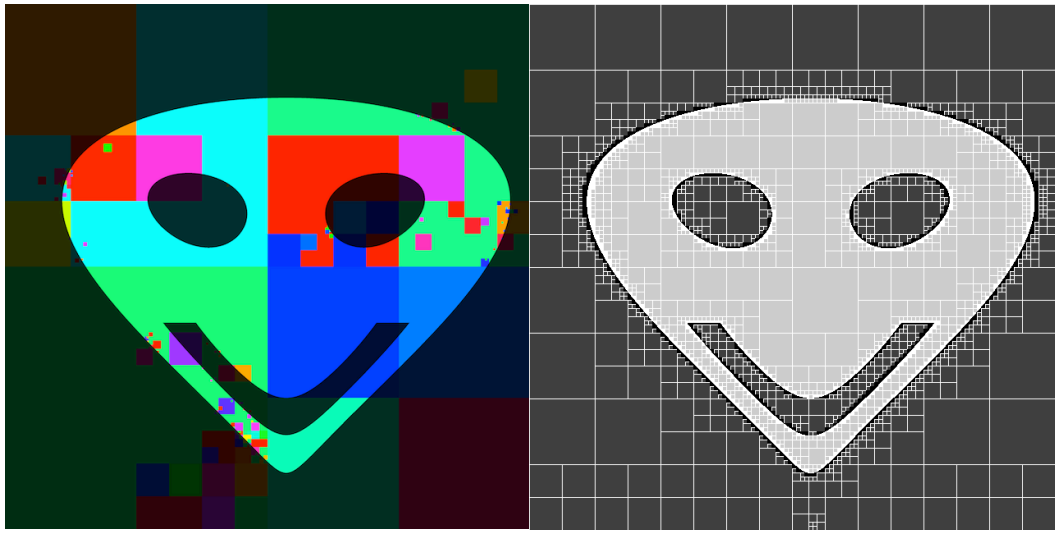
```
import sys
sys.path.append('/'.join(sys.argv[1].split('/')[:-1]))
from shapes import *
from constants import *

# Make the basic octagon shape
octagon = triangle(0, 0,
                   -octagon_side / 2, octagon_height / 2,
                    octagon_side / 2, octagon_height / 2)
octagon = reduce(add, [rotate(octagon, 360 / 8. * i) for i in range(8)], '0')
oct_slot = slot(0, octagon_height / 2)
octagon = reduce(subtract, [rotate(oct_slot, 360 / 8. * i - 360. / 8) for i in range(7)], octagon)

# Cut out a hole for the speakers
octagon = subtract(octagon, circle(0, 0, speaker_center_radius))

# Cut out screw holes as well
for i in range(0, 360, 90):
    octagon = subtract(octagon, rotate(circle(0, speaker_hole_loc, speaker_hole_radius), i))

octagons = add(move(octagon, -octagon_center_offset, 0),
               move(reflect_x(octagon, 0), octagon_center_offset, 0))

frame = add(octagons, rectangle(-front_panel_width / 2, front_panel_width / 2,
                                -octagon_side / 2, octagon_side / 2))
frame = subtract(frame, slot(0, octagon_side / 2))
frame = subtract(frame, reflect_y(slot(0, octagon_side / 2)))

cad.xmin = -octagon_height - front_panel_width / 2 - border
cad.xmax = -cad.xmin
cad.ymin = -octagon_height/2 - border
cad.ymax = -cad.ymin
cad.mm_per_unit = 25.4 # inch units

cad.function = frame
```





How to Make Something That Makes (Almost) Anything

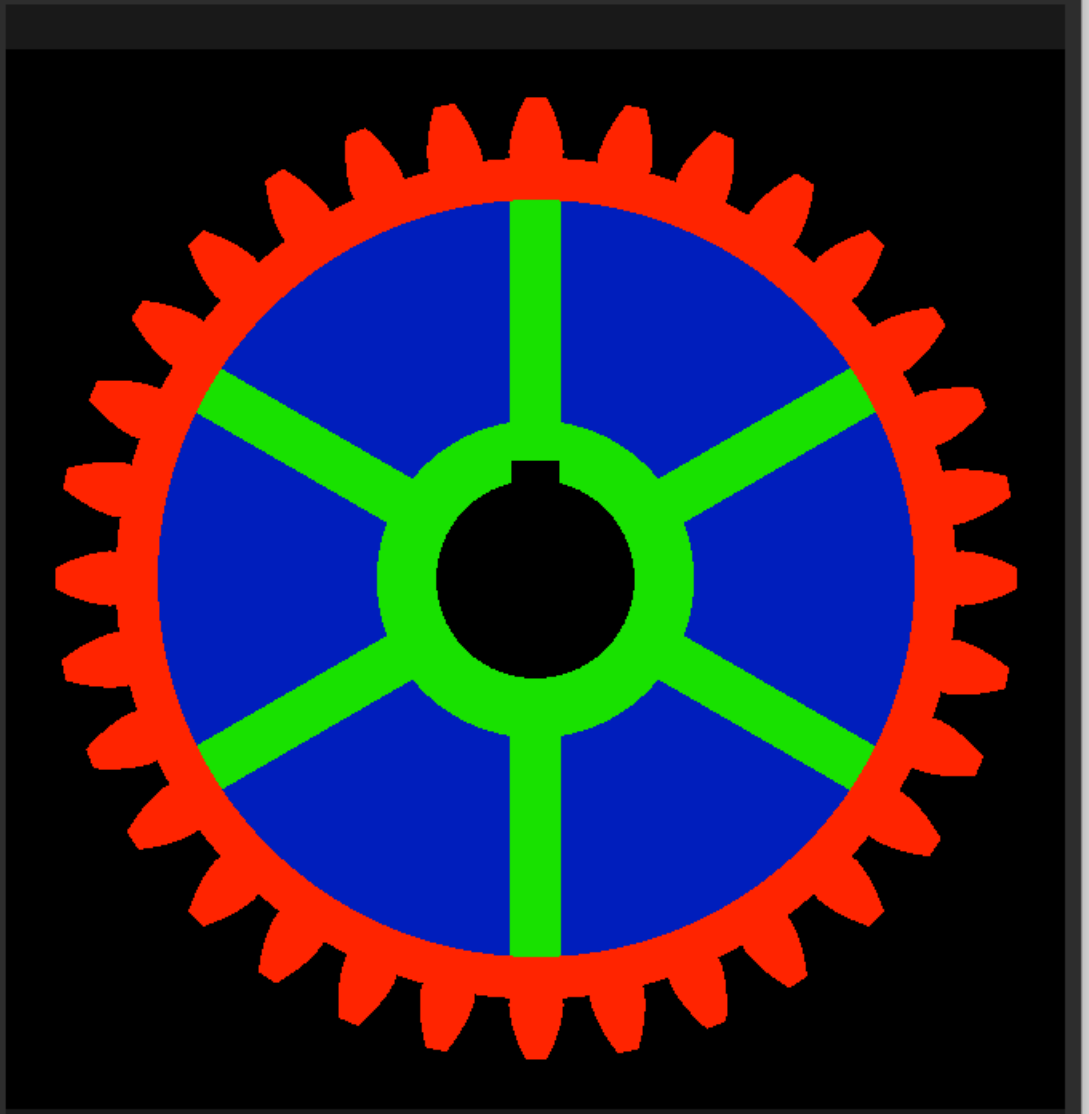
Spring 2012



kokopelli: gear.cad

kokopelli 0.2

```
45
46 tooth.shape = True
47 tooth &= reflect_y(tooth)
48
49 # If we have an odd number of teeth, then we can't take
50 # advantage of bilateral tooth symmetry.
51 if N % 2:
52     tooth &= -X
53     teeth = reduce(operator.add, [rotate(tooth, i*360/N)
54                                   for i in range(N)])
55 else:
56     teeth = reduce(operator.add, [rotate(tooth, i*360/N)
57                                   for i in range(N/2)])
58
59 teeth += circle(0, 0, RR)
60 teeth &= circle(0, 0, RO) - circle(0, 0, RR*0.9)
61 teeth.bounds = circle(0, 0, RO).bounds
62 teeth = extrusion(teeth, -0.1, 0.1)
63
64 teeth.color = 'red'
65
66 # Create a set of six ribs inside the gear
67 ribs = rectangle(-0.002*N, 0.002*N, -RR*0.95, RR*0.95)
68 ribs = reduce(operator.add, [rotate(ribs, i*120) for i in r
69 ribs += circle(0, 0, 0.4)
70 ribs -= circle(0,0,0.25)
71 ribs -= rectangle(-0.06, 0.06, 0, 0.3)
72 ribs = extrusion(ribs, -0.08, 0.08)
73 ribs.color = 'green'
74
75 # Create a base for the gear
76 base = circle(0, 0, RR*0.95) - circle(0, 0, 0.35)
77 base -= rectangle(-0.06, 0.06, 0, 0.3)
78 base = extrusion(base, -0.04, 0.04)
79 base.color = 'blue'
80
81 cad.shapes = teeth, ribs, base
82
83 """
84 Notes:
85
86 (1)
87 We want to find the angle such that the involute curve
88 intersects a circle of radius R, where the involute is being
89 unwound from a circle of radius RB (and RB < R)
90
91 The involute has coordinates
92     x, y = RB*(cos(t)+t*sin(t)), RB*(sin(t)-t*cos(t))
```



Re-render the output image

Hierarchical Volumetric Object Representations for Digital Fabrication Workflows

by

Matthew Keeter

Submitted to the Program in Media Arts and Sciences,
School of Architecture and Planning
in partial fulfillment of the requirements for the degree of

Master of Science in Media Arts and Sciences

at the

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

June 2013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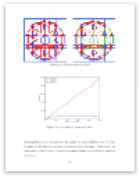
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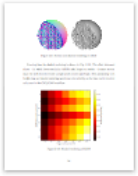
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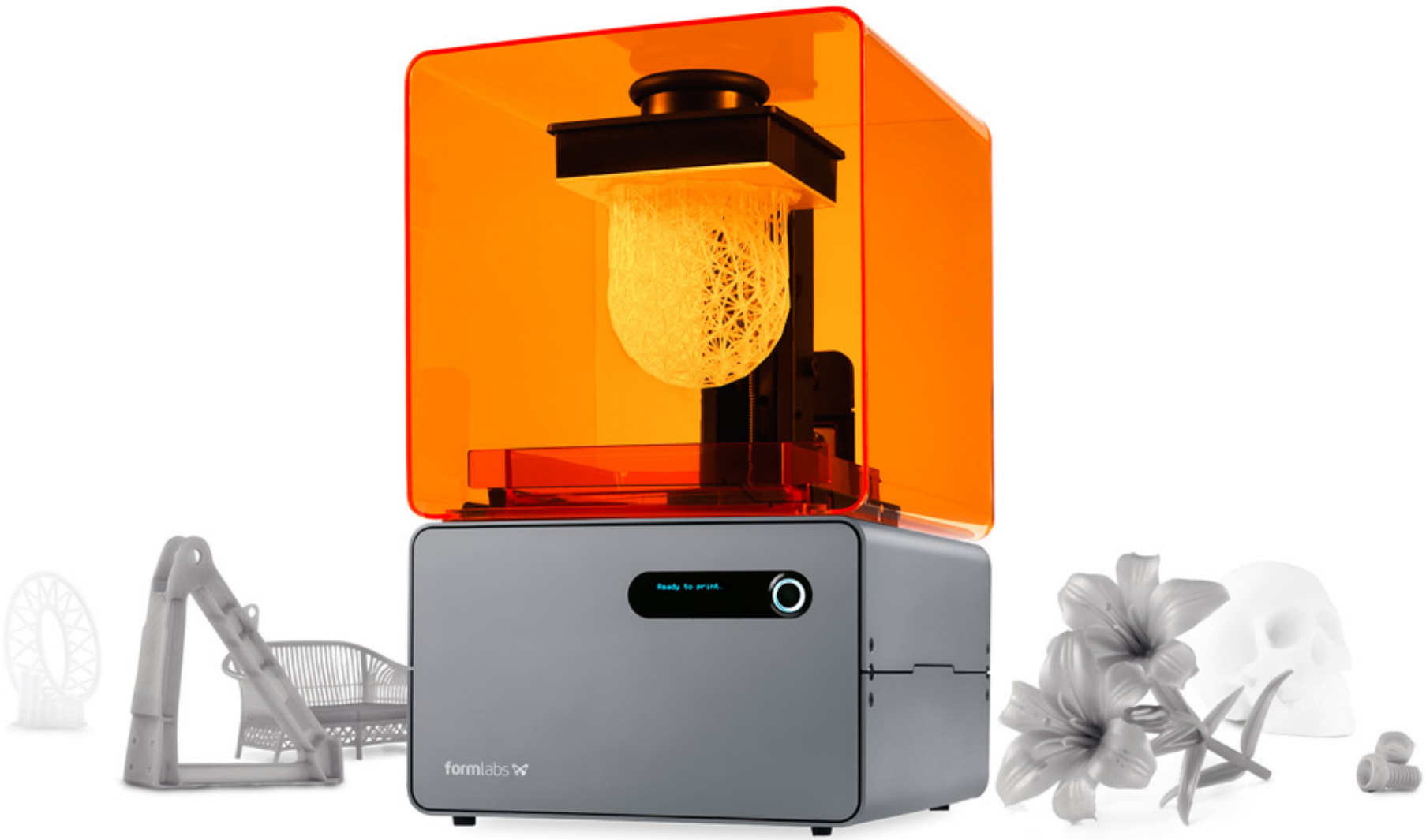

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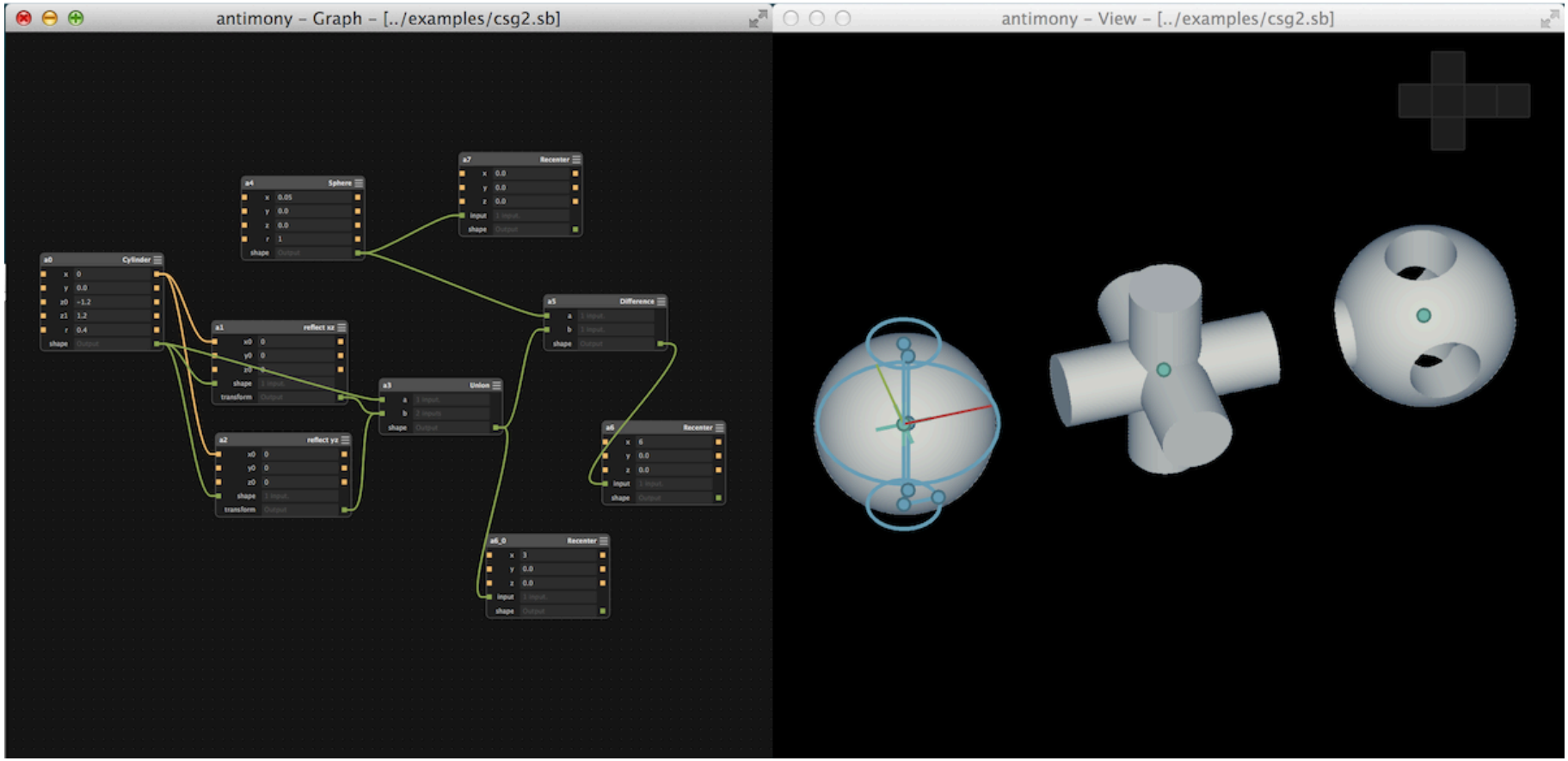
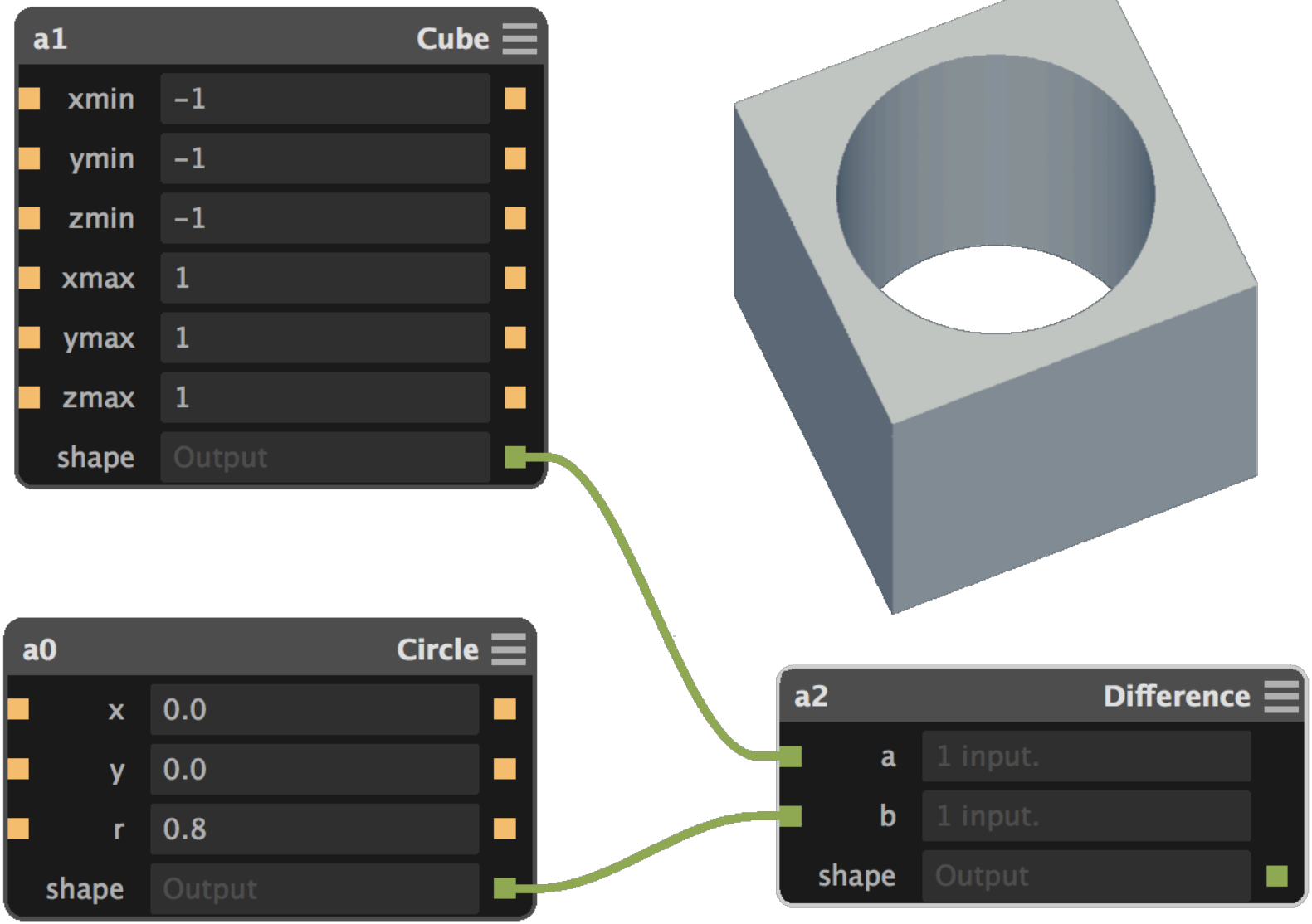
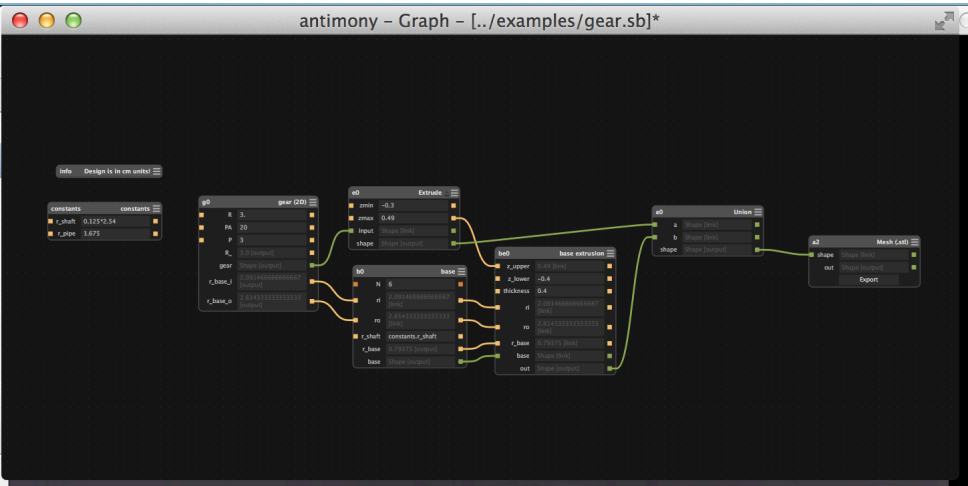
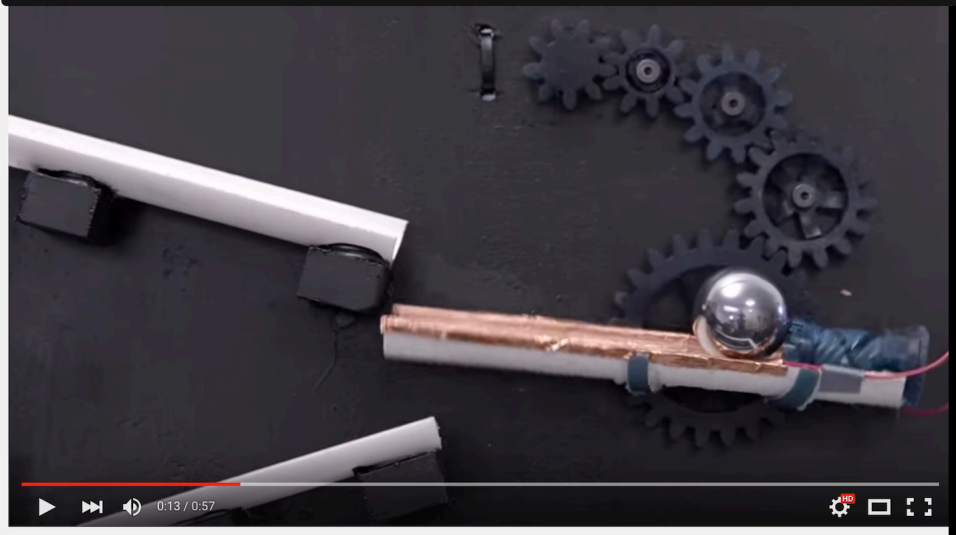


Antimony

github.com/mkeeter/antimony


a1
Cube
xmin
-1
ymin
-1
zmin
-1
xmax
1
ymax
1
zmax
1
shape
Output
a0
Circle
x
0.0
y
0.0
r
0.8
shape
Output
a2
Difference
a
1 input.
b
1 input.
shape
Output





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