Von LaTeX zum Plätzchen

Workflow zum Erstellen einfacher 3D Dateien

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Dante Frühjahrstagung Darmstadt

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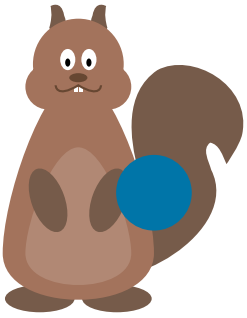
LaTeX Graphiken vorbereiten: Öffnungen

```
\usepackage{tikzlings}

\begin{tikzpicture}
 \squirrel

\end{tikzpicture}
```

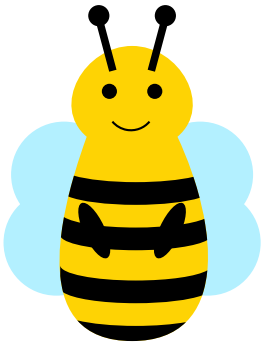
LaTeX Graphiken vorbereiten: Öffnungen

```
\usepackage{tikzlings}

\begin{tikzpicture}
 \squirrel
 \fill (0.5,0.9) circle [radius=0.25cm];
\end{tikzpicture}
```



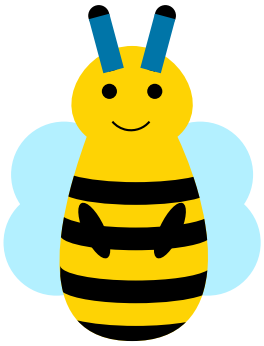
LaTeX Graphiken vorbereiten: filigrane Elemente

```
\usepackage{tikzlings}

\begin{tikzpicture}
 \bee



\end{tikzpicture}
```



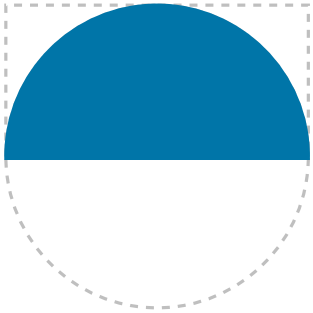
LaTeX Graphiken vorbereiten: filigrane Elemente

```
\usepackage{tikzlings}

\begin{tikzpicture}
 \bee
 \fill[rotate around={15:(-0.175,2.115)}]
      (-0.24,1.93) rectangle (-0.1,2.3);
 \fill[rotate around={-15:(0.175,2.115)}]
      (0.24,1.93) rectangle (0.1,2.3);
\end{tikzpicture}
```



LaTeX Graphiken vorbereiten: \clip

```
\usepackage{tikzlings}

\begin{tikzpicture}
  \clip (-1,0) rectangle (1,1);
  \fill (0,0) circle [radius=1cm];
\end{tikzpicture}
```



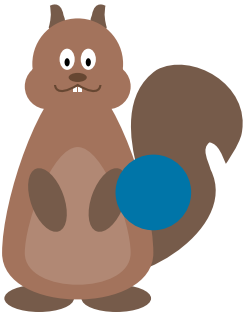
LaTeX Graphiken vorbereiten: \clip

```
\usepackage{tikzlings}

\begin{tikzpicture}
  \fill (1,0) arc [start angle=0,
    end angle=180, radius=1cm] -- cycle;
\end{tikzpicture}
```

SVG erstellen

Beispielsweise:

- Kompilieren als PDF
- Konvertieren nach SVG mittels Poppler Bibliothek:
  `pdftocairo -svg Beispiel.pdf Beispiel.svg`



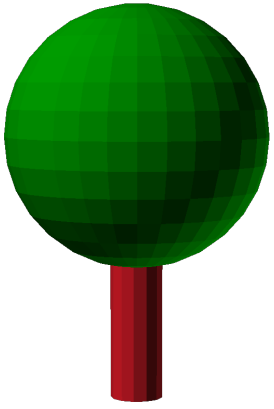
Umriss erstellen

Inkscape:

```
inkscape -g --actions="\
  select-all; object-to-path;\
  select-all; path-union;\
  export-filename:Beispiel_merged.svg;\
  export-do; quit-immediate;"\
  "Beispiel.svg"
```

OpenSCAD

- **C**omputer-**A**ided **D**esign Programm
- Textbasierte Skriptsprache
- Opensource
  `https://github.com/openscad/openscad/`
- Export u.a. als .stl Datei



Beispiel:

```
color("brown") cylinder(h=30, r=4);
translate([0, 0, 40]) color("green") sphere(20);
```

OpenSCAD v2021.01

Syntax

var = value;
var = cond ? value_if_true : value_if_false;
var = function (x) x + x;
module name(…) { … }
name();
function name(…) = …
name();
include <….scad>
use <….scad>

Constants

undef undefined value
PI mathematical constant π (~

Operators

n + m Addition
n - m Subtraction
n * m Multiplication
n / m Division
n % m Modulo
n ^ m Exponentiation
n < m Less Than
n <= m Less or Equal
b == c Equal
b != c Not Equal
n >= m Greater or Equal
n > m Greater Than
b && c Logical And
b || c Logical Or
!b Negation

Modifier Characters

* disable
! show only
highlight / debug
% transparent / background

2D

circle(radius | d=diameter)
square(size,center)

3D

sphere(radius | d=diameter)
cube(size, center)
cube([width,depth,height], center)
cylinder(h,r|d,center)
cylinder(h,r1|d1,r2|d2,center)
polyhedron(points, faces, convexity)
import("….ext", convexity)
linear_extrude(height,center,convexity,twist,slices)
rotate_extrude(angle,convexity)
surface(file = "….ext",center,convexity)

Transformations

Lists

list = […, …, …]; create a list
var = list[2]; index a list (from 0)
var = list.z; dot notation indexing (x/y/z)

Boolean operations

union()
difference()
intersection()

Flow Control

for (i = [start:end]) { … }
for (i = [start:step:end]) { … }
for (i = […,…,…]) { … }
for (i = …, j = …, …) { … }
intersection_for(i = [start:end]) { … }
intersection_for(i = [start:step:end]) { … }
intersection_for(i = […,…,…]) { … }
if (…) { … }
let (…) { … }

Type test functions

Functions

concat
lookup
str
chr
ord
search
version
version_num
parent_module(idx)

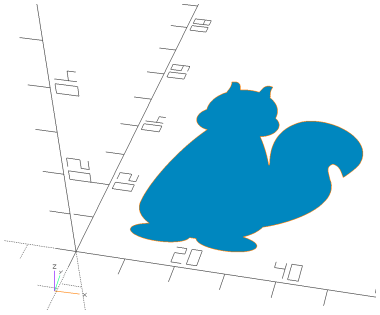
Mathematical

abs
sign
sin
cos
tan
acos
asin
atan
atan2
floor
round
ceil
ln
len
let
log
pow
sqrt
exp

Spickzettel
https://openscad.org/cheatsheet/

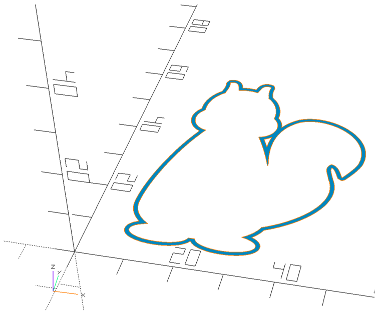
OpenSCAD

```
filepath = "Beispiel_merged.svg";
wall_thickness = 0.9; rim_thickness = 2.7;
wall_height = 15;     rim_height = 3;


  import(filepath);
```



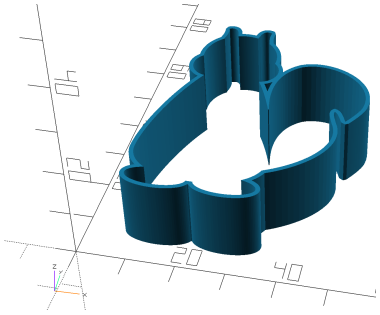
OpenSCAD

```
filepath = "Beispiel_merged.svg";
wall_thickness = 0.9; rim_thickness = 2.7;
wall_height = 15;     rim_height = 3;


difference(){
  offset(wall_thickness) import(filepath);
  import(filepath);
}
```



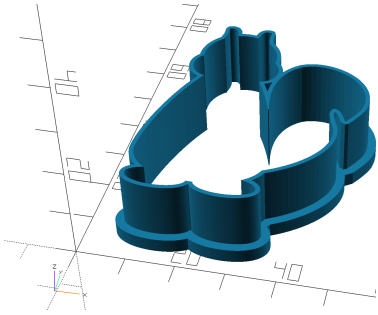
OpenSCAD

```
filepath = "Beispiel_merged.svg";
wall_thickness = 0.9; rim_thickness = 2.7;
wall_height = 15;     rim_height = 3;

linear_extrude(height=wall_height)
difference(){
  offset(wall_thickness) import(filepath);
  import(filepath);
}
```



OpenSCAD

```
filepath = "Beispiel_merged.svg";
wall_thickness = 0.9; rim_thickness = 2.7;
wall_height = 15;     rim_height = 3;

linear_extrude(height=wall_height)
difference(){
  offset(wall_thickness) import(filepath);
  import(filepath);
}

linear_extrude(height=rim_height)
difference(){
  offset(rim_thickness) import(filepath);
  import(filepath);
}
```



Ausgedruckt

Guten Appetit!

Photo von Ulrike Fischer

https://github.com/TikZlings/cookiecutter

OpenSCAD Einführung:
https://www.youtube.com/watch?v=z8lqDGMTbZs