TikZ & PGF(plots)

Daniel Knittl-Frank
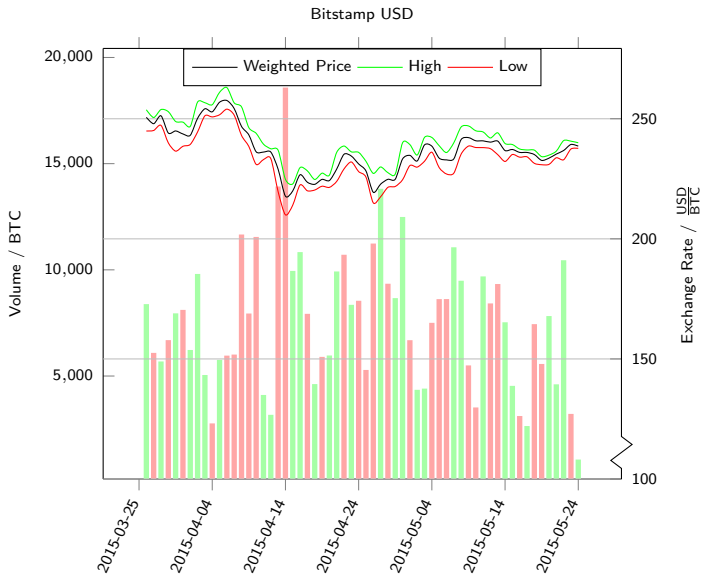
May 2015

2D value plot

Bitstamp USD

2D function plot

$$x^2 - y = 0$$

3D function plot

$\sin(x) \times \sin(y)$
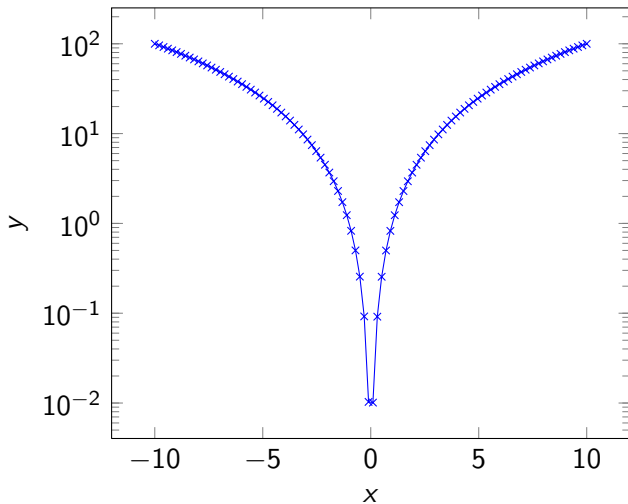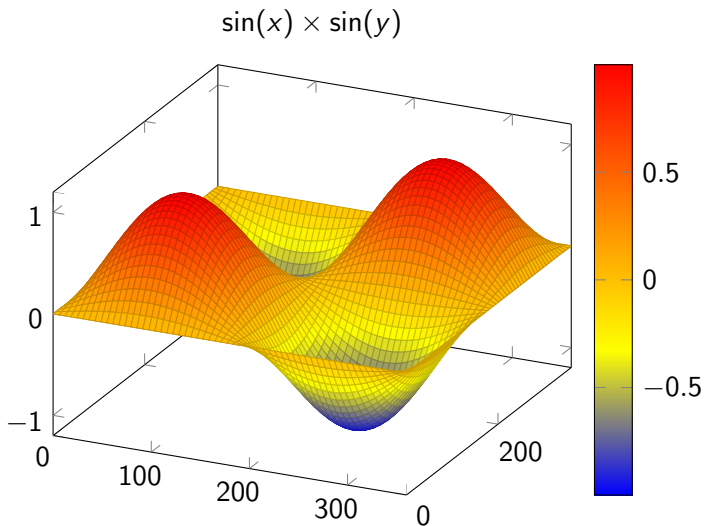
TikZ & PGF(plots)

- TikZ ist kein Zeichenprogramm
- Portable Graphics Format / pretty, good, functional
- Usable with LaTeX, TeX, ConTeXt

TikZ

- "Program" your graphics
- Advantages: quick creation of simple graphics, precise positioning, macros, superior typography
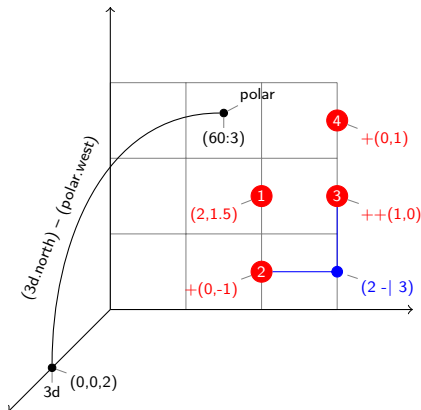- Disadvantages: steep learning curve, no WYSIWYG, compilation times

PGFPLOTS

- Draw plots and labeled axes easily
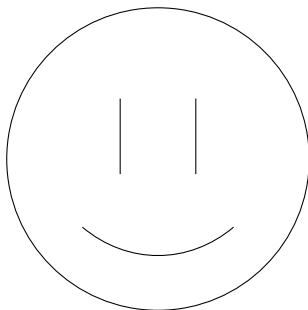- Linear plots, logplots, semi-logplots
- 2D and 3D

Part I

TikZ

TikZ

Coordinates

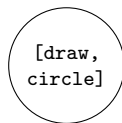- Many different *coordinate systems*
- Always in round brackets
- Absolute or relative
- Cartesian, Polar, Barycentric, Perpendicular, user-defined, …

- ▶ Basic entity of drawing
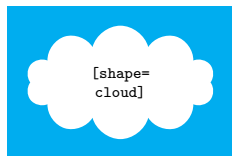- ▶ Consist of parts
- ▶ Closed or open curves

TikZ

- Text placed at coordinate
- Simple and complex shapes
- Anchors for precise positioning
- `\node` is shorthand for `\path node`

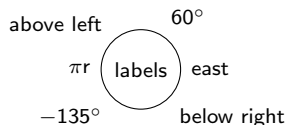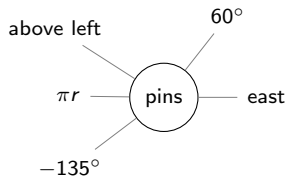[draw, circle]

[fill=red]

\node[draw]

There is NO CLOUD, just

[shape= cloud]

other people's computers

[draw=red, fill=blue, text=white, font=\tiny, thick, rounded corners=4mm]
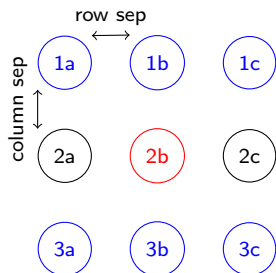
- Add nodes to existing nodes
- Can be called multiple times per node
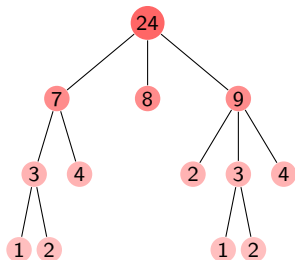
- Mostly treated like nodes
- Similar to tabular environment
- Consist of rows of *cells*
- Each cell contains a *cell picture*
- `cell1; & cell2; \\`

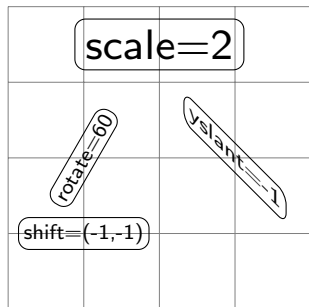- ▶ Visualize hierarchical structures
- ▶ Customizable growth functions

- ▶ Rotate, translate, scale, slant

Libraries

- Arrow tip
- Automata drawing
- Background
- Calc
- Calendar
- Chains
- Circuits (logical)
- Circuits (electrical engineering)
- Decoration
- ER diagram drawing
- Externalization
- Fading
- Fitting
- Fixed point arithmetic
- Lindenmayer system drawing
- Matrix

- Mindmap drawing
- Paper folding diagrams
- Pattern
- Petri-net drawing
- Plot handler
- Plot mark
- Profiler
- Shadings
- Shadow
- Shape
- Spy
- SVG-path
- To path
- Through
- Tree
- Turtle graphics

Part II

PGFPLOTS

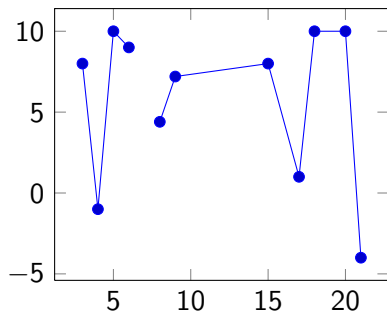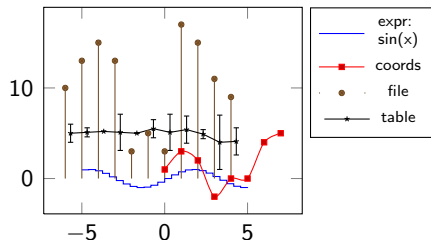# PGFPLOTS

Plots

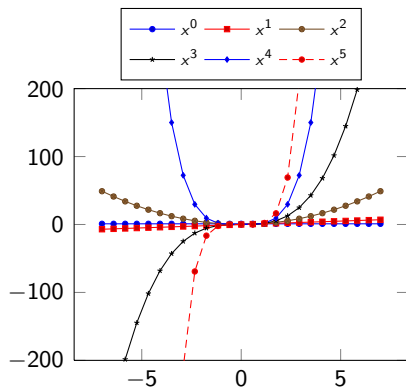- Plots contained in axis environment
- \addplot
- Data inline or from file

PGFPLOTS

- coordinates, file, table, expression
- \addplot, \addplot+
  - const plot, sharp plot, smooth, x/ybar (interval), x/ycomb, only marks, scatter, mesh
- \addplot3, \addplot3+
  - sharp plot, smooth, scatter, only marks, mesh, surf
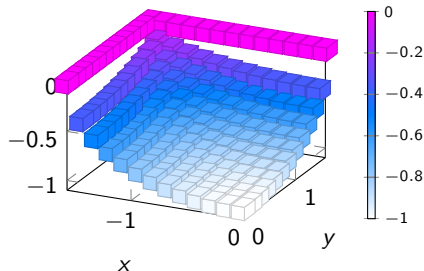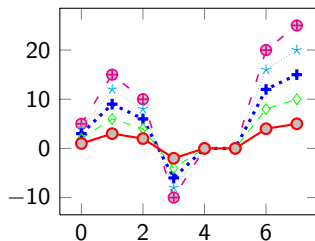
PGFPLOTS

Plots: Automatic style cycling

- ▶ Plot styles from a predefined list
- ▶ Used for plot lines and legend entries

PGFPLOTS

Plots: styles

- solid, (densely/loosely) dotted, (densely/loosely) dashed
- thin, ultra thin, very thin, semithick, thick, very thick, ultra thick
- red, green, blue, cyan, magenta, yellow, black, gray, white, darkgray, lightgray, brown, lime, olive, orange, pink, purple, teal, violet
- mark=*, x, +, -, |, o, asterisk, star, oplus(*), otimes(*), square(*), triangle(*), diamond(*), pentagon(*), cube(*), text, *user defined*

PGFPLOTS

Plots: descriptions

- title
- x/ylabel
- legend
- ticklabel style
- axis x/y line
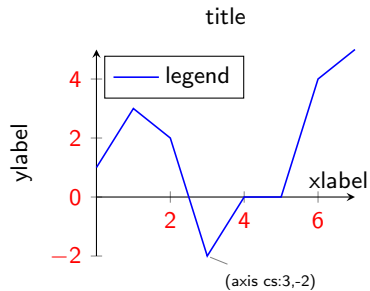
- Pretty-print numbers
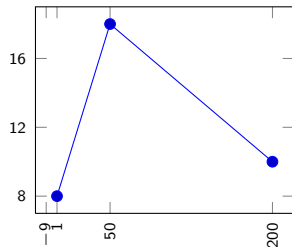- \pgfmathprintnumber [...]{...}
- fixed, sci, std, frac, . . .

- std: $1.23 \cdot 10^7$
- fixed: 12,304,567.89
- fixed, zerofill: 12,304,567.890
- sci: $1.23 \cdot 10^7$
- sci, sci e: $1.23e+7$
- sci, zerofill: $1.230 \cdot 10^7$
- frac: $12304567\frac{89}{100}$
- frac, frac whole=false:
  $\frac{1230456789}{100}$

- $x/y/z$tick$=$ \empty, data, *coordinate list*

- $\{0,1,3.5,2\,e1\}$, $\{0,...,5\}$, $\{0,2,...,5\}$, $\{9,...,3.5\}$

PGFPLOTS

- ▶ x/y/zminorgrids
- ▶ x/y/zmajorgrids
- ▶ grid=major/minor/both

References

- http://pgf.sourceforge.net
- http://pgfplots.sourceforge.net
- http://en.wikibooks.org/wiki/LaTeX/PGF/TikZ
- http://tex.stackexchange.com
- http://texample.net/tikz