1 Introduction

tikz-helper is a set of common lisp functions and macros to make plots. This is done by generating LaTeX code using pgf and Ti*k*Z.

To generate a plot, the macro with-tikz-figure is called. The macro adds a preamble and a tikzfigure environment to the file where the resulting LaTeX code ends up, collects information needed to perform transformations between the data frame and a default frame, and draws axis for the plot. The transformations are linear and works so that plot-x-min is at 0cm in the default frame, and plot-x-max is at 0+width cm, and similarly in the y-direction.

The axis-style should be one of :rectangle :cross :left-bottom :popped-out or :none. Examples of all the different axis styles are below. Axis ticks are added to the axis. The position of the ticks is so that they are placed with a spacing of 1,2 or 5 times 10 to a power such that you get between 4 and 10 ticks on the axis. If custom ticks are needed, or ticks with names, not numbers, use :none, and call the corresponding draw-axis-* function.

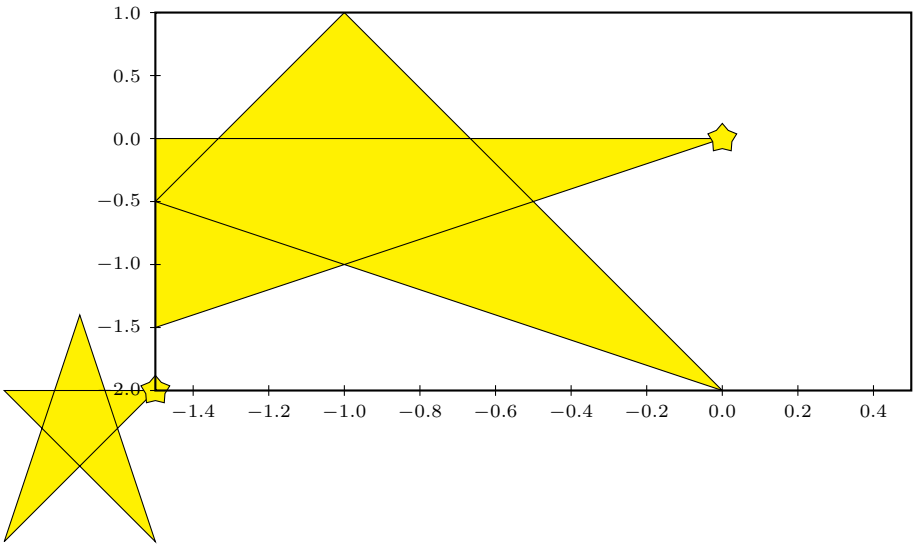

Figure 1: By default paths and nodes are drawn in a frame where origin is the lower left corner of the plot (plot-x-min,plot-y-min), and the units in x and y is 1cm. The transform macro generates tikz transformations, so that all points within the scope are drawn in the plot frame. The clip-and-transform macro also clips the plotting area. Sizes with units like cm or pt are not scaled, only translated.

2 Simple plots

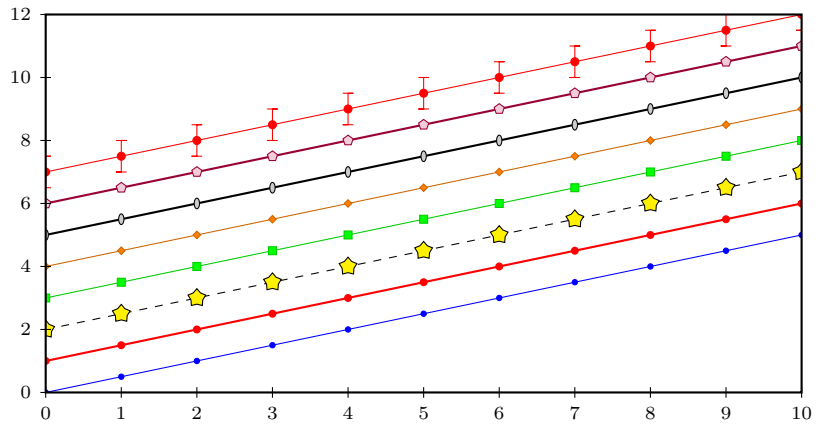

Figure 2: Different styles of lines and nodes. The styles are just regular tikz options. Most functions dealing with sets of data points call the clip-and-transform macro themselves, so calling it from top level is not necessary.

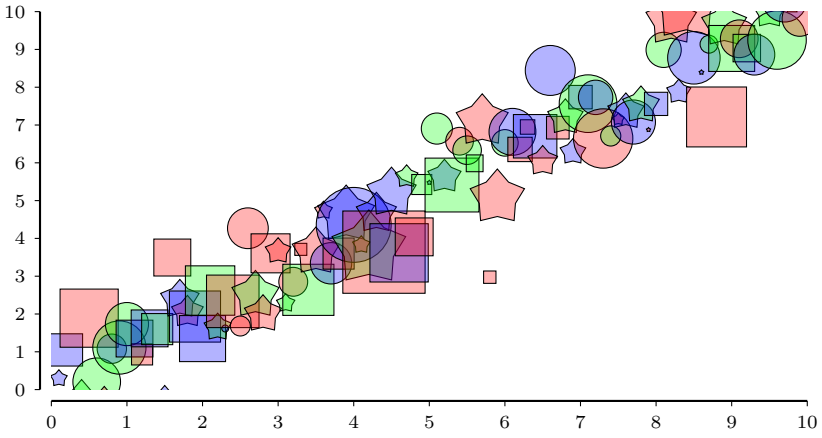

Figure 3: Data points of varying sizes, shapes and colors. Draw node does not automatically transform, since it can be useful in the default frame.

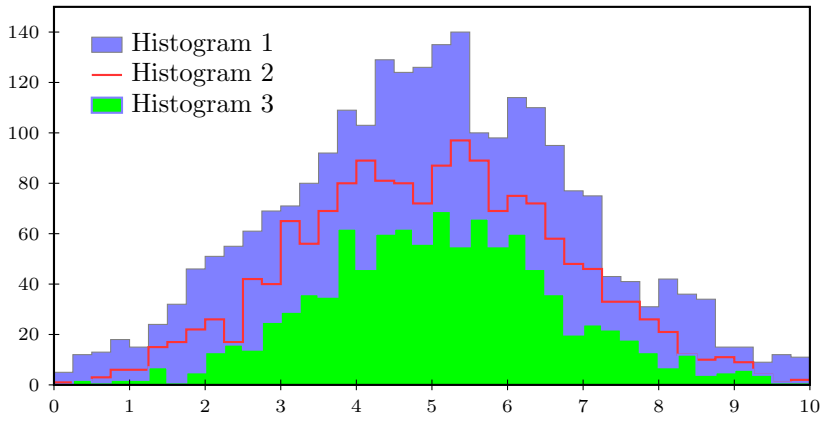

Figure 4: Some Gaussian histograms with different styles and with legend entries. The legend entries are placed in the default cm frame, unless draw-histogram is called within (transform (tikz) ...

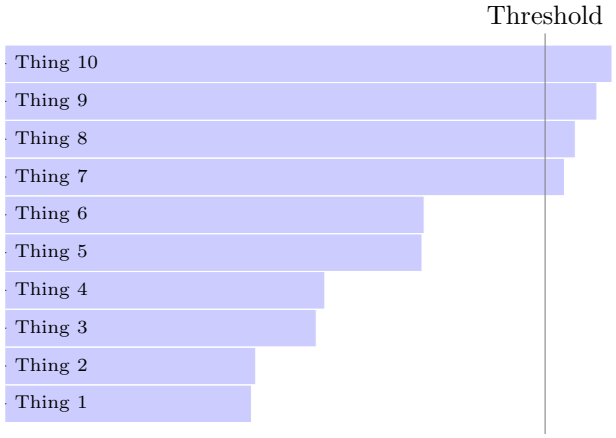

Figure 5: Histogram with bins extending in the horizontal direction. The bins are named with the draw-axis-ticks function.

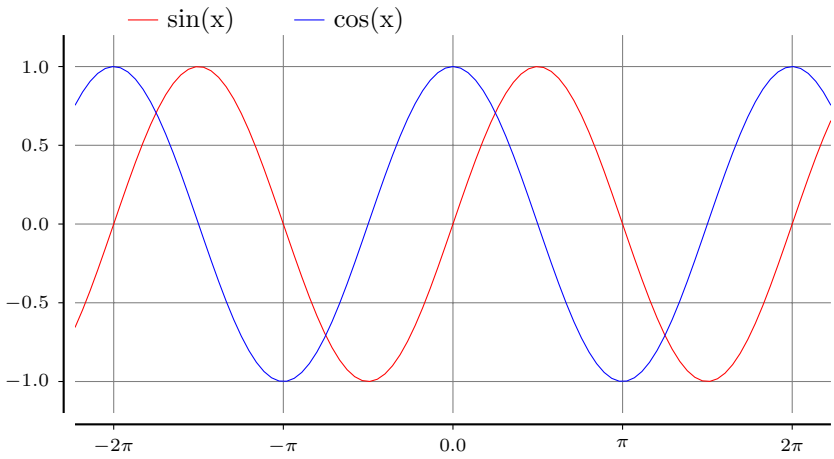

Figure 6: Plotting sin(x) and cos(x), with grid lines and tick names on the x-axis.

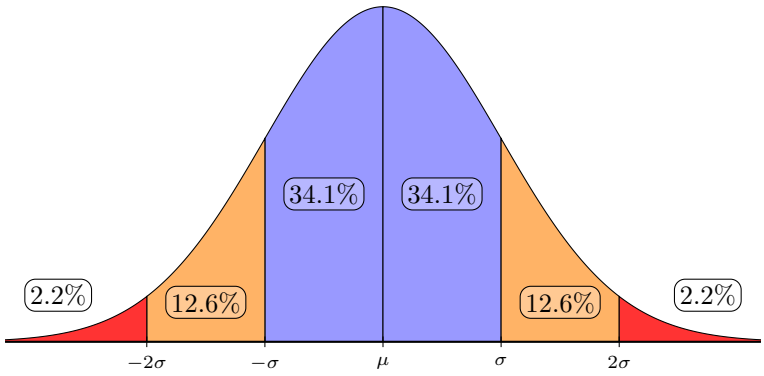

Figure 7: Gaussian function, made by drawing and filling function segments.

3 Fitting with levenberg marquart

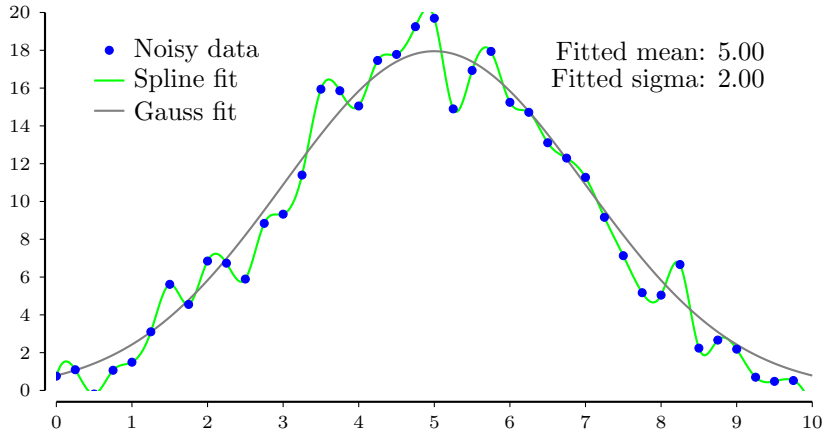

Figure 8: Some Gauss smeared data points, fitted with the Gaussian function. Fit parameters are printed in the plot. A spline fit is also plotted.

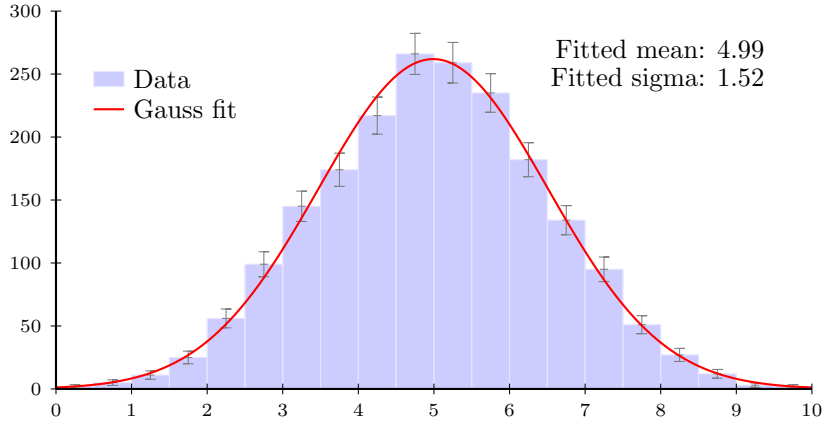

Figure 9: Same as above, except the data points have errors. The error bars are calculated from bin content. Empty bins are discarded in the fit.

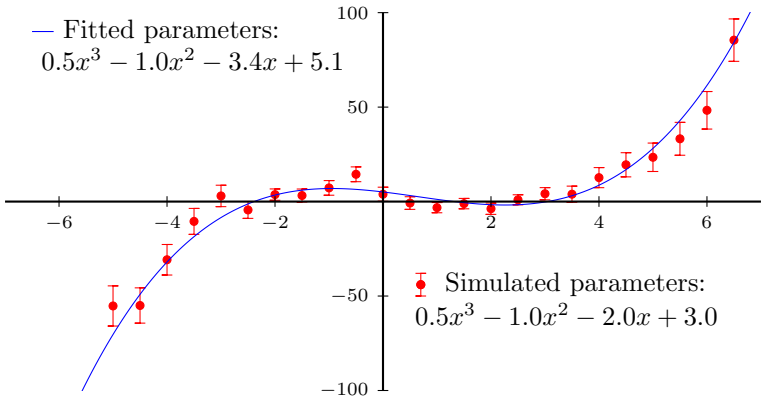

Figure 10: Noisy data points, with known errors, fitted with a polynomial of the third degree. The "Simulated parameter" legend is placed in the default frame, the "Fitted parameters" in the data frame.

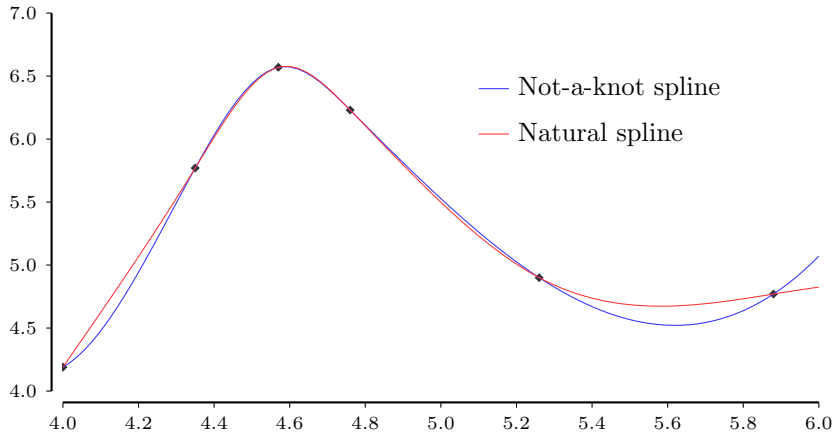

Figure 11: Cubic splines, with different end point conditions.

4 Sub figures

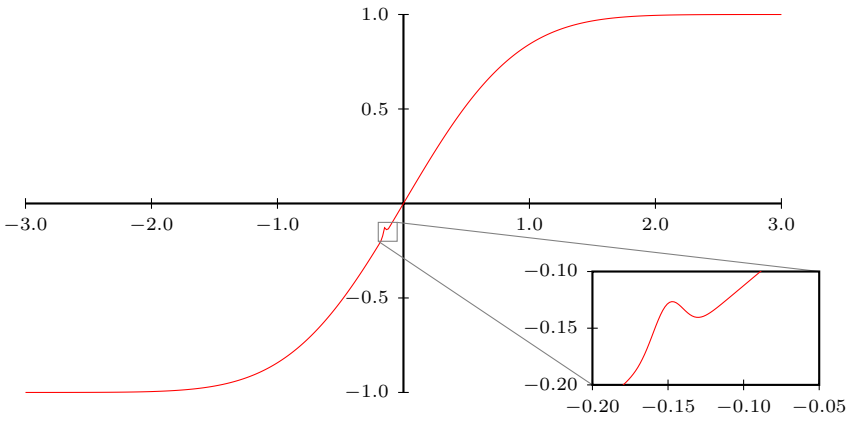

Figure 12: More than one plot can be plotted in the same figure by using sub figures. Sub figures are basically a new set of transformations, and do not affect the default cm frame at all. Here is a function with a zoomed view of a region of interest.

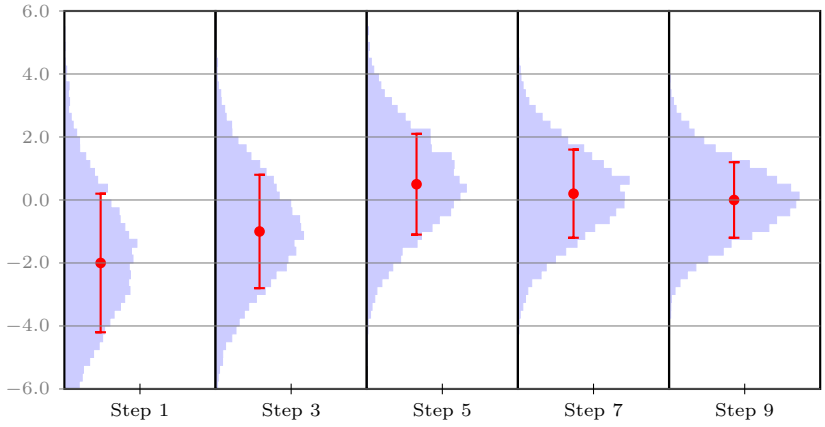

Figure 13: Horizontal histograms, in sub figures side by side. The mean and σ are indicated in red.

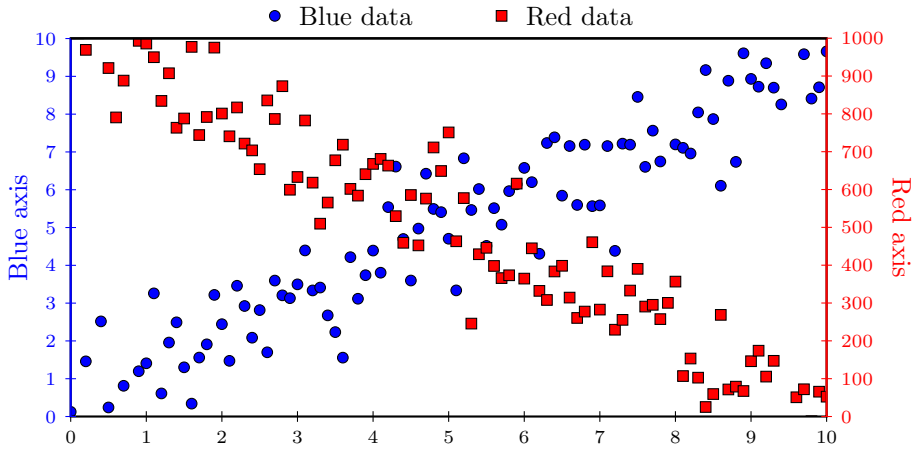

Figure 14: Two data sets with different transformations are plotted on top of ech other.

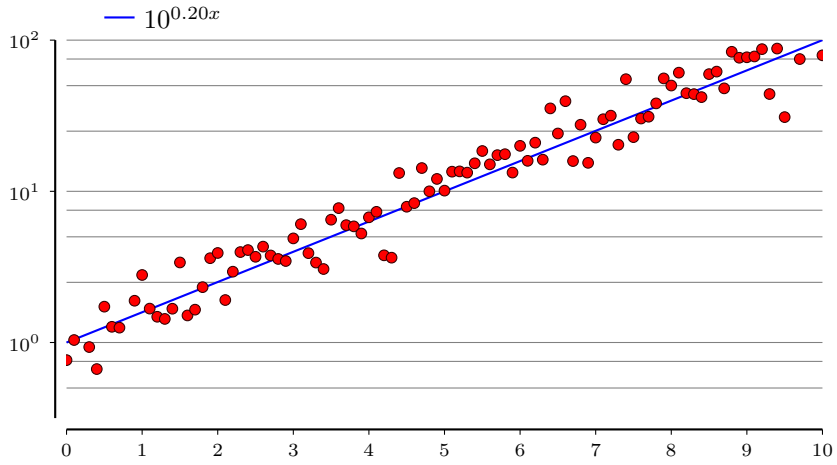

Figure 15: Plot with log scale in the y direction. Explicit transformation.

5 2D histograms

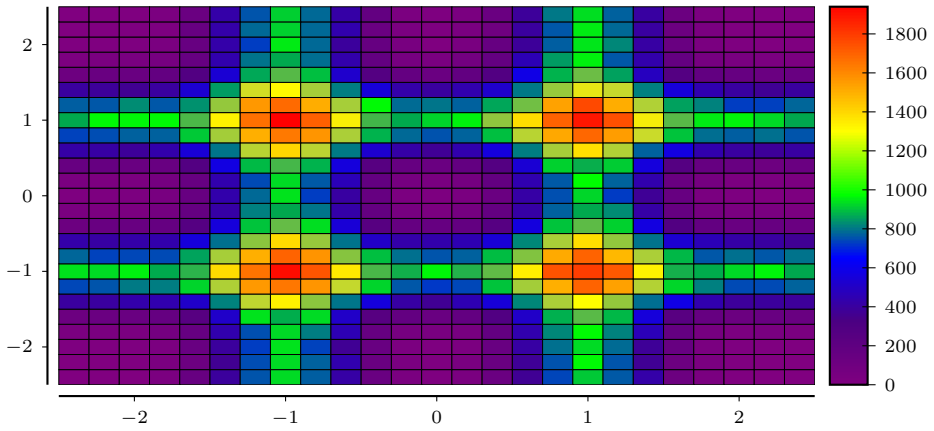

Figure 16: 2D histogram drawn as filled rectangles. Takes a while to compile with pdflatex, especially if the binning is fine.

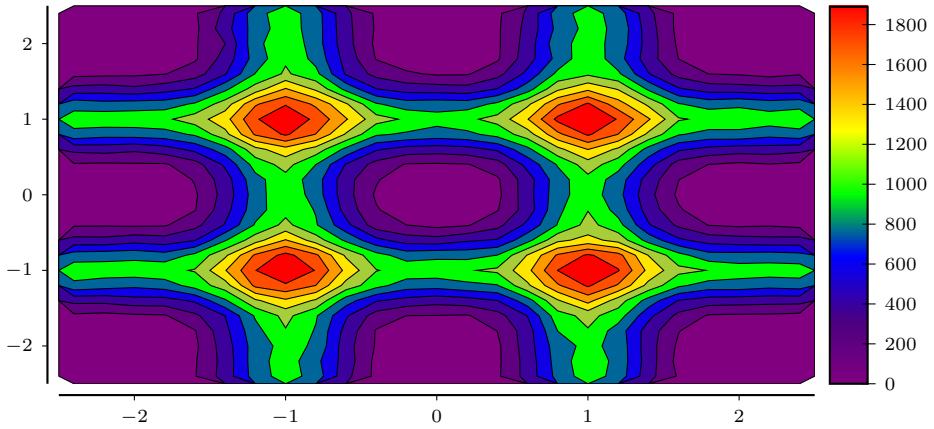

Figure 17: 2D histogram drawn as filled contour regions. The points making up the contour lines are just linear interpolation between neighbors on either side of the contour height.

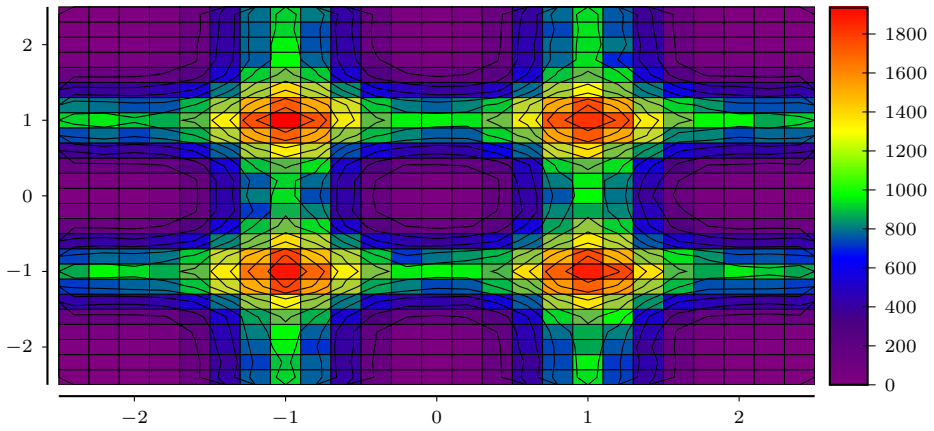

Figure 18: 2D histogram drawn as filled rectangles with contour lines.

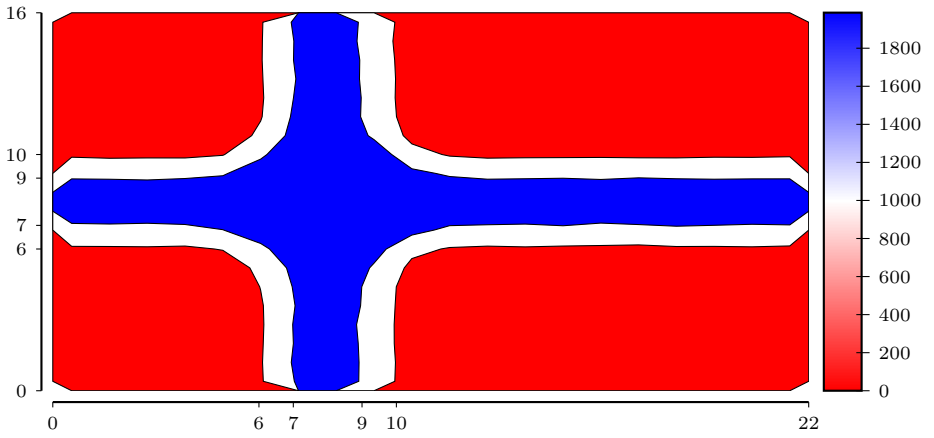

Figure 19: 2D histogram drawn as filled contour regions, not using rainbow colors, and using non uniformly distributed tick marks.