Drawing histogram bars inside the \LaTeX picture–environment

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Abstract
This article describes an enhancement of the \LaTeX picture–environment to draw histogram bars. It is written in the self documenting \TeX format developed by Frank Mittelbach.

1 User interface
\typeout{--JDocument style option 'histogr',
version 1.0 by RmS, released Nov 15, 1987}

This is a macro collection to draw histogram bars inside a picture–environment. Use is as follows:
\histogram(x_0,y_0)(x_1,y_1)...(x_n,y_n)

The coordinate pairs specify the upper left corner of the histogram bars, i.e.
this will draw a horizontal line from (x_i,y_i) to (x_{i+1},y_i), then a vertical
line from (x_{i+1},y_i) to (x_{i+1},y_{i+1}) if \noverticallines was specified, else from (x_{i+1},y_0) to
(x_{i+1},\max(y_i,y_{i+1})). Default is \verticallines. y_0 should be less or equal
the minimum of all the y_i (i.e. other cases have not been tested).

Let’s start with an example: to get the following picture:

![Histogram Example](image)

I used these \LaTeX commands:

\setlength{\unitlength}{1mm}
\begin{picture}(100,65)(-10,-15)
\thicklines
\put(0,-3){\vector(0,1){50}}
\put(-3,0){\vector(1,0){90}}
\thinlines
\put(0,0){\line(0,-1){2}}
\put(2,0){\line(0,-1){2}}
\put(20,0){\line(0,-1){2}}
\put(22,0){\line(0,-1){2}}
\put(40,0){\line(0,-1){2}}
\put(42,0){\line(0,-1){2}}
\end{picture}
Implementation

Here's how it is implemented: first we allocate three counters that are needed later on. \histax and \histay are the x and y coordinate of the current point, i.e. the point that serves as a start for the next box of the histogram. \histaystart holds the y coordinate of the first point, i.e. yo.

\newcount\histQx
\newcount\hist@y
\newcount\histQystart

We need a switch to decide if the vertical lines of the histogram boxes are to be drawn from \yt to \yt+1 or from \y0 to max(\yt, \yt+1). Default is the latter.

\newif\ifhistavert
\let\vertical\histaverttrue
\let\novertical\histavertfalse

We need a switch to decide if the vertical lines of the histogram boxes are to be drawn from \yt to \yt+1 or from \y0 to max(\yt, \yt+1). Default is the latter.

\def\histbox(#1,#2){\tempcnta -\histax
\def\histQnext{
\def\histOnext{\ifnextchar
\def\histObox>{\histObox>{\histOend

The \histogram command takes the starting point as argument and initializes the counters. \histQx, \histQy and \histQystart are set to \x0, \y0 and \y0, respectively.

\def\histogram(#1,#2){\histQx #1 \histQy #2 \histQystart\histQy

Then the macro \histQnext is used.

\histQnext

\histQnext looks at the next token to see if there is another open parenthesis. If this is the case it calls \histbox, otherwise \histQend.

\def\histQnext{\ifnextchar
\def\histbox>{\histbox>{\histQend

The macro \histbox does nearly all the work. The first thing to do is to set the temporary counter \tempcnta to \x1 - \x0. Remember that \histQx is the x coordinate of the last point (i.e. \x0) whereas the macro's first argument is \x1. So we write

\def\histbox(#1,#2){\tempcnta -\histQx
\advance\tempcnta #1
The next step is easy: draw the horizontal part of the histogram box. The line starts at \((x_i, y_i)\) and has length \(\text{unitlength}\).

\[
\text{ifnum} \ \text{tempcnta} > 2 \{
\text{put}(\text{histx}, \text{histy})\{\text{line}(1,0)\{\text{tempcnta}\}\}\text{else}\n\text{put}(\text{histx}, \text{histy})\{\text{line}(-1,0)\{-\text{tempcnta}\}\}\}
\]

Now set \(\text{histx}\) to \(x_{i+1}\):

\[
\text{histx} \#1
\]

If \(\text{verticallines}\) was set we first set \(\text{tempcnta}\) to \(\max(y_i, y_{i+1})\):

\[
\text{ifhistovert}\n\text{ifnum} \ \text{histy} > 2 \ \text{tempcnta}\ \text{histy}\n\text{else} \ \text{tempcnta} \#2 \ \text{fi}\n\]

then we set \(\text{tempcntb}\) to the same value and \(\text{tempcnta}\) to the length of the line to draw.

\[
\text{tempcntb}\ \text{tempcnta}\n\text{advance}\ \text{tempcnta} \ -\ \text{histystart}\n\]

We draw the line

\[
\text{put}(\text{histx}, \text{tempcntb})\{\text{line}(0,-1)\{\text{tempcnta}\}\}
\]

which finishes this case.

\[
\text{else}\n\]

In the other case (i.e. if \(\text{noverticallines}\) was set) we have to draw a line from \(y_i\) to \(y_{i+1}\). We set \(\text{tempcnta}\) to \(y_{i+1} - y_i\)

\[
\text{tempcnta} \ -\ \text{histy}\n\text{advance}\ \text{tempcnta} \#2
\]

and draw the line.

\[
\text{ifnum} \ \text{tempcnta} > 2 \{
\text{put}(\text{histx}, \text{histy})\{\text{line}(0,1)\{\text{tempcnta}\}\}\text{else}\n\text{put}(\text{histx}, \text{histy})\{\text{line}(0,-1)\{-\text{tempcnta}\}\}\}
\]

Thus endeth the drawing.

\[
\text{fi}\n\]

Finally we set \(\text{histy}\) to \(y_{i+1}\) and call \(\text{histnext}\) to look for the next coordinate pair.

\[
\text{histy} \#2\ \text{histnext}\}
\]

There is only one thing we left out: what if there is not another open parenthesis? That’s the easy part: do nothing.

\[
\text{def}\ \text{histend}\}
\]

Frank Mittelbach has suggested that the \(x\)-coordinate should specify the midpoint of the histogram bar, not the upper left corner. However, I don’t see how this will work if the bars have different widths. What do you think about it? Well, that’s all. Use it and enjoy.