

Figure 3: A minimal spanning tree connecting selected US cities.

Wichura's $\text{P}\text{T}\text{E}\text{X}$ [1987], is composed of a set of TEX macros that allow the user to draw graphics such as curves, histograms, etc. $\text{P}\text{T}\text{E}\text{X}$ draws those graphics by printing dots so close to one another that they seem to form a continuous line.

Graphics drawn with $\text{P}\text{T}\text{E}\text{X}$ form an integral part of the text and therefore benefit from all the advantages offered by TEX , e.g., both computer and peripheral independency. TEX 's power in mathematics composition can be used in captions.

I deliberately chose not to use $\text{P}\text{T}\text{E}\text{X}$ facilities to draw vertical or horizontal rules because the relative positions of the rules and the lines made up of dots could not be set to match each other. It is possibly due to the dvi to PostScript driver, but by eliminating the rules I got rid of the problem.

The Driver

Written in C, the driver is divided into elementary procedures (moving the pen, drawing a line, drawing text). Those procedures are called by S graphic functions while drawing graphics.

Graphics are stored in a file named `Slatex.out`. This file contains $\text{P}\text{T}\text{E}\text{X}$ commands that will then be included in a TEX text file.

The default size of the graphics is 360×360 points. The S coordinate system uses integer variables. The hundredth of a point was the measure to be used for adequate precision.

When several lines are drawn at the same time, they are concatenated and a single `\put` command is issued. To draw a line with the following coordi-

nates: $\{(10, 10)(10, 20)(20, 20)\}$ the driver will generate the command:

```
\put{\!start(10,10)
      \!ljoin(10,20)
      \!ljoin(20,20)
} [lb] at 0 0
```

$$(10, 20) \sqrt{(20, 20)} \\ \quad \quad \quad \sqrt{(10, 10)} \\ \quad \quad \quad \cdot (0, 0)$$

The result obtained is much more compact than when using two separate commands, one for $\{(10, 10)(10, 20)\}$ and another for $\{(10, 20)(20, 20)\}$.

Text is drawn as strings and not as separate characters; TEX attends to the composition of the final text strings. Text strings can be centred, left- or right-flushed respective to the current point.

As the driver was designed to be used with $\text{L}\text{A}\text{T}\text{E}\text{X}$, changing character size is done by the commands `\tiny`, ..., `\Huge`; the default size is `\small`. Changing line thickness is done by changing the size of the dots used to draw the lines. A line type change is obtained by the $\text{P}\text{T}\text{E}\text{X}$ `\setdashpattern` command.

Using the Driver

From S This driver can be used like any S graphic driver. It is called by the new S command `latex`. It is possible to change the default graphics width and height with command options. The minimum graphics size is 100×100 points.

When the driver starts, the file `Slatex.out` is opened and $\text{P}\text{T}\text{E}\text{X}$ graphic commands are added

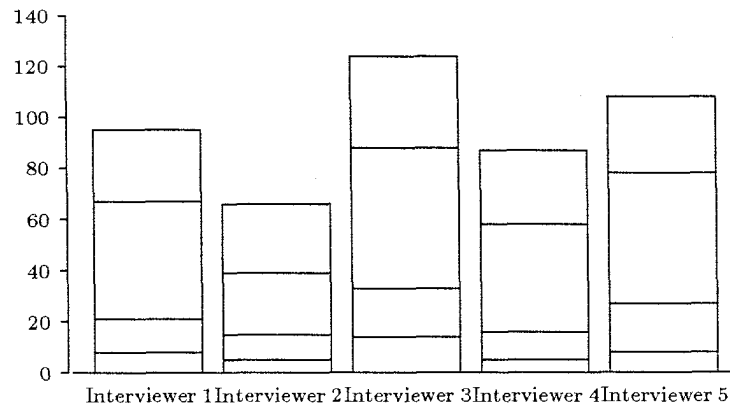


Figure 4: Bar plot of responses received by 5 telephone interviewers.

to the file. If the driver is started a second time, the file is overwritten. This will keep the file from growing indefinitely, but if the user wishes to save the `Slatex.out` file, he will have to rename it. A standard graphic file takes up 10 KB.

The only problem — apparently due to a fault in an S function — I could not do away with, is when the user need to type a `\` character in a character string. He will have to type four “`\`” successively, e.g., “parameter θ_2 ” has to be typed `parameter $\\theta_2$`.

From T_EX Before a user can include his graphics in his text file, he should load the P_ICT_EX library. This is done with the three following `\input` commands:

```
\documentstyle{...}
\input prepictex
\input pictex
\input postpictex
```

`Prepictex` and `postpictex` files must be used to run P_ICT_EX with L_AT_EX.

Wherever the user wishes to include graphics, these are loaded by using another `\input` command, for instance:

```
..., these are loaded by using another
\input command, for instance:
```

```
\begin{figure}
\input figfour
\caption{Bar plot of responses...}
\end{figure}
```

The user will take advantage of the `\caption` command to append captions to his graphics. He will

then be able to use cross-references with the `\ref` and `\label` L_AT_EX commands.

Two weak points remain. First, composing graphics is very slow, e.g., it takes up to ten minutes on a Sun3/50 workstation. Second, if graphics are too complex, T_EX memory capacity is exceeded. Those problems are well known to P_ICT_EX users. Maps of the USA are about the most complex graphics that can be drawn.

All graphic examples are extract from the S introduction manual. Graphics size is 330×203 points.

Finally, I wish to thank Ben O’Ferle for his help with my English.

Bibliography

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