Through the looking glass, and what Joseph found there

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LaTeX Project

The xfp package
Floating Point Unit

The LaTeX3 Project*

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This package provides a LaTeX 2$_\varepsilon$ document-level interface to the LaTeX3 floating point unit (part of expl3). It also provides a parallel integer expression interface for convenience.

`\fpeval` ⋆

The expandable command `\fpeval` takes as its argument a floating point expression and produces a result using the normal rules of mathematics. As this command is expandable it can be used where TeX requires a number and for example within a low-level `\edef` operation to give a purely numerical result.

Briefly, the floating point expressions may comprise:

The LaTeX 2$_\varepsilon$ environment

- `picture` mode

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- color and graphicx
- `pdftex.def`, *etc.*

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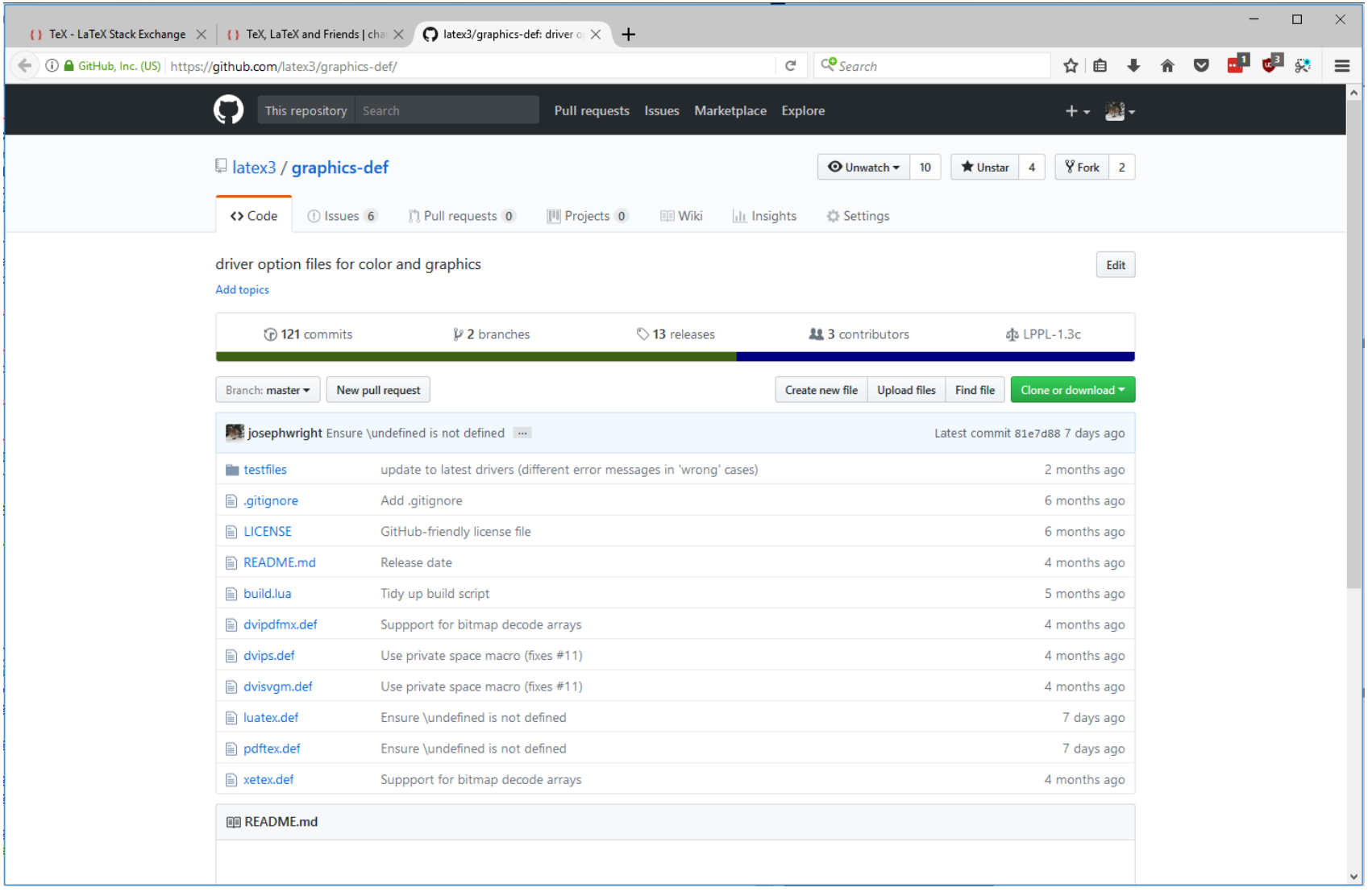
- xcolor
- xxcolor, colorspace, ...
- pgf, Ti*k*Z

LaTeX 2ε Drivers



LaTeX3 drivers

```
%<*package>
\ProvidesExplFile
%<*dvipdfmx>
  {l3dvidpfmx.def}{2018-06-14}{}
  {L3 Experimental driver: dvipdfmx}
%</dvipdfmx>
%<*dvips>
  {l3dvips.def}{2018-06-14}{}
  {L3 Experimental driver: dvips}
%</dvips>
...
```

2.3.2 Meaning of standard color expressions

We explain now how an expression

$$\langle prefix\rangle\langle name\rangle\texttt{!}\langle pct\rangle_1\texttt{!}\langle name\rangle_1\texttt{!}\langle pct\rangle_2\texttt{!}\ldots\texttt{!}\langle pct\rangle_n\texttt{!}\langle name\rangle_n\langle postfix\rangle$$

is being interpreted and processed:

1. First of all, the model and color parameters of $\langle name\rangle$ are extracted to define a temporary color $\langle temp\rangle$. If $\langle postfix\rangle$ has the form '`!![`$\langle num\rangle$`]`', then $\langle temp\rangle$ will be the corresponding (direct-accessed) color $\langle num\rangle$ from the series $\langle name\rangle$.

2. Then a color mix, consisting of $\langle pct\rangle_1\%$ of color $\langle temp\rangle$ and $(100-\langle pct\rangle_1)\%$ of color $\langle name\rangle_1$ is computed; this is the new temporary color $\langle temp\rangle$.

3. The previous step is being repeated for all remaining parameter pairs $(\langle pct\rangle_2,\langle name\rangle_2)$, ..., $(\langle pct\rangle_n,\langle name\rangle_n)$.

4. If $\langle prefix\rangle$ consists of an odd number of minus signs '-', then $\langle temp\rangle$ will be changed into its complementary color.

5. If $\langle postfix\rangle$ has the form '`!!+`', '`!!++`', '`!!+++`', etc., a number of step commands (= number of '`+`' signs) are performed on the underlying color series $\langle name\rangle$. This has no consequences for the color $\langle temp\rangle$.

6. Now the color $\langle temp\rangle$ is being displayed or serves as an input for other operations, depending on the invoking command.

Note that in a typical step 2 expression $\langle temp\rangle\texttt{!}\langle pct\rangle_n\texttt{!}\langle name\rangle_n$, if $\langle pct\rangle_n$=100

Model interconversion

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- Cyan–Magenta–Yellow–blacK
- Grayscale
- Spot color

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Interconversion is non-trivial!

Motivation

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- ‘Feature complete’ aims of expl3
- API consistency
- Exploit expl3 features: the FPU

Drawing layers

Layer
System
Base
Interface

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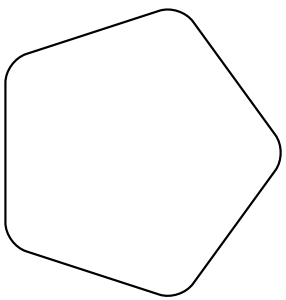
Layer	Ti*k*z/pgf
System	`\pgfsys@moveto`
Base	`\pgfpathmoveto`
Interface	`\draw`

Drawing layers

Layer	Ti*k*z/pgf	l3draw
System	`\pgfsys@moveto`	`\driver_draw_moveto:nn`
Base	`\pgfpathmoveto`	`\draw_path_moveto:n`
Interface	`\draw`	—

Drawing



```
\draw_begin:
  \draw_path_corner_arc:nn { 4pt } { 4pt }
  \draw_path_moveto:n
    { \draw_point_polar:nn { 0 } { 1cm } }
  \int_step_inline:nnnn { 72 } { 72 } { 359 }
    {
      \draw_path_lineto:n
        { \draw_point_polar:nn { #1 } { 1cm } }
    }
  \draw_path_close:
  \draw_path_use_clear:n { stroke }
\draw_end:
```

Integration with expl3 concepts


```
\draw_begin:
  \draw_path_moveto:n { 0cm , 0cm }
  \draw_path_lineto:n { 0cm , 1cm }
  \draw_path_use_clear:n { stroke }
  \hcoffin_set:Nn \l_tmpa_coffin
    { This~is~text. }
  \draw_coffin_use:Nnn \l_tmpa_coffin { hc } { vc }
\draw_end:
```

Expandable expressions

22.72949518869545pt,-17.11517943480897pt

```
\tl_set:Nx \l_tmpa_tl
  {
    \draw_point_intersect_circles:nnnnn
      { (0,0) } { 1cm }
      { (sqrt(2),sqrt(3)) } { 1cm }
      { 1 }
  }
\tl_to_str:N \l_tmpa_tl
```

Right arm over, three to come . . .

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- More driver work still required

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- Many core pgf functions working
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- Still to do: transparency, objects, *etc.*
- Perhaps an interface to Ti*k*Z . . .