Writing, running and including the output of external documents from within a main LaTeX document –v. 0.42

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Contents

*Thanks to Karl Berry; Denis Bitouzé; Werner Lemberg; Rolf Niepraschk

1 Loading the package

```
\usepackage[Option]{hvextern}
```

There exists only one option `checkCode` which is valid for all TEX-compiler. In this case an already existing external file will only be compiled, if the external code changed. This doesn't depends on the setting of the option `force`. `checkCode` can speed up the compilation time.

2 Syntax

This package allows to write external METAPOST, TEX, ConTEXt, LATEX, LuaTEX, LuaLATEX, XETEX, XELATEX, Lua, Perl, Java, Python, and /or R source code, which will then be run via `shell escape` to create a PDF or text output to include it into the main LATEX document. The values for the optional argument `compiler` must be the real prgram name on the the local system, e.g. for Windows: mpost, tex, context.exe, latex.exe, luatex.exe, lualatex.exe, xetex.exe, xelatex.exe, lua.exe, perl.exe, java.exe, pathon.exe, and /or Rscript.exe.

There is only one environment and one command:

```
\begin{externalDocument}[<options>]{<external filename without extension>}
...
source code
...
\end{externalDocument}

\runExtCmd[<options>]
    {<command with arguments>}
    {<external filename without extension>}
```

The very first compilation run of the main document must be done with the `-shell-escape` command-line option, otherwise it won't work. Follow-up runs, for example, to resolve references, should usually be done without `-shell-escape`. The currently used filename for the example is saved in the macro `\hvExternFilename`.

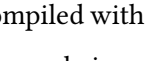
```
lualatex --shell-escape <file>
```

The purpose for this package is to show the output of documents which have to be compiled with a different preamble or a different engine or a complete different system, but integrating the output automatically in the main document..

All examples in this document are created on-the-fly while running this LATEX document with `lualatex` with the `--shell-escape` option.

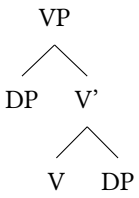
3 First examples

3.1 Without showing the code

This document was run with LuaLATEX. Suppose you want to insert the output of a document which needs for several reasons a XELATEX run. Instead of created and running a document outside of the main document and then to insert the output we can do this from within this LuaLATEX document itself. The external document is compiled with XELATEX and the output is insert as pdf image:  .The current filename of the above example is voss-1 and for the source see page 16.

Let's show another example which needs a pdfLATEX run. The source code itself is also not shown by the environment `externalDocument`.

```
\begin{externalDocument}[
  compiler=pdflatex,cleanup]{voss}
\documentclass{standalone}
%StartVisiblePreamble
\usepackage{fontenc}
\usepackage{libertinus}
\usepackage[linguistics]{forest}
\forestapplylibrarydefaults{linguistics, edges}
%StopVisiblePreamble
\begin{document}
\begin{forest}
[VP
  [DP]
  ['V
    [V]
  [DP]
  ]
]
\end{forest}
\end{document}
\end{externalDocument}
```



3.2 Showing code and output of a Python example

The png image is created on the fly with the following arguments of externalDocument:

```
\begin{externalDocument}[
  compiler=python3,
  code,
  ext=py,
  docType=py,
  usefancyvrb,
  grfOptions={width=\linewidth}]{python}
... Python code ...
\end{externalDocument}
```

The code which is declared as header and main can be marked by:

```
\hv@extern@exampleType{py}
  {\NumChar StartVisibleMain}
  {\NumChar StopVisibleMain}
  {\NumChar StartVisiblePreamble}
  {\NumChar StopVisiblePreamble}
```

\NumChar is the default Python comment character # and needs to be saved with a different catagory, which is done internally by the package. The complete definition of the code is:

```
\begin{externalDocument}[
  compiler=python3,
  code,
  ext=py,
  docType=py,
  usefancyvrb,
  grfOptions={width=\linewidth}]{python}
import os
#StartVisiblePreamble
from PIL import Image
```

```
import subprocess
# drawing area (xa < xb and ya < yb)
xa = -0.1716
xb = -0.1433
ya = 1.022
yb = 1.044
maxIt = 1024  # iterations
imgx = 1000   # image size
imgy = 750
image = Image.new("RGB", (imgx, imgy))
#StopVisiblePreamble

#StartVisibleMain
for y in range(imgy):
    cy = y * (yb - ya) / (imgy - 1)  + ya
    for x in range(imgx):
        cx = x * (xb - xa) / (imgx - 1) + xa
        c = complex(cx, cy)
        z = 0
        for i in range(maxIt):
            if abs(z) > 2.0: break
            z = z * z + c
        r = i % 4 * 6
        g = i % 8 * 32
        b = i % 16 * 16
        image.putpixel((x, y), b * 65536 + g * 256 + r)
#StopVisibleMain
# now get the filename created by the latex document
imageName = os.path.basename(os.path.splitext(__file__)[0])+".png" # get filename
image.save(imageName, "PNG")
\end{externalDocument}
```

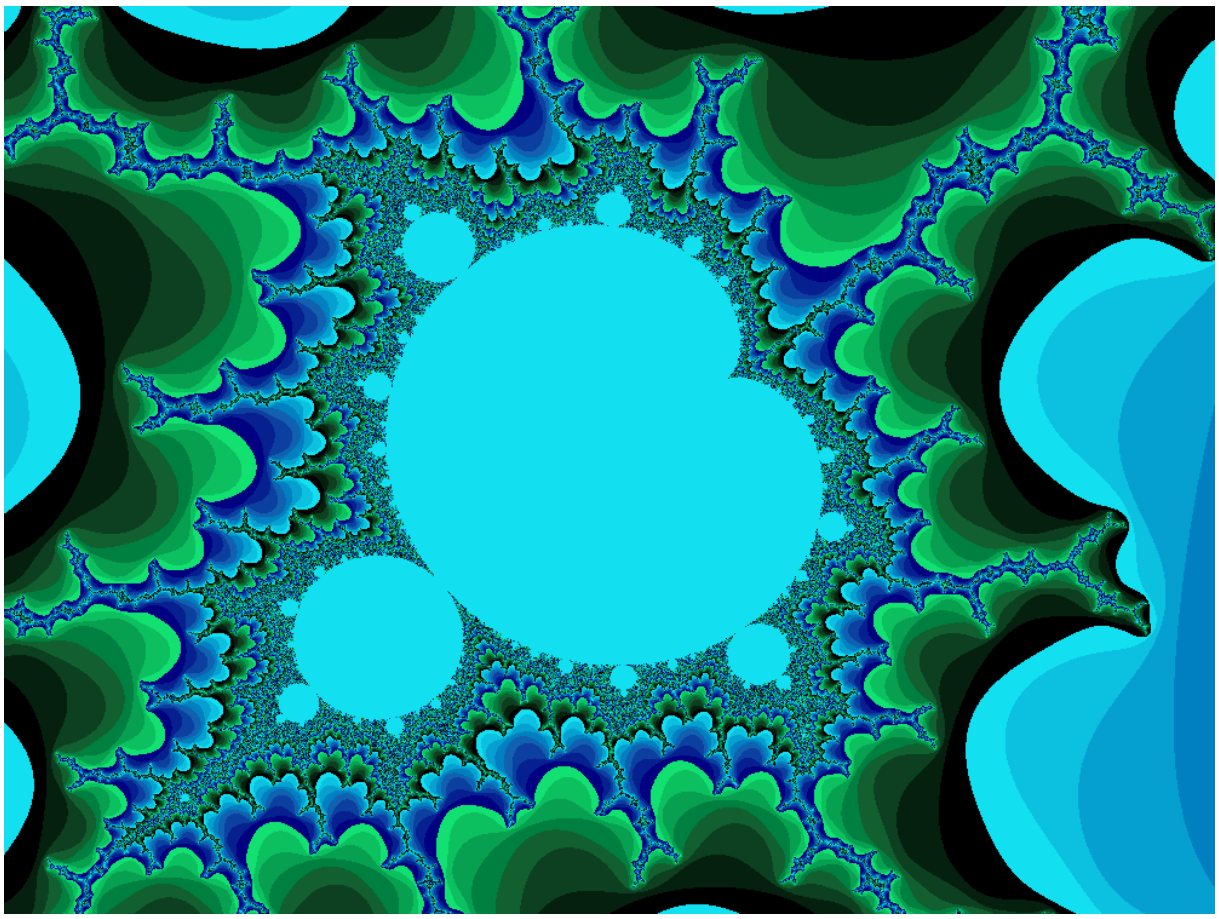
And with using this code we get the image as png inserted. The given filename of the external document is internally extended by a consecutive number which isn't known to the Python code. However, it is no problem in any programming language to get the name of a running file. The forlast line in the above code shows how it can be done with Python.

```
from PIL import Image
import subprocess
# drawing area (xa < xb and ya < yb)
xa = -0.1716
xb = -0.1433
ya = 1.022
yb = 1.044
maxIt = 1024  # iterations
imgx = 1000   # image size
imgy = 750
image = Image.new("RGB", (imgx, imgy))
```

```
for y in range(imgy):
    cy = y * (yb - ya) / (imgy - 1)  + ya
    for x in range(imgx):
        cx = x * (xb - xa) / (imgx - 1) + xa
        c = complex(cx, cy)
```

python-3.py

```
        z = 0
        for i in range(maxIt):
            if abs(z) > 2.0: break
            z = z * z + c
        r = i % 4 * 6
        g = i % 8 * 32
        b = i % 16 * 16
        image.putpixel((x, y), b * 65536 + g * 256 + r)
```

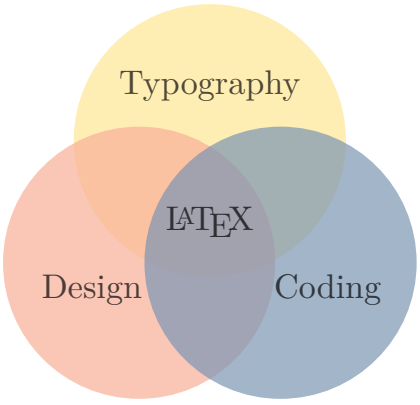


The external filename, extended by a consequtive number, kan be printed in the margin by setting the keyword `showFilename`. In general it is printed in the outer margin or in twocolumn mode in the outer column. If the example is set in twocolumn mode but inside a starred floating environment over both column, then use the keyword `outerFN`. Then `hvextern` doesn't test for twocolumn mode.

A vertical shift of the filename is possible by setting a length to the keyword `shiftFN`, e.g. `shiftFN=5ex`.

```
\usepackage{pst-geo,graphicx}
```

```
\resizebox{\linewidth}{!}{%
  \begin{pspicture}*(-9,-9)(9,10)
  \rput{90}(0,0){\WorldMap[cities,USA,Australia,Mexico]}
  \end{pspicture}}
```



4 Setting marker in the source

The marker for the code ranges which should be listed depend to the used programming language:

```
[...]
%StartVisiblePreamble
[... listed preamble code ]
%StopVisiblePreamble
[...]
\begin{document}
[...]
\end{document}
```

everything between `%StartVisiblePreamble` and `%StopVisiblePreamble` will be listed as preamble and in case of a LaTeX source everything between `\begin{document}` and `\end{document}` as body. The marker must be defined with an own macro, e.g.:

```
\hv@extern@exampleType{py}
  {\NumChar StartVisibleMain}
  {\NumChar StopVisibleMain}
  {\NumChar StartVisiblePreamble}
  {\NumChar StopVisiblePreamble}
```

`\NumChar` is the comment character `#`, which needs a special handling. This version of `hvextern` supports the following programming languages (option `compiler`): `mpost`, `tex`, `latex`, `luatex`, `python3`, `perl`, `lua`, `xetex`, `pdflatex`, `lualatex`, `xelatex`, and `context`. The default is `pdflatex`. The option `docType` selects the config file, which must be one of `context`, `lua`, `pl`, `tex`, `latex`, `mp`, and `py`. For Lua it is

```
\hv@extern@exampleType{lua}
  {--StartVisibleMain}
  {--StopVisibleMain}
  {--StartVisiblePreamble}
  {--StopVisiblePreamble}
```

It defines the marker strings for the listed code sequences. In some cases you have to use multiple times the same value for different optional arguments, e.g.

```
ext=lua, compiler=lua, docType=lua, ...
```

5 Optional arguments

The default setting is always shown in brackets.

5.1 Programs and runs

The `progpath` should only in some rare cases needed. In general all used compilers will be found by the system. A given `progpath` must be end with a slash, e.g. `./bin/`

```
\define@key{hv}{progpath}[]{\def\hv@extern@progpath{#1}}
\define@key{hv}{compiler}[pdflatex]{\def\hv@extern@compiler{#1}}
\define@key{hv}{runsequence}[]{\def\hv@extern@runsequence{#1}}
\define@key{hv}{runs}[1]{\setcounter{hv@extern@runs}{#1}}
```

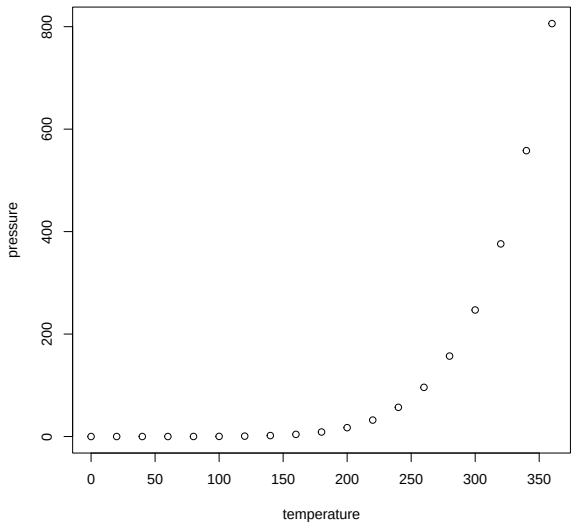
For Windows the `progpath` should always be written with slashes and not backslashes. e.g.

```
compiler=Rscript.exe,
progpath=C:/Program Files/R/R-4.3.3/bin/x64/,
```

For macOS it is something like this:

voss-5.R

```
head(pressure) # Die ersten Werte der internen Datenliste
pdf()          # erzeugt die PDF "Rplots.pdf"
plot(pressure)
```



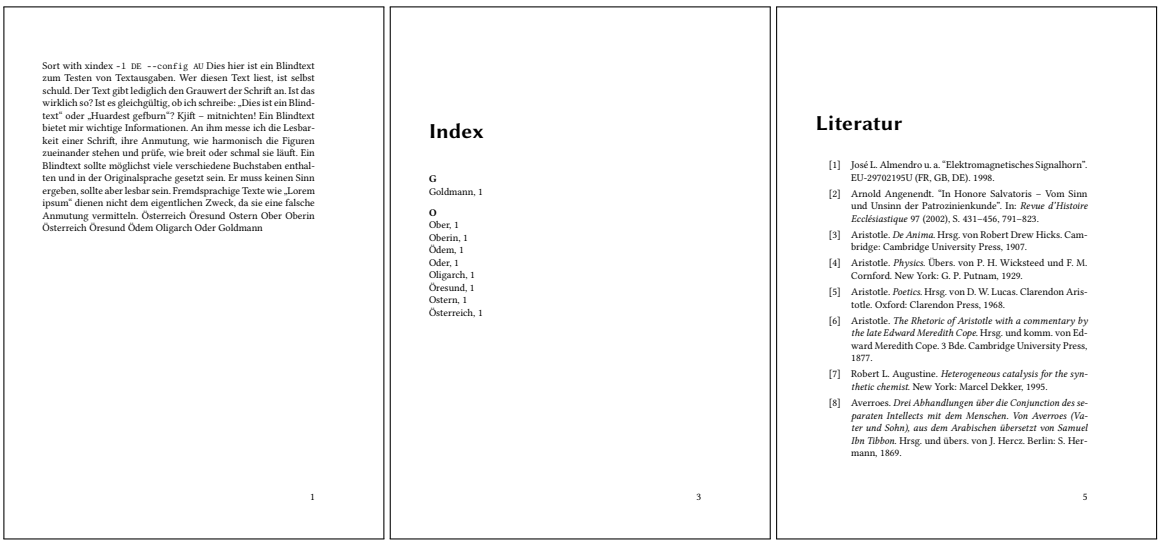
Instead of the optional arguments `compiler`, `biber`, and `xindex` one can define an individual command sequence by using the optional argument `runsequence`. It must be comma separated list:

```
runsequence={lualatex,biber,xindex -l de -c AU,lualatex,lualatex}
```

voss-6.tex

```
\usepackage{pst-geo}
```

```
\begin{pspicture}(-3,-9)(3,10)
\rput{90}(0,0){\WorldMap[type=3,maillage]}
\end{pspicture}
```



Sort with xindex -l DE --config AU Dies hier ist ein Blindtext zum Testen von Textausgaben. Wer diesen Text liest, ist selbst schuld. Der Text gibt lediglich den Grauwert der Schrift an. Ist das wirklich so? Ist es gleichgültig, ob ich schreibe: „Dies ist ein Blindtext“ oder „Huardest gefburn“? Kjift – mitnichten! Ein Blindtext bietet mir wichtige Informationen. An ihm messe ich die Lesbarkeit einer Schrift, ihre Anmutung, wie harmonisch die Figuren zueinander stehen und prüfe, wie breit oder schmal sie läuft. Ein Blindtext sollte möglichst viele verschiedene Buchstaben enthalten und in der Originalsprache gesetzt sein. Er muss keinen Sinn ergeben, sollte aber lesbar sein. Fremdsprachige Texte wie „Lorem ipsum“ dienen nicht dem eigentlichen Zweck, da sie eine falsche Anmutung vermitteln. Österreich Öresund Ostern Ober Oberin Österreich Öresund Ödem Oligarch Oder Goldmann

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5

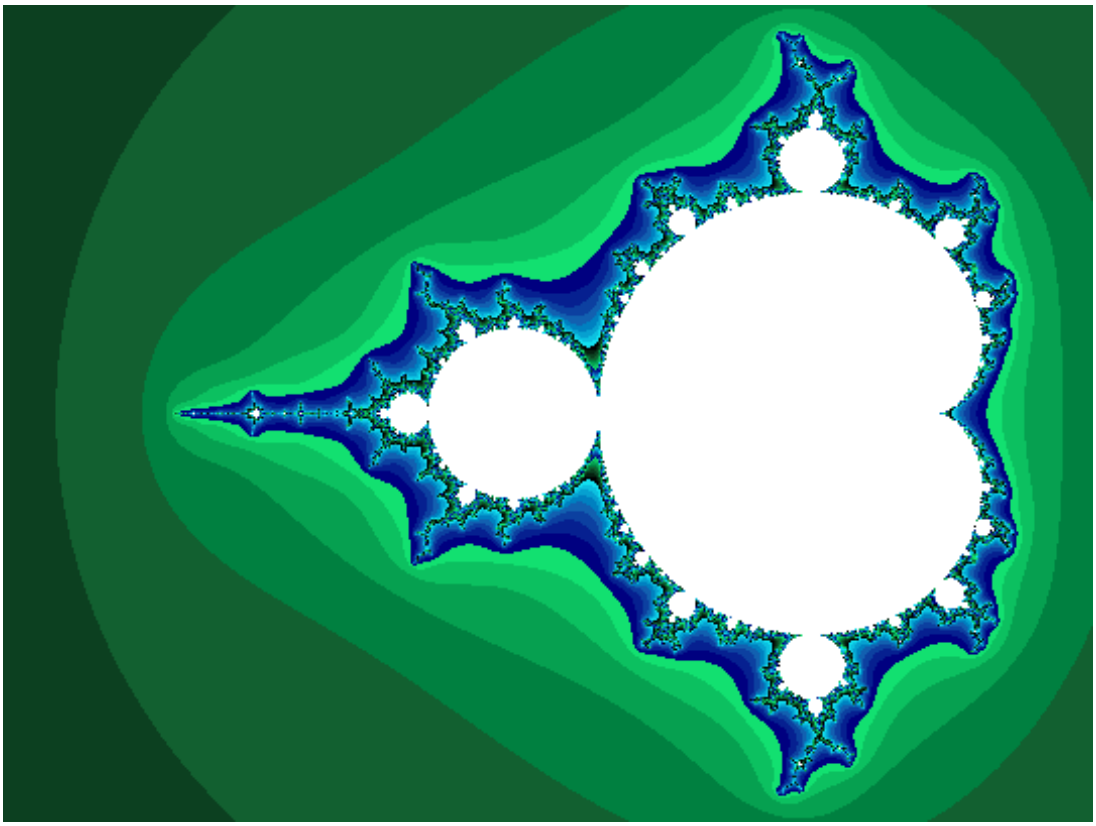
The following Java-program creates the Mandelbrot set as png image. The valid setting for the environment `externalDocument` is:

```
compiler=java,ext=java,docType=java,
```

```
public static int iterZahl(final double cx, final double cy, int maxIt,
              final double radius) {
// bestimmt Anzahl der Iterationen
  int zaehler = 0;
  double zx = 0.0, zy = 0.0, tmp;
  do {
    tmp = zx*zx - zy*zy + cx;
    zy = 2*zx*zy + cy; zx = tmp;
    zaehler++;
  } while (zx*zx + zy*zy <= radius && zaehler < maxIt);
  return zaehler;
}
```

java-7.java

```
  double xa = -2.5, xe = 0.7, ya = -1.2, ye = 1.2; // Ratio 20:15
  double dx = (xe-xa)/(imageBreite-1), dy = (ye-ya)/(imageHoehe-1);
  double cx, cy; int R, G, B;
  double radius = 10.0;  int maxIt = 1024;
  cx = xa;
  for (int sp = 0; sp < imageBreite; sp++) {
    cy = ye; // von oben nach unten
    for (int ze = 0; ze < imageHoehe; ze++) {
      int zIter = iterZahl(cx, cy, maxIt, radius);
      if (zIter == maxIt) {
        g.setColor(Color.WHITE);
        g.drawLine(sp, ze, sp, ze);
      } else {
        R = zIter % 4 * 6 ; G = zIter % 8 * 32; B = zIter % 16 * 16;
        g.setColor(new Color(R,G,B));
        g.drawLine(sp, ze, sp, ze);
      }
      cy = cy - dy;
    } // for ze
    cx = cx + dx;
  } // for sp
```



5.2 Grafik options

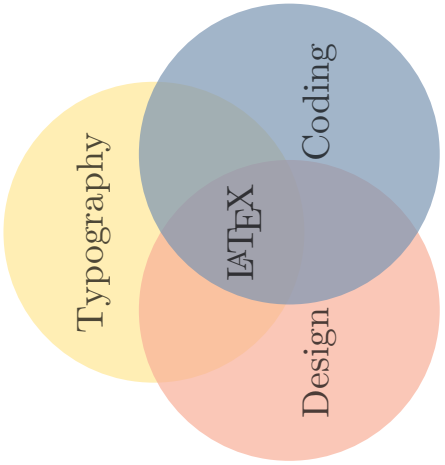
```
\define@key{hv}{grfOptions}[]{\def\hv@extern@grfOptions{#1}}
```

The option is passed to `\includegraphics`, e.g. `angle=90,width=\linewidth` for the follwing example.

```
\usepackage{pst-geo,graphicx}
```

```
\resizebox{\linewidth}{!}{%
  \begin{pspicture}*(-9,-9)(9.5,9)
  \WorldMap[type=5]
  \end{pspicture}}
```

voss-8.tex



5.3 Listings options

```
\define@key{hv}{lstOptions}[]{\def\hv@extern@lstOptions{#1}}
```

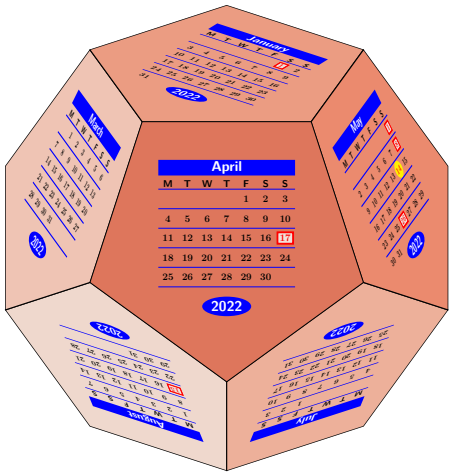
The option is passed either to `\lstinputlisting`, or, if `usefancyvrb` is active, to `\VerbatimInput`. The following example uses

```
lstOptions={basicstyle=\sffamily\itshape\scriptsize},
```

```
\usepackage{pst-geo}
```

```
\psset{xunit=0.75,yunit=0.75}
\begin{pspicture}(-9,-7)(10,7)
\WorldMap[type=6]
\end{pspicture}
```

voss-9.tex



5.4 Background color

There are different colors for the preamble and body listing: the backgrund and frame color.

```
\define@key{hv}{BGpreamble}[black12]{\def\hv@extern@BGpreamble{#1}}
\define@key{hv}{BGbody}[black8]{\def\hv@extern@BGbody{#1}}
\define@key{hv}{BOpreamble}[black12]{\def\hv@extern@BOpreamble{#1}}
\define@key{hv}{BObody}[black8]{\def\hv@extern@BObody{#1}}
```

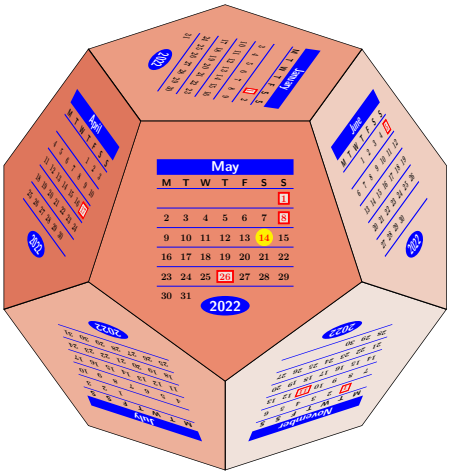
The options are passed to tcolorbox and preset to black"!12 and black"!8. The color of the frame is set to the same values, hence not seen. The following example uses

```
BGpreamble=red!10, BOpreamble=red,
BGbody=blue!8, BObody=blue,
```

voss-10.tex

```
\usepackage{pst-geo}
```

```
\psset{xunit=0.75,yunit=0.75}
\begin{pspicture}(-9,-7)(10,7)
\WorldMap[type=7]
\end{pspicture}
```



5.5 Type of the source code

The current version of hvextern supports code written as METAPOST, plain TEX, LATEX, ConTEXt, and Python. Every type has its own keywords for the linerange which should be printed for the preamble and the body. For example the latex config is:

```
\hv@extern@exampleType{latex}%                    for _all_LaTeX engines
  {\string\begin\string{document\string}}%
  {\string\end\string{document\string}}%
  {\perCent StartVisiblePreamble}%
  {\perCent StopVisiblePreamble}%

% only for the sequence latex->dvips->ps2pdf
\def\hv@extern@runLATEX#1#2#3#4{% path compiler file extension
  \ifhv@extern@verbose \typeout{>>>> running #1#2 #3#4}\fi
  \ShellEscape{#1#2\space #3#4}%
  \ifhv@extern@verbose \typeout{>>>> running #1dvips #3}\fi
  \ShellEscape{#1dvips\space #3.dvi}%
  \ifhv@extern@verbose \typeout{>>>> running ps2pdf #3.ps}\fi
  \ShellEscape{#1ps2pdf\space -dAutoRotatePages=/None\space -dALLOWPSTRANSPARENCY\space  #3.ps}%
}
```

If a source needs more than running the defined compiler, it must be defined by a macro

```
\def\hv@extern@run<NAME>#1#2#3#4{% path compiler file extension
...}
```

The type of the source code can be different to the compiler, e.g. source latex, but compiler lualatex.

5.6 Output more than one page

The pages which should be printed can be defined by

```
\define@key{hv}{pages}[1]{\def\hv@extern@pages{#1}}
\define@key{hv}{pagesep}[1em]{\hv@extern@pagesep=#1}
\define@boolkey{hv}[hv@extern@]{frame}[true]{}
```

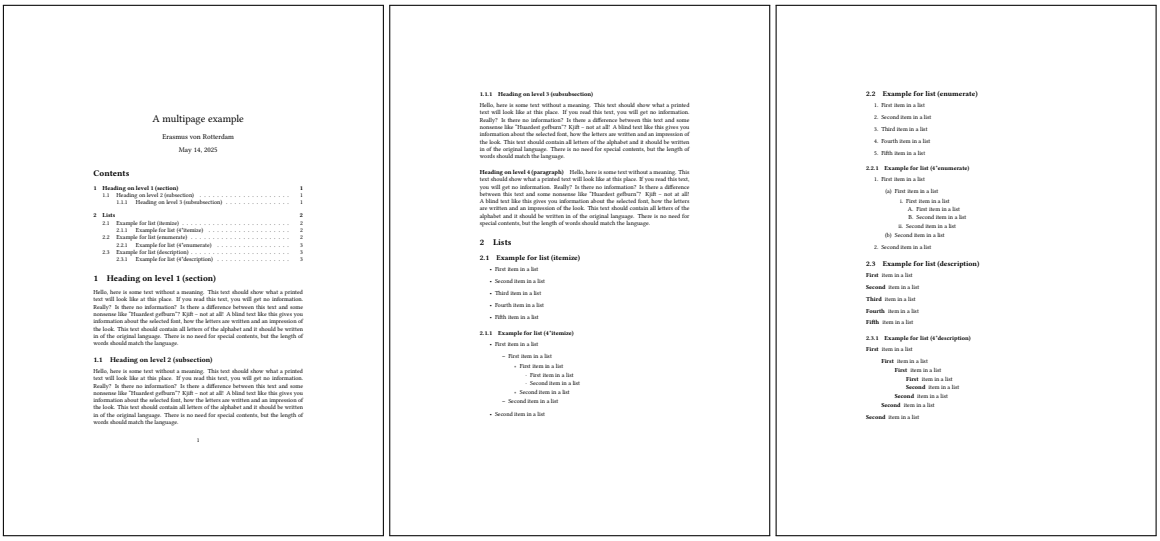
With `frame` the pages can be framed (internally by `\fbox`). It is leaved to the user to choose the correct image width for the pages. The separation between the pages is defined by the length `pagesep`. The following example uses:

```
pages={1,2,3},
pagesep=2pt,
grfOptions={width=0.3\linewidth},
compiler=lualatex, runs=2,  % for the TOC
frame,
```

voss-11.tex

```
\usepackage{pst-geo}
```

```
\begin{pspicture}(-7,-10)(7,3)
\WorldMap[type=8]
\end{pspicture}
```



5.7 Output as floating object with caption and label

By default the images are not inserted as a float. This can be changed by the keyword `float`, a caption and a label are optional. The float type is always `figure`.

```
\define@boolkey{hv}[hv@extern@]{float}[true]{}
\define@key{hv}{floatsetting}[]{\def\hv@extern@floatsetting{#1}}
\define@key{hv}{caption}[]{\def\hv@extern@caption{#1}}
\define@key{hv}{label}[]{\def\hv@extern@label{#1}}
```

The image Figure 1 shows an example for a floating object, which uses the floatsetting `!htb`, which is the default. Using a caption and a label are optional.

voss-12.tex

```
\usepackage{pst-geo}
```

```
\psset{level=1,linewidth=0.5\pslinewidth,
  xunit=0.75,yunit=0.75}
\begin{pspicture*}[showgrid](-9,-9)(10,9)
\WorldMap[rivers,cities,USA,maillage=false]
```

```
\psframe[linewidth=0.5mm,linecolor=red](-6.5,1)(-3,3)
\end{pspicture*}
```

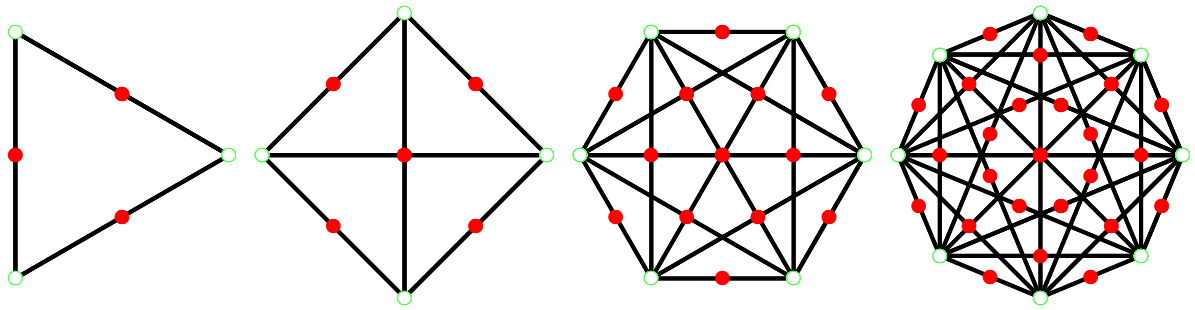


Figure 1: An example for Coxeter images

5.8 Cropping the PDF

Instead of using the documentclass `standalone`, which already crops the created PDF, one can use the optional argument `crop`.

```
\define@boolkey{hv}[hv@extern@]{crop}[true]{}
\define@key{hv}{cropmargin}[2]{\def\hv@extern@cropmargin{#1 }}% length in pt
```

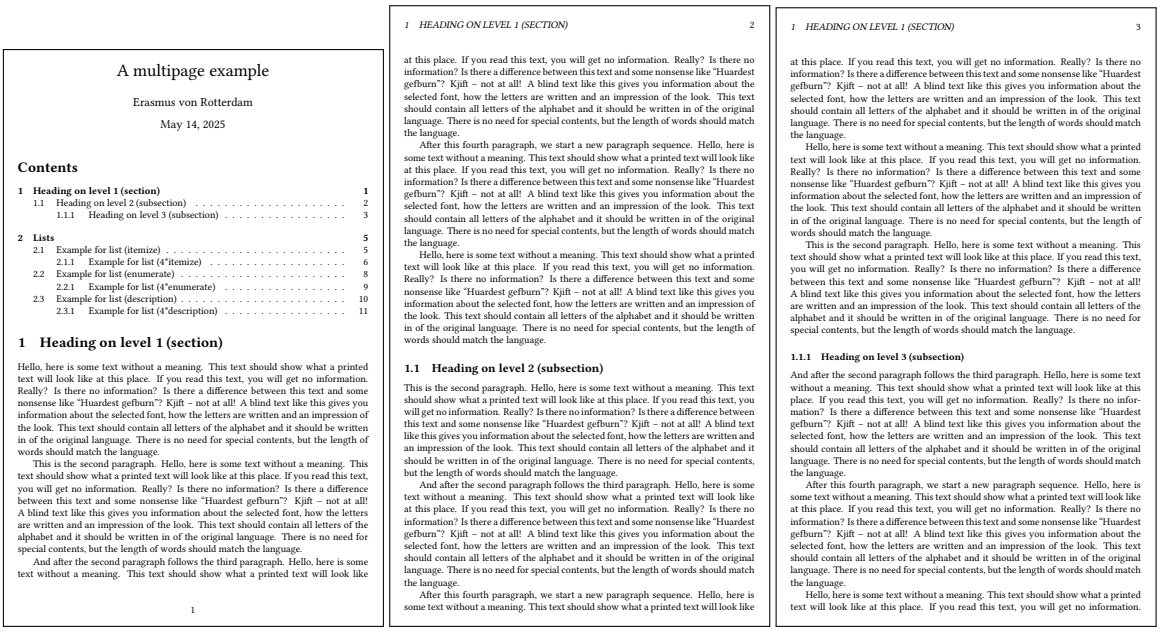
It is also possible to crop a document with more than one page. In this case the beginning and end of the pages should be on the same height. Otherwise the pages will have different heights after cropping (see next image). The follwoing example was created with

```
  pages={1,2,3},
  pagesep=2pt,
  grfOptions={width=0.3\linewidth},
  compiler=lualatex, runs=2,  % for the TOC
  frame,
  crop, cropmargin=5,%    5pt margin
```

voss-13.tex

```
\usepackage{pst-geo}
```

```
\psset{xunit=4,yunit=4,
   linewidth=1.25\pslinewidth}
\begin{pspicture}*(-6.5,1)(-3,3)
\WorldMap[rivers,cities,USA,maillage]
\end{pspicture}
```



A multipage example

Erasmus von Rotterdam

May 14, 2025

Contents

1 Heading on level 1 (section)

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special contents, but the length of words should match the language.

This is the second paragraph. Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special contents, but the length of words should match the language.

And after the second paragraph follows the third paragraph. Hello, here is some text without a meaning. This text should show what a printed text will look like

1

1 HEADING ON LEVEL 1 (SECTION) 2

at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special contents, but the length of words should match the language.

After this fourth paragraph, we start a new paragraph sequence. Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special contents, but the length of words should match the language.

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1.1 Heading on level 2 (subsection)

This is the second paragraph. Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special contents, but the length of words should match the language.

And after the second paragraph follows the third paragraph. Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special contents, but the length of words should match the language.

After this fourth paragraph, we start a new paragraph sequence. Hello, here is some text without a meaning. This text should show what a printed text will look like

1 HEADING ON LEVEL 1 (SECTION) 3

at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special contents, but the length of words should match the language.

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special contents, but the length of words should match the language.

This is the second paragraph. Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special contents, but the length of words should match the language.

1.1.1 Heading on level 3 (subsection)

And after the second paragraph follows the third paragraph. Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special contents, but the length of words should match the language.

After this fourth paragraph, we start a new paragraph sequence. Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information.

5.9 Code and output side by side

By default the code and the output is on top of each other. With setting the width of a minipage with `mpwidth` greater than 0 pt the output will be side by side.

```
\define@key{hv}{mpwidth}[0pt]{\setlength\hv@extern@mpwidth{#1}}
\define@key{hv}{mpvalign}[0pt]{\def\hv@extern@mpvalign{#1}}
```

`mpwidth` is the width of the code. The rest of the line, minus 1em for the space between the minipages, will be the possible width for the output and will be calculated automatically. The two minipages are aligned by defaults to its top. This can be changed by setting `mpvalign` to `c` or `b`.

5.10 Horizontal alignment of the output

```
  align=\centering,  % default
```

```
\usepackage{pst-geo}
```

```
\psset{xunit=5,yunit=5}
\psframebox[framesep=0pt,linewidth=0.2mm,doubleline]{%
  \begin{pspicture}*(-0.5,1.70)(1.5,3)%
  \WorldMapII[Africa,increment=2]
\end{pspicture}}
```

[redacted]

```
  align=\raggedright,
```

```
\usepackage{pst-geo}
```

```
\makebox[\textwidth]{%
\begin{pspicture*}(-9,-9)(9,10)
\rput{90}(0,0){\WorldMapII[all,rivers=false,borders=false,linewidth=0.1\pslinewidth,level=75]}
\end{pspicture*}}
```

[redacted]

```
  align=\raggedleft,
```

```
\usepackage{pst-geo}
```

```
\makebox[\textwidth]{%
   \psset{xunit=0.75,yunit=0.75}
   \begin{pspicture}(-9,-5)(9,5)
   \WorldMapII[type=2,all,rivers=false,borders=false,linewidth=0.1\pslinewidth]
   \end{pspicture}}
```

```
  align=\centering,  mpwidth=0.5\linewidth,   % default for side by side
```

```
\usepackage{pst-geo}
\definecolor{ocean}{rgb}{0.5,0.8,0.8}
```

```
\begin{pspicture*}(-9,-3)(9,3)
  \psframe*[linecolor=ocean](-9,-3)(9,3)
  \WorldMapII[type=3,all,maillage=false,rivers=
      false,borders=false,linewidth=0.1\
      pslinewidth]
\end{pspicture*}
```

```
  align=\raggedright,   mpwidth=0.5\linewidth,
```

```
\usepackage{pst-geo,graphicx}
```

```
\resizebox{\linewidth}{!}{%
  \begin{pspicture*}(-10,-5)(10,5)
  \WorldMapII[type=4,all,rivers=false,borders=false
      ,linewidth=0.1\pslinewidth]
  \end{pspicture*}}
```

```
  align=\raggedleft,  mpwidth=0.5\linewidth,
```

```
\usepackage{pst-geo}
```

```
\psset{xunit=0.5,yunit=0.5}
\begin{pspicture}*(-9,-12)(9.5,14)
\psframe(-9,-12)(9.5,14)
\WorldMapII[type=5,all,linewidth=0.1\pslinewidth,
    rivers=false,borders=false]
\end{pspicture}
```

5.11 Inline images

By default code and image are own paragraphs. With the optional argument `inline` the created image can be part of the current line. This may make sense, if you need characters which are not part of your current font.

```
\define@boolkey{hv}[hv@extern@]{inline}[true]{%
    \hv@extern@codefalse
    \hv@extern@showFilenamefalse}
```

With the setting `inline=true` the optional keyword `code` and `showFilename` is automatically set to false. The next Chinese characters 美好的一天are inserted as inline image without showing the code. The complete code looks like:

With \Lkeyset{inline} the optional argument \Lkeyword{code} is
automatically set to false. The next Chinese characters
\begin{externalDocument}[vshift=-1pt,
  compiler=xelatex, inline, runs=2, grfOptions={height=8pt},
  crop, cropmargin=0, cleanup, docType=latex]{voss}
\documentclass{ctexart}
\pagestyle{empty}
\begin{document}
美好的一天
\end{document}
\end{externalDocument}
are inserted as inline image without showing the code. The complete
code looks like:

With the keyword `vshift` the inserted image can be moed in vertically direction.

5.12 Input text instead of an image

By default the created pdf which can be, of course, only text, will be inserted by `\includegraphics`. If you have only text as output and don't want to create a pdf you can insert this kind of output as verbatim text by setting `includegraphic=false` .

```
\define@boolkey{hv}[hv@extern@]{includegraphic}[true]{}
```

The textfile must have the same main filename with the extension `.txt`. As already mentioned, in every programming language you can get the current used filename from within the code itself. The following Perl example which calculates the Kaprekar constants uses

```
my $filename = $0;             # the current filename
$filename =~ s/\.pl//;         # without extension .pl
$filename = "${filename}.txt"; # for the output
```

Only for some completeness: a Kaprekar constant is a number A with $\max(A) - \min(A) = A$. max and min are the sorted digits of the number A: $495 = 954 - 459$.

voss-21.pl

```
my $zahl = 1;
my $anfang = 1;
my $ende = 9;
```

```
print $fh "Finding Kaprekarconstants ...\n";
while ($zahl < 8) {
  print $fh "${zahl}-stellig: ";
  foreach ($anfang...$ende) { # for every row $_
    @Zeichen = split(//,$_);
    $Min = join("",sort(@Zeichen));
    $Max = reverse($Min);
    $Dif=$Max-$Min;
    if($_ eq $Dif) {
      $found = 1;
      print $fh $_,",  ";
    }
  }
  if (!$found) { print $fh "---\n"; }
  else         { print $fh "\n";    }
  $found = false;
  $zahl = $zahl+1;
  $anfang = $anfang*10;
  $ende = $ende*10;
}
```

```
Finding Kaprekarconstants ...
1-stellig: ---
2-stellig:
3-stellig: 495,
4-stellig: 6174,
5-stellig:
6-stellig: 549945,  631764,
7-stellig:
```

Another example with running Lua to calculate and print the Pascal's triangle. The internal filename is available with

```
local filename = arg[0]
local shortFN = str:match("(.+)%..+")   -- delete extension
outFile = io.open(shortFN..".txt","w+") -- open external file
```

voss-22.lua

```
function nextrow(t)
  local ret = {}
  t[0], t[#t+1] = 0, 0
  for i = 1, #t do ret[i] = t[i-1] + t[i] end
  return ret
end

function triangle(n)
  t = {1}
  for i = 1, n do
    m = (n - i)
    for j = 1,m do outFile:write("    ") end
    for k = 1,i do outFile:write(string.format("%8s",t[k])) end
    outFile:write("\n")
    t = nextrow(t)
  end
end
```

```
triangle(10)
```

```
                                   1
                               1       1
                           1       2       1
                       1       3       3       1
                   1       4       6       4       1
               1       5      10      10       5       1
           1       6      15      20      15       6       1
```

```
          1       7      21      35      35      21       7       1
      1       8      28      56      70      56      28       8       1
  1       9      36      84     126     126      84      36       9       1
```

5.13 Running additional external programs

For a LaTeX additional programs for bibliography, index, a.s.o. maybe needed.

```
\define@boolkey{hv}[hv@extern@]{biber}[true]{}
\define@boolkey{hv}[hv@extern@]{xindex}[true]{}
\define@key{hv}{xindexOptions}[]{\def\hv@extern@xindexOptions{#1}}
\define@key{hv}{runsequence}[]{\def\hv@extern@runsequence{#1}}
```

The `biber` run needs no additional options, but for `xindex` it maybe useful. The following examples uses

```
\begin{externalDocument}[
  compiler=lualatex, runs=2, pages=2,crop,
  xindex, xindexOptions={-l DE --config AU},
  mpwidth=0.6\linewidth, usefancyvrb=false,
  docType=latex,
  ...
]{voss}
```

voss-23.tex

```
\usepackage{pst-geo}
```

```
\psset{linewidth=0.2\pslinewidth,
   xunit=0.75,yunit=0.75}
\begin{pspicture*}[showgrid](-9,-9)(10,9)
  \WorldMapII[maillage=false,rivers=false,borders=false,all]
\psframe[linewidth=0.5mm,linecolor=red](-6.5,1)(-3,3)
\end{pspicture*}
```

Index

F
Fluss
- Oder, 1

G
Göbel, 1
Goethe, 1
Goldmann, 1
Göthe, 1
Götz, 1

O
Ober, 1
Oberin, 1
Obstler, 1
Ödem, 1
oder, 1
Oder, 1, *siehe auch* Fluss
Öl, 1
ölen, 1
Oligarch, 1
Öresund, 1
Ostern, 1
Österreich, 1

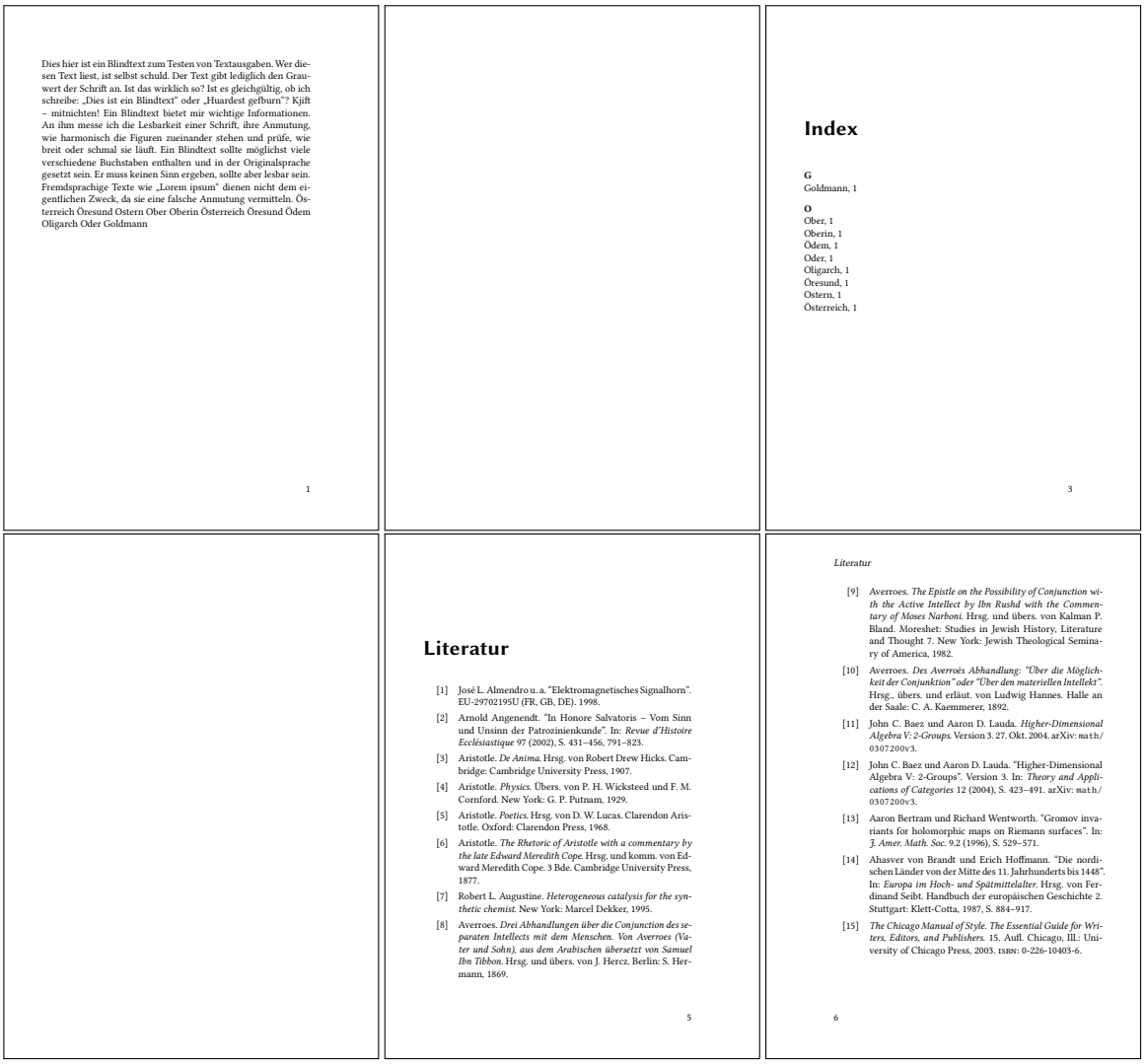
Instad of using the options `compiler`, `biber`, and `xindex` one can also use only the optional argument `runsequence` to define an individuell sequence of commands, e.g.:

```
runsequence={lualatex,biber,{xindex -l de -c AU},lualatex,lualatex}
```

voss-24.tex

```
\usepackage{pst-geo}
```

```
\psset{xunit=4,yunit=4,% zoom 4*
   linewidth=1.25\pslinewidth}
  \begin{pspicture}*(-6.5,1)(-3,3)
  \WorldMapII[Southamerica,Northamerica,Europe=false]
\end{pspicture}
```



5.14 Using `listings`

The default is using `\lstinputlisting` for the printed code sequences.

voss-25.tex

```
\usepackage{pst-geo}
```

```
\psset{xunit=10,yunit=10, % zoom 10*
   linewidth=1.25\pslinewidth}
  \begin{pspicture}*(6.2,1.4)(7.6,2.8)
  \WorldMapII[Asia,increment=1]
\end{pspicture}
```

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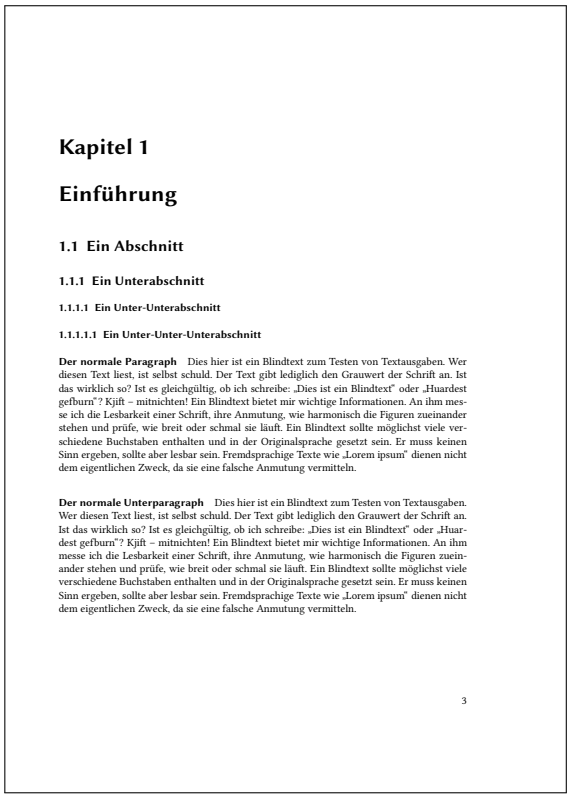


Kapitel 1

Einführung

1.1 Ein Abschnitt

1.1.1 Ein Unterabschnitt

1.1.1.1 Ein Unter-Unterabschnitt

1.1.1.1.1 Ein Unter-Unter-Unterabschnitt

Der normale Paragraph Dies hier ist ein Blindtext zum Testen von Textausgaben. Wer diesen Text liest, ist selbst schuld. Der Text gibt lediglich den Grauwert der Schrift an. Ist das wirklich so? Ist es gleichgültig, ob ich schreibe: „Dies ist ein Blindtext“ oder „Huardest gefburn“? Kjift – mitnichten! Ein Blindtext bietet mir wichtige Informationen. An ihm messe ich die Lesbarkeit einer Schrift, ihre Anmutung, wie harmonisch die Figuren zueinander stehen und prüfe, wie breit oder schmal sie läuft. Ein Blindtext sollte möglichst viele verschiedene Buchstaben enthalten und in der Originalsprache gesetzt sein. Er muss keinen Sinn ergeben, sollte aber lesbar sein. Fremdsprachige Texte wie „Lorem ipsum“ dienen nicht dem eigentlichen Zweck, da sie eine falsche Anmutung vermitteln.

Der normale Unterparagraph Dies hier ist ein Blindtext zum Testen von Textausgaben. Wer diesen Text liest, ist selbst schuld. Der Text gibt lediglich den Grauwert der Schrift an. Ist das wirklich so? Ist es gleichgültig, ob ich schreibe: „Dies ist ein Blindtext“ oder „Huardest gefburn“? Kjift – mitnichten! Ein Blindtext bietet mir wichtige Informationen. An ihm messe ich die Lesbarkeit einer Schrift, ihre Anmutung, wie harmonisch die Figuren zueinander stehen und prüfe, wie breit oder schmal sie läuft. Ein Blindtext sollte möglichst viele verschiedene Buchstaben enthalten und in der Originalsprache gesetzt sein. Er muss keinen Sinn ergeben, sollte aber lesbar sein. Fremdsprachige Texte wie „Lorem ipsum“ dienen nicht dem eigentlichen Zweck, da sie eine falsche Anmutung vermitteln.

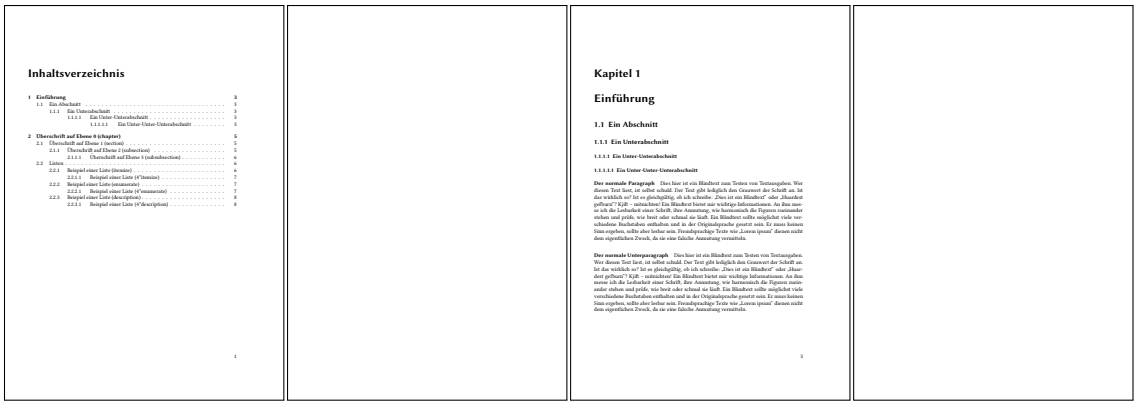
3

It also possible to use `\VerbatimInput` from package `fancyvrb`. In general it makes no difference using the optional argument `usefancyvrb` or not.

voss-26.tex

```
\usepackage{pst-geo}
```

```
\psframebox[fillstyle=solid,fillcolor=black!30]{%
\begin{pspicture}(-7,-7)(7,7)
  \WorldMapThreeD[PHI=30,THETA=0,gridmapcolor=black]%
\end{pspicture}}
```



5.15 Vertical space

```
\define@key{hv}{aboveskip}[\medskipamount]{%
        \setlength\hv@extern@aboveskip{#1}}
\define@key{hv}{belowpreambleskip}[\smallskipamount]{%
        \setlength\hv@extern@belowpreambleskip{#1}}
\define@key{hv}{belowbodyskip}[\smallskipamount]{%
        \setlength\hv@extern@belowbodyskip{#1}}
\define@key{hv}{belowskip}[\medskipamount]{%
        \setlength\hv@extern@belowskip{#1}}
```

aboveskip Vertical space *before* the environment `externalDocument` or the command `\runExtCmd` (default `\medskipamount`)

belowpreambleskip Vertical space between preamble and body (default `\smallskipamount`)

belowbodyskip Vertical space between body and output (default `\smallskipamount`)

belowskip Vertical space *after* the environment `externalDocument` or the command `\runExtCmd` (default `\medskipamount`)

The listings environment uses its own keywords `aboveskip` and `belowskip`, also preset to `\medskipamount`. These ones can be changed by using the keyword `lstOptions`:

```
..., lstOptions = {aboveskip=..., belowskip=...}, ...
```

5.16 No output

By default there is an image or text as output of the external run. In a case, where you are only interested in the code, which should be formatted in the same style as other examples, you can set `showoutput` to false.

voss-27.tex

```
\usepackage{pst-geo}
```

```
\psframebox[fillstyle=solid,fillcolor=black!30]{%
\begin{pspicture}(-7,-7)(7,7)
  \WorldMapThreeD[PHI=50,THETA=0,cities,RotX=-60]%
\end{pspicture}}
```

6 Defining new marker

Suppose you do not want for a LaTeX document the complete body part between `\begin` and `\end` printed. In this case you can define own markers, e.g.:

```
\defMarkerType{ltx}
  {\perCent StartVisibleBody}
  {\perCent StopVisibleBody}
  {\perCent StartVisiblePreamble}
  {\perCent StopVisiblePreamble}
```

Whith this definition and the setting `docType=ltx` the last example looks like:

voss-28.tex

```
\usepackage{pst-geo}
```

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7 Supported engines

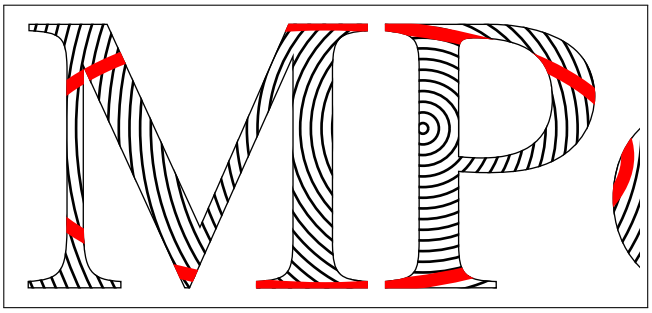
7.1 METAPOST example

Needs the run sequence setting to get a `pdf` from the created `dvi` output. It is already internally defined.

```
defaultfont:="ptmr8r";
warningcheck:=0;
```

voss-29.mp

```
draw fullcircle shifted (0.5,0.6) xscaled 8cm yscaled 3.5cm
  withpen pencircle scaled 5bp withcolor red;
special( " /Times-Roman findfont 150 scalefont setfont " &
  " 0 10 moveto (MPost) false charpath clip stroke gsave 150 70 translate " &
  " 2 4 600 {dup 0 moveto 0 exch 0 exch 0 360 arc stroke} for grestore ");
```



For METAPOST exists an optional argument `mposttex` which is preset to `tex`. If you want to run the METAPOST part with LaTeX instead of TeX then use `mposttex=latex`.

7.2 plainTEX example

Needs the run sequence setting to get a pdf from the created dvi output. It is already internally defined.

voss-30.tex

```
\usepackage{pst-geo}
```

An elementary proof of the reconstruction conjecture

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Submitted: Jan 1, 2009; Accepted: Jan 2, 2009; Published: Jan 3, 2009
Mathematics Subject Classifications: 05C88, 05C89

Abstract

The reconstruction conjecture states that the multiset of unlabeled vertex-deleted subgraphs of a graph determines the graph, provided it has at least 3 vertices. A version of the problem was first stated by Stanisław Ulam. In this paper, we show that the conjecture can be proved by elementary methods. It is only necessary to integrate the Lenkle potential of the Broglington manifold over the quantum supervacillatory measure in order to reduce the set of possible counterexamples to a small number (less than a trillion). A simple computer program that implements Pipletti's classification theorem for torsion-free Aramaic groups with simplectic socles can then finish the remaining cases.

1. Introduction.

This is the start of the introduction.

* Thanks to the editors of this journal!

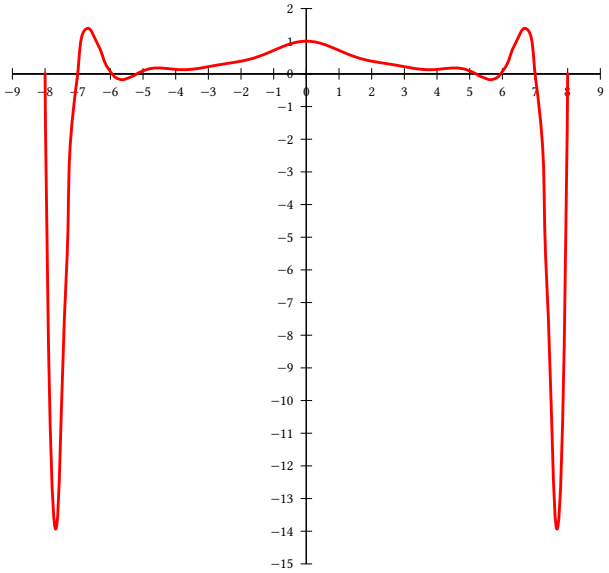
7.3 LuaLATEX example

With LuaLATEX and and using PostScript code the intermediate GhostScript run is not needed. The pdf is directly created.

voss-31.tex

```
\usepackage{pst-geo}
```

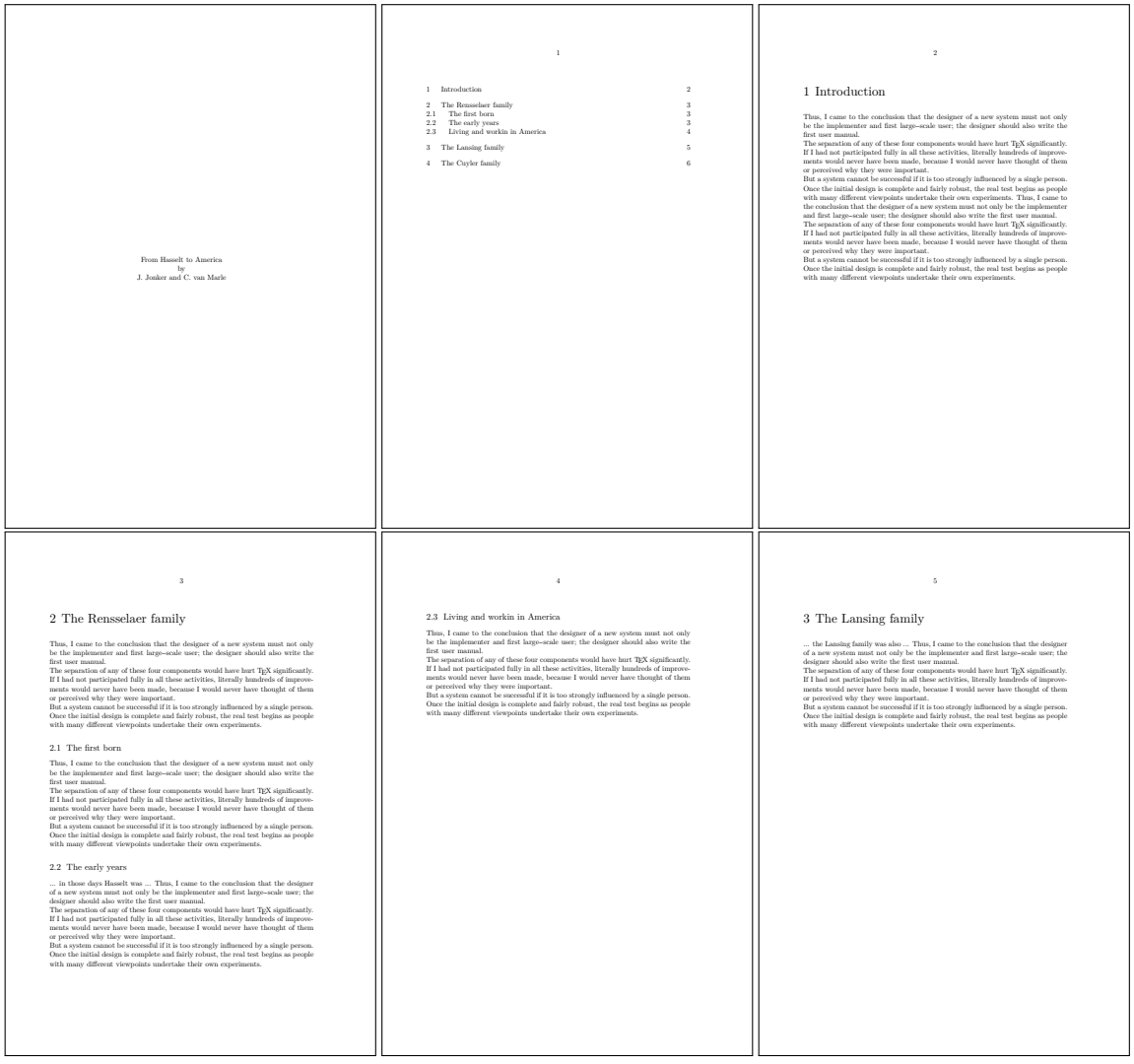
```
\psframebox[fillstyle=solid,fillcolor=black!30,linewidth=0.5pt]{%
\begin{pspicture}*(-7,-4)(7,4)
\WorldMapThreeD[PHI=48,THETA=30,cities,increment=5,Decran=48,level=1]%
\end{pspicture}}
```



7.4 ConTEXt example

voss-32.tex

```
\usepackage{pst-geo,multido}
```



From Hasselt to America
by
J. Jonker and C. van Marle

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2.1 The first born 3
2.2 The early years 3
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4 The Cuyler family 6

2

1 Introduction

Thus, I came to the conclusion that the designer of a new system must not only be the implementer and first large–scale user; the designer should also write the first user manual.
The separation of any of these four components would have hurt TEX significantly. If I had not participated fully in all these activities, literally hundreds of improvements would never have been made, because I would never have thought of them or perceived why they were important.
But a system cannot be successful if it is too strongly influenced by a single person. Once the initial design is complete and fairly robust, the real test begins as people with many different viewpoints undertake their own experiments. Thus, I came to the conclusion that the designer of a new system must not only be the implementer and first large–scale user; the designer should also write the first user manual.
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3

2 The Rensselaer family

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2.1 The first born

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The separation of any of these four components would have hurt TEX significantly. If I had not participated fully in all these activities, literally hundreds of improvements would never have been made, because I would never have thought of them or perceived why they were important.
But a system cannot be successful if it is too strongly influenced by a single person. Once the initial design is complete and fairly robust, the real test begins as people with many different viewpoints undertake their own experiments.

2.2 The early years

... in those days Hasselt was ... Thus, I came to the conclusion that the designer of a new system must not only be the implementer and first large–scale user; the designer should also write the first user manual.
The separation of any of these four components would have hurt TEX significantly. If I had not participated fully in all these activities, literally hundreds of improvements would never have been made, because I would never have thought of them or perceived why they were important.
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4

2.3 Living and workin in America

Thus, I came to the conclusion that the designer of a new system must not only be the implementer and first large–scale user; the designer should also write the first user manual.
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But a system cannot be successful if it is too strongly influenced by a single person. Once the initial design is complete and fairly robust, the real test begins as people with many different viewpoints undertake their own experiments.

5

3 The Lansing family

... the Lansing family was also ... Thus, I came to the conclusion that the designer of a new system must not only be the implementer and first large–scale user; the designer should also write the first user manual.
The separation of any of these four components would have hurt TEX significantly. If I had not participated fully in all these activities, literally hundreds of improvements would never have been made, because I would never have thought of them or perceived why they were important.
But a system cannot be successful if it is too strongly influenced by a single person. Once the initial design is complete and fairly robust, the real test begins as people with many different viewpoints undertake their own experiments.

8 Running external commands

Integrating the current directory of this document we can use the macro `\runExtCmd` with the optional argument `redirect`

```
\runExtCmd[redirect]{ls -la}{voss}
```

to get the directory listed:

```
total 4744
drwxr-xr-x   18 voss  staff      576 14 Mai 09:38 .
drwxr-xr-x  150 voss  staff     4800 14 Mai 08:44 ..
drwxr-xr-x    3 voss  staff       96 27 Mär  2024 .ctan
drwxr-xr-x    4 voss  staff      128 27 Apr  2022 .test
-rw-r--r--    1 voss  staff     2664 14 Mai 08:52 Changes
drwxr-xr-x  104 voss  staff     3328 14 Mai 09:38 Exa
-rw-r--r--    1 voss  staff     3998 27 Mai  2022 hvdoctools.sty
-rwxr-xr-x    1 voss  staff     1040 21 Jul  2022 hvextern-checkfile.lua
-rw-r--r--    1 voss  staff    16384 14 Mai 09:38 hvextern.aux
-rw-r--r--    1 voss  staff     8192 14 Mai 09:38 hvextern.idx
-rw-r--r--    1 voss  staff    98873 14 Mai 09:38 hvextern.log
-rw-r--r--    1 voss  staff      727 20 Jun  2022 hvextern.lua
-rw-r--r--@   1 voss  staff  1355913 14 Mai 09:38 hvextern.pdf
-rw-r--r--    1 voss  staff    48816 14 Mai 08:52 hvextern.sty
-rw-r--r--    1 voss  staff    53769 14 Mai 09:38 hvextern.tex
-rw-r--r--    1 voss  staff        0 14 Mai 09:38 hvextern.toc
-rwxr-xr-x    1 voss  staff     1183 22 Nov  2023 Makefile
-rw-r--r--    1 voss  staff      711 19 Sep  2023 README
```

```
\runExtCmd[redirect,verbose,lstOptions={basicstyle=\ttfamily\small}]{du}{voss}% *nix
```

```
1264    ./.test
6336    ./Exa
96      ./.ctan/hvextern/latex
8       ./.ctan/hvextern/script
3056    ./.ctan/hvextern/doc
8       ./.ctan/hvextern/lualatex
3184    ./.ctan/hvextern
3184    ./.ctan
15528   .
```

9 Other options

vshift A length for a vertical shift of the object, only valid for the inline mode. See document source of example on page 16.

force=false can speed up the comiling time for the document. If a created image/output already exists, there is no need to create it with the next run again and again. *T*his option is not valid if the package option `checkCode` exists.

cleanup the auxiliary files of a LaTeX-run are deleted, preset to `aux`, `log`. It must be a comma seperated list of the extensions of the main file, s.g. `cleanup={aux,log}`.

moveToExampleDir move all examples into a directory, must be set *before* the option `ExampleDir`.

ExampleDir name of a directory for the examples, must first be created by the user himself.

tcbox=false Can be used if there are some negative interactions between package `listings` and package `tcolorbox`.

framesep Value for `\fbox` if keyword `frame` is used.

mpsep Distance between code and output (default 1 em).

pagesep Distance between pages for multipage output (default 1 em).

verbose Print control messages into the terminal and logfile.

eps create an eps from the pdf (historical).

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