

Writing, running and including the output of external documents from within a main \LaTeX document –v. 0.41

Herbert Voß hvoss@tug.org*

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1 Loading the package

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

There exists only one option `checkCode` which is valid for all T_EX-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, T_EX, ConT_EXt, L^AT_EX, LuaT_EX, LuaL^AT_EX, X_YL^AT_EX, X_YL^AT_EX, 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 L^AT_EX document. The values for the optional argument `compiler` must be the real program 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 L^AT_EX document with `lualatex` with the `--shell-escape` option.

3 First examples

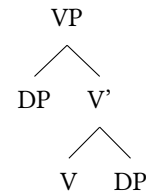
3.1 Without showing the code

This document was run with LuaL^AT_EX. Suppose you want to insert the output of a document which needs for several reasons a X_YL^AT_EX 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 Lua_{AT}EX document itself. The external document is compiled with Xe_{AT}EX and the output is insert as pdf image: 美好的一天. The current filename of the above example is voss-1 and for the source see page 15.

Let's show another example which needs a pdf_{AT}EX 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 category, which is done internally by the package. The complete definition of the code is:

```
\begin{externalDocument}[
  compiler=python3,
  code,
  ext=py,
```

3 First examples

```
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}
```

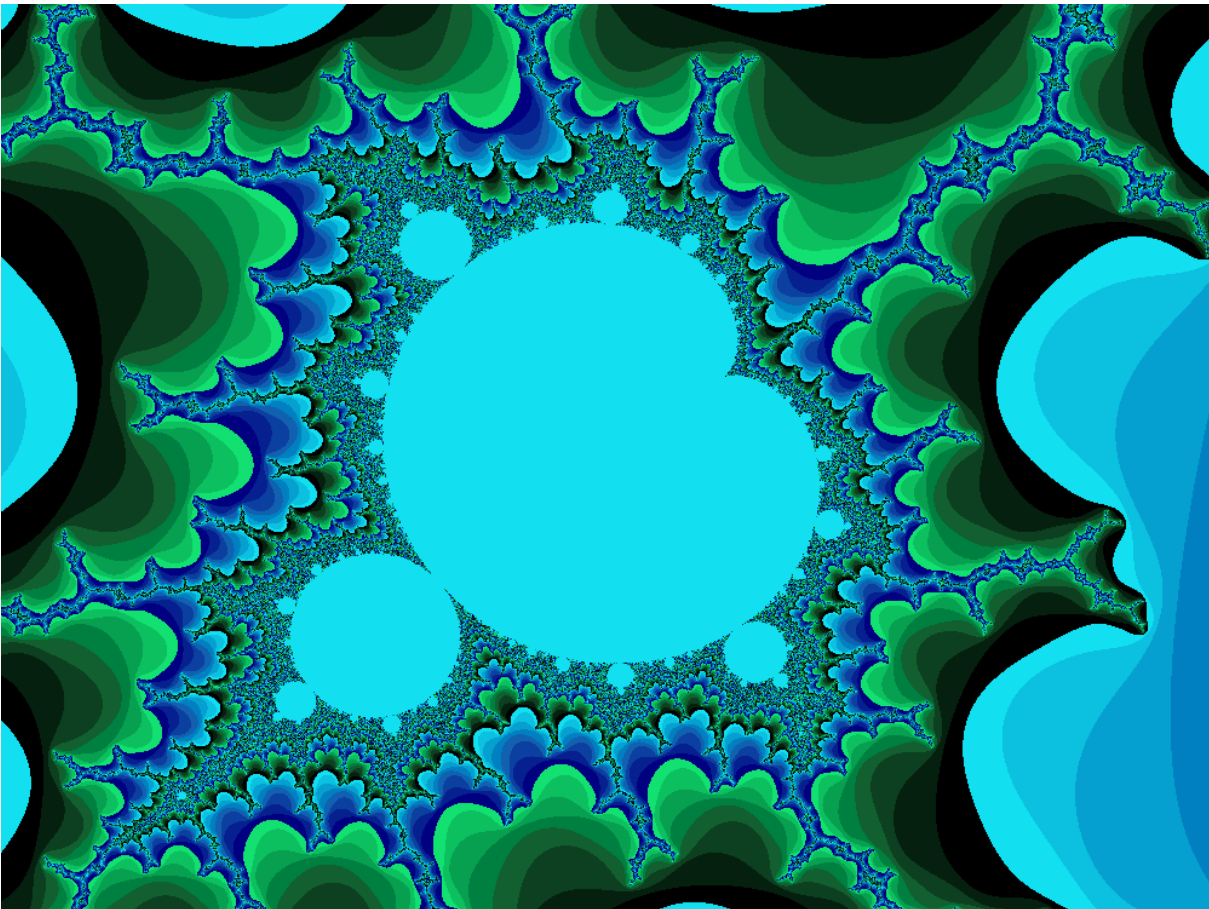
And with using this code we get the image as png inserted. The given filename of the external document is internally extended by a consecutive number which isn't known to the Python code. However, it is no problem in any programming language to get the name of a running file. The forlast line in the 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)
        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 consecutive number, can 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 columns, then use the keyword `outerFN`. Then `hvxtern` 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`.

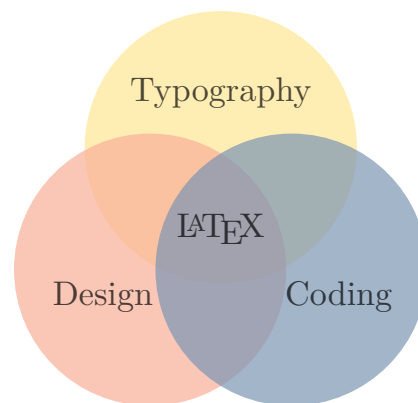
```

\usepackage{tikz}
\usepackage[hks,pantone,xcolor]{xespotcolor}

\SetPageColorSpace{HKS}
\definecolor{HYellow}{spotcolor}{HKS05N,0.5}
\definecolor{HRed}{spotcolor}{HKS14N,0.5}
\definecolor{HBlue}{spotcolor}{HKS38N,0.5}
\begin{tikzpicture}[scale=0.7,fill opacity=0.7]
  \fill[HYellow]( 90:1.2) circle (2);
  \fill[HRed]( 210:1.2) circle (2);
  \fill[HBlue]( 330:1.2) circle (2);

  \node at ( 90:2) {Typography};
  \node at ( 210:2) {Design};
  \node at ( 330:2) {Coding};
  \node {\LaTeX};
\end{tikzpicture}

```



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/

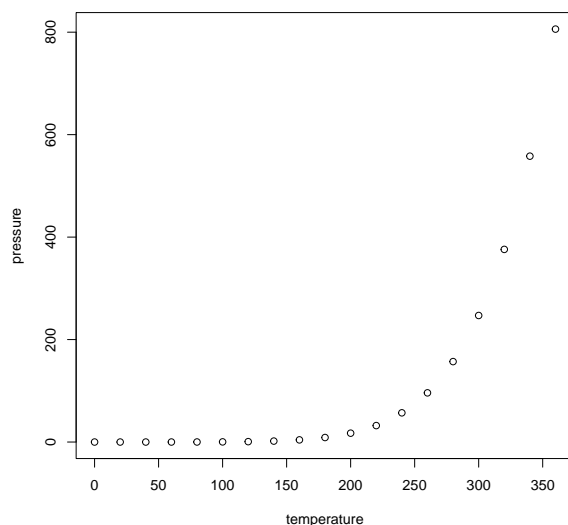
```
\define@key{hv}{progpath}[]{\def\hv@extern@progpath{#1}}
\define@key{hv}{compiler}[pdflatex]{\def\hv@extern@compiler{#1}}
\define@key{hv}{runsequence}[]{\def\hv@extern@runsequence{#1}}
\define@key{hv}{runs}[1]{\setcounter{hv@extern@runs}{#1}}
```

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:

```
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}
```

```
\usepackage[ngerman]{babel}
\usepackage{libertinus,hvindex}
\usepackage{makeidx}\makeindex
\usepackage{biblatex}\addbibresource{biblatex-examples.bib}
```

```
Sort with xindex \verb|-l DE --config AU|
\blindtext
\Index{Österreich} \Index{Öresund}
\Index{Ostern} \Index{Ober} \Index{Oberin}
\Index{Österreich} \Index{Öresund}
\Index{Ödem} \Index{Oligarch} \Index{Oder}
\Index{Goldmann}
\printindex
\nocite{*}\printbibliography
\blindtext
\blindeddocument
```

<p>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 „Hundert gelbun?“ Kjilt – 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</p> <p style="text-align: center;">1</p>	<h3 style="text-align: center;">Index</h3> <p>G Goldmann, 1</p> <p>O Ober, 1 Oberin, 1 Oder, 1 Oligarch, 1 Ostern, 1</p> <p>Ö Ödem, 1 Öresund, 1 Österreich, 1</p> <p style="text-align: center;">3</p>	<h3 style="text-align: center;">Literatur</h3> <p>[1] José L. Alameddine u. a. "Elektromagnetisches Signalhorn". E1-29702195U (FR, GB, DE), 1998.</p> <p>[2] Arnold Angenendt. "In Honore Salvatoris – Vom Sinn und Unsinn der Patrozinienkunde". In: <i>Revue d'Histoire Ecclesiastique</i> 97 (2002), S. 431–456, 791–823.</p> <p>[3] Aristotle. <i>De Anima</i>. Hrsg. von Robert Drew Hicks. Cambridge: Cambridge University Press, 1907.</p> <p>[4] Aristotle. <i>Physics</i>. Übers. von P. H. Wicksteed und F. M. Cornford. New York: G. P. Putnam, 1929.</p> <p>[5] Aristotle. <i>Poetics</i>. Hrsg. von D. W. Lucas. Clarendon Aristotle. Oxford: Clarendon Press, 1968.</p> <p>[6] Aristotle. <i>The Rhetoric of Aristotle with a commentary by the late Edward Meredith Cope</i>. Hrsg. und komm. von Edward Meredith Cope. 3 Bde. Cambridge University Press, 1877.</p> <p>[7] Robert L. Augustine. <i>Heterogeneous catalysis for the synthetic chemist</i>. New York: Marcel Dekker, 1995.</p> <p>[8] Averroes. <i>Drei Abhandlungen über die Conjunction des separaten Intellects mit dem Menschen</i>. Von Averroes (Vater und Sohn), aus dem Arabischen übersetzt von Samuel Ibn Tibbon. Hrsg. und übers. von J. Herze. Berlin: S. Hermann, 1869.</p> <p style="text-align: center;">5</p>
--	---	---

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,
```

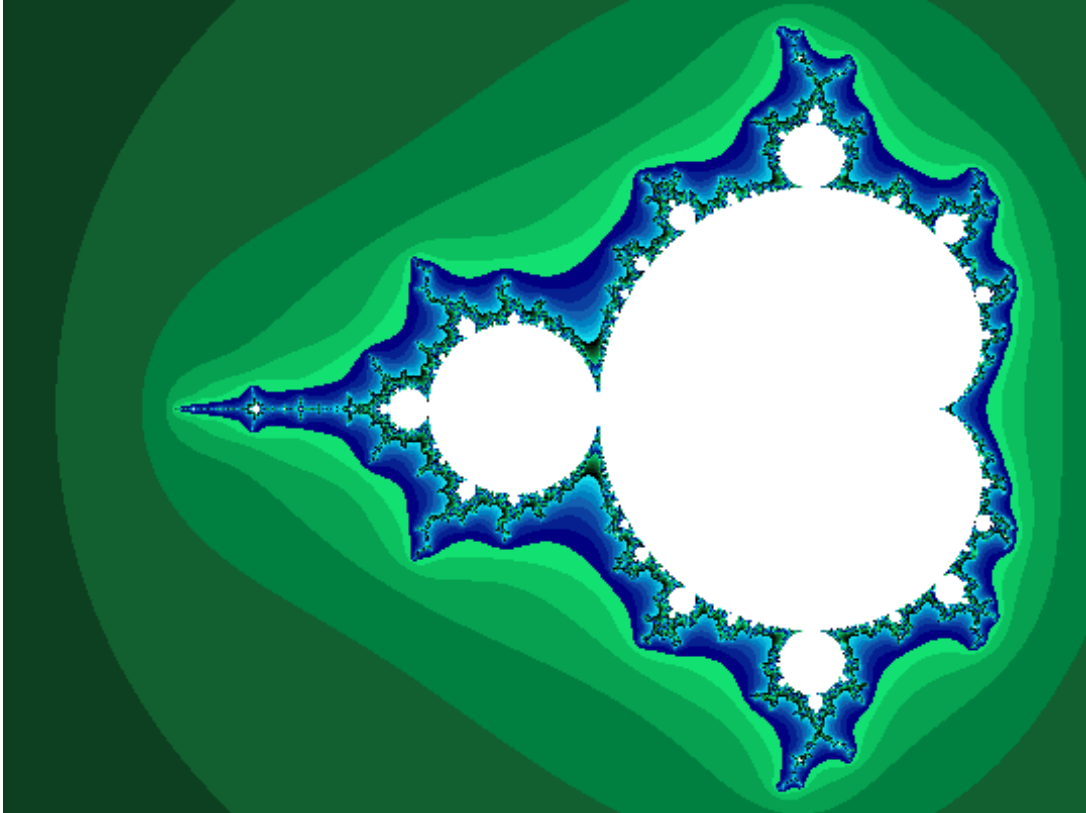
java-7.java

```
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;
}
```

```
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

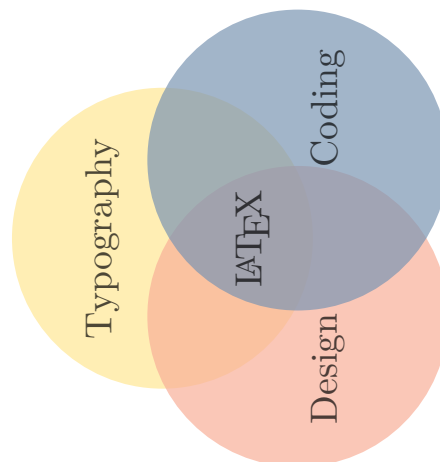
```
\define@key{hv}{grfOptions}[]{\def\hv@extern@grfOptions{#1}}
```

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

voss-8.tex

```
\usepackage{tikz}
\usepackage[hks,pantone,xcolor]{xspotcolor}

\SetPageColorSpace{HKS}
\definecolor{HYellow}{spotcolor}{HKS05N,0.5}
\definecolor{HRed}{spotcolor}{HKS14N,0.5}
\definecolor{HBlue}{spotcolor}{HKS38N,0.5}
\begin{tikzpicture}[scale=0.7,fill opacity=0.7]
  \fill[HYellow] (90:1.2) circle (2);
  \fill[HRed] (210:1.2) circle (2);
  \fill[HBlue] (330:1.2) circle (2);
  \node at (90:2) {Typography};
  \node at (210:2) {Design};
  \node at (330:2) {Coding};
  \node {\LaTeX};
\end{tikzpicture}
```



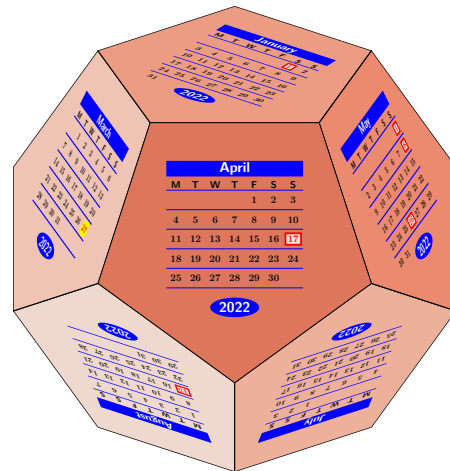
5.3 Listings options

```
\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-calendar}
\psscalebox{0.3}{%
\psCalDodecaeder[Year=2022,style=april]%
}
```



voss-9.tex

5.4 Background color

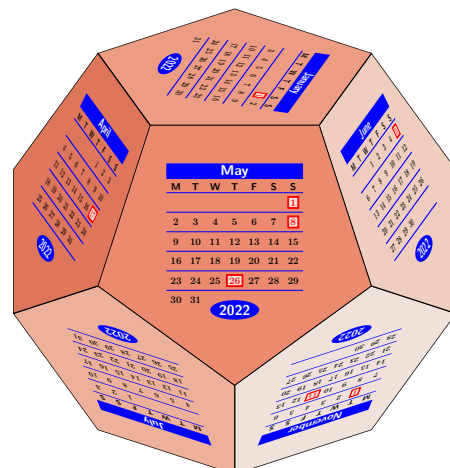
There are different colors for the preamble and body listing: the background and frame color.

```
\define@key{hv}{BGpreamble}[black12]{\def\hv@extern@BGpreamble{#1}}
\define@key{hv}{BGbody}[black8]{\def\hv@extern@BGbody{#1}}
\define@key{hv}{B0preamble}[black12]{\def\hv@extern@B0preamble{#1}}
\define@key{hv}{B0body}[black8]{\def\hv@extern@B0body{#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, B0preamble=red,
BGbody=blue!8, B0body=blue,
```

```
\usepackage{pst-calendar}
\psscalebox{0.3}{%
\psCalDodecaeder[Year=2022,style=may]%
}
```



voss-10.tex

5.5 Type of the source code

The current version of hvextern supports code written as METAPOST, plain T_EX, L^AT_EX, ConT_EXt, 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:

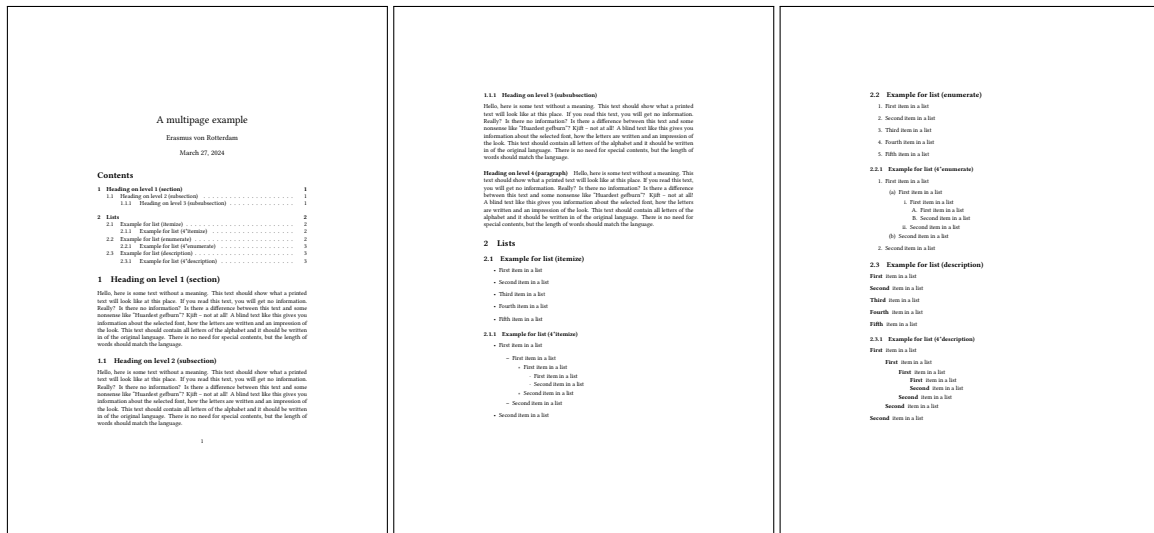
```
pages={1,2,3},
pagesep=2pt,
grfOptions={width=0.3\linewidth},
compiler=lualatex, runs=2, % for the TOC
frame,
```

voss-11.tex

```
\usepackage[american]{babel}
\usepackage{libertinus}
\usepackage{blindtext}
```

```
\title{A multipage example}
\author{Erasmus von Rotterdam}
\maketitle
\tableofcontents
```

```
\blinddocument
```



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.

```
\usepackage{pst-coxeterp}
\begin{pspicture}(-1,-1)(1,1)\Simplex[dimension=2]\end{pspicture}
\begin{pspicture}(-1,-1)(1,1)\Simplex[dimension=3]\end{pspicture}
\begin{pspicture}(-1,-1)(1,1)\Simplex[dimension=5]\end{pspicture}
\begin{pspicture}(-1,-1)(1,1)\Simplex[dimension=7]\end{pspicture}
```

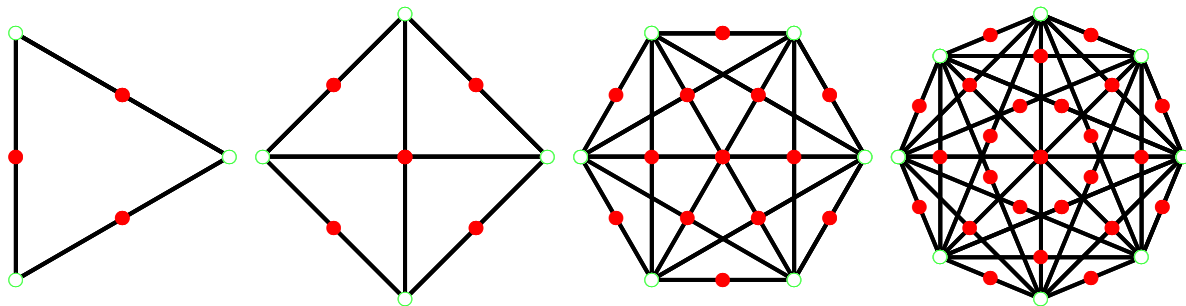


Figure 1: An example for Coxeter images

5.8 Cropping the PDF

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

voss-12.tex

5.10 Horizontal alignment of the output

`align=\centering, % default`

```
\rule{0.5\linewidth}{5mm}
```



`align=\raggedright,`

```
\rule{0.5\linewidth}{5mm}
```



`align=\raggedleft,`

```
\rule{0.5\linewidth}{5mm}
```



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

```
\rule{0.25\linewidth}{5mm}
```



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

```
\rule{0.25\linewidth}{5mm}
```



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

```
\rule{0.25\linewidth}{5mm}
```



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 moved 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

```

```

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

```

voss-22.lua

5.13 Running additional external programs

For a L^AT_EX 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{makeidx}\makeindex
\usepackage{hvindex}
```

```
Sort with xindex \verb|-l DE --config AU|
\Index{Österreich} \Index{Öresund}

\Index{Ostern} \Index{Ober} \Index{Oberin}
\Index{Österreich} \Index{Öresund}

\Index{Ödem} \Index{Oligarch} \Index{Oder}
\Index{Ostern} \Index{Ober} \Index{Oberin}

\Index{Obstler} \Index{Öl} \Index{ölen}
\Index{Oder|seealso{Fluss}} \Index{Göbel}

\Index{oder} \index{Fluss!Oder}
\Index{Goethe} \Index{Göthe} \Index{Götz}

\Index{Goldmann}
\printindex
```

Index

F	Obstler, 1
Fluss	oder, 1
- Oder, 1	Oder, 1, <i>siehe auch</i> Fluss
G	Oligarch, 1
Goethe, 1	Ostern, 1
Goldmann, 1	Ö
Göbel, 1	Ödem, 1
Göthe, 1	Öl, 1
Götz, 1	Öresund, 1
O	Österreich, 1
Ober, 1	ö
Oberin, 1	ölen, 1

Instead 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[ngerman]{babel}
\usepackage{libertinus,hvindex}
\usepackage{makeidx}\makeindex
\usepackage{biblatex}\addbibresource{biblatex-examples.bib}
```

```
\blindtext
\Index{Österreich} \Index{Öresund}
\Index{Ostern} \Index{Ober} \Index{Oberin}
\Index{Österreich} \Index{Öresund}
\Index{Ödem} \Index{Oligarch} \Index{Oder}
\Index{Goldmann}
\printindex
\nocite{*}\printbibliography
\blindtext
\blindeddocument
```

Dies hier ist ein Blindtext zum Testen von Textausgaben. Wer diesen Text liest, ist selbst schuldig. Der Text gibt lediglich den Granzwert der Schrift an. Ist das wirklich so? Ist es gleichgültig, ob ich schreibe „Dies ist ein Blindtext“ oder „Huardest gefburnt“? 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

1

Index

G
Goldmann, 1

O
Ober, 1
Oberin, 1
Ödem, 1
Oligarch, 1
Ostern, 1

Ö
Ödem, 1
Öresund, 1
Österreich, 1

3

	<p style="text-align: center;">Literatur</p> <p>[1] José L. Almedro u. a. "Elektromagnetisches Signalhorn". EU-29702195U (FR, GB, DE), 1998.</p> <p>[2] Arnold Angenendt. "In Honore Salvatoris – Vom Sinn und Unsinn der Patronenzienkunde". In: <i>Revue d'Histoire Ecclesiastique</i> 97 (2002), S. 431–456, 791–823.</p> <p>[3] Aristotile. <i>De Anima</i>. Hrsg. von Robert Drew Hicks. Cambridge: Cambridge University Press, 1907.</p> <p>[4] Aristotile. <i>Physics</i>. Übers. von F. H. Wicksteed und F. M. Cornford. New York: G. P. Putnam, 1929.</p> <p>[5] Aristotile. <i>Poetics</i>. Hrsg. von D. W. Lucas. Clarendon Aristotile. Oxford: Clarendon Press, 1968.</p> <p>[6] Aristotile. <i>The Rhetoric of Aristotle with a commentary by the late Edward Meredith Cope</i>. Hrsg. und komm. von Edward Meredith Cope. 3 Bde. Cambridge University Press, 1877.</p> <p>[7] Robert L. Augustine. <i>Heterogeneous catalysis for the synthetic chemist</i>. New York: Marcel Dekker, 1995.</p> <p>[8] Averroes. <i>Drei Abhandlungen über die Conjunction des separaten Intellekts mit dem Menschen</i>. Von Averroes (Vater und Sohn), aus dem Arabischen überetzt von Samuel Ibn Tibhon. Hrsg. und übers. von J. Hercz. Berlin: S. Hermann, 1869.</p> <p style="text-align: right;">5</p>	<p style="text-align: center;"><i>Literatur</i></p> <p>[9] Averroes. <i>The Epistle on the Possibility of Conjunction with the Active Intellect by Ibn Rushd with the Commentary of Moses Narboni</i>. Hrsg. und übers. von Kalman P. Bland. Moreshet: Studies in Jewish History, Literature and Thought 7. New York: Jewish Theological Seminary of America, 1982.</p> <p>[10] Averroes. <i>Des Averroës Abhandlung: "Über die Möglichkeit der Conjunction" oder "Über den materiellen Intellekt"</i>. Hrsg., übers. und erlaut. von Ludwig Hannes. Halle an der Saale: C. A. Kaemmerer, 1892.</p> <p>[11] John C. Baez und Aaron D. Lauda. <i>Higher-Dimensional Algebra V: 2-Groups</i>. Version 3.27. Okt. 2004. arXiv:math/0307200v3.</p> <p>[12] John C. Baez und Aaron D. Lauda. "Higher-Dimensional Algebra V: 2-Groups". Version 3. In: <i>Theory and Applications of Categories</i> 12 (2004), S. 423–491. arXiv:math/0307200v3.</p> <p>[13] Aaron Bertram und Richard Wentworth. "Gromov invariants for holomorphic maps on Riemann surfaces". In: <i>J. Amer. Math. Soc.</i> 9.2 (1996), S. 529–571.</p> <p>[14] Ahasver von Brandt und Erich Hoffmann. "Die nordschen Länder von der Mitte des 11. Jahrhunderts bis 1448". In: <i>Europa im Hoch- und Spätmittelalter</i>. Hrsg. von Ferdinand Seibt. Handbuch der europäischen Geschichte 2. Stuttgart: Klett-Cotta, 1987, S. 884–917.</p> <p>[15] <i>The Chicago Manual of Style. The Essential Guide for Writers, Editors, and Publishers</i>. 15. Aufl. Chicago, Ill.: University of Chicago Press, 2003. isbn: 0-226-10403-6.</p> <p style="text-align: right;">6</p>
--	---	---

5.14 Using listings

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

```
\documentclass[chapterprefix=on,parskip=half-,DIV=12,fontsize=12pt]{scrbook}
\DeclareNewSectionCommand[
  style=section,
  level=4,
  beforekip=-3.25ex plus -1ex minus -.2ex,
  afterskip=1.5ex plus .2ex,
  font=\normalsize,
  indent=0pt,
  counterwithin=subsubsection
]{subsubsection}
\RedeclareSectionCommand[
  level=5,
  toplevel=5,
  tocindent=13em,
  tocnumwidth=5.9em,
  counterwithin=subsubsubsection
]{paragraph}
\RedeclareSectionCommand[
  level=6,
  toplevel=6,
  tocindent=15em,
  tocnumwidth=6.8em
]{subparagraph}
\setcounter{secnumdepth}{\subsubsectionnumdepth}
\setcounter{tocdepth}{\subsubsectionontocdepth}
```

```
\tableofcontents
\chapter{Einführung}
\section{Ein Abschnitt}
\subsection{Ein Unterabschnitt}
\subsubsection{Ein Unter-Unterabschnitt}
\paragraph{Der normale Paragraph}
\blindtext
\subparagraph{Der normale Unterparagraph}
\blindtext
\blindeddocument
```

voss-25.tex

Inhaltsverzeichnis	
1 Einführung	3
1.1 Ein Abschnitt	3
1.1.1 Ein Unterabschnitt	3
1.1.1.1 Ein Unter-Unterabschnitt	3
1.1.1.1.1 Ein Unter-Unter-Unterabschnitt	3
2 Überschrift auf Ebene 0 (chapter)	5
2.1 Überschrift auf Ebene 1 (section)	5
2.1.1 Überschrift auf Ebene 2 (subsection)	5
2.1.1.1 Überschrift auf Ebene 3 (subsubsection)	6
2.2 Listen	6
2.2.1 Beispiel einer Liste (itemize)	6
2.2.1.1 Beispiel einer Liste (4*itemize)	7
2.2.2 Beispiel einer Liste (enumerate)	7
2.2.2.1 Beispiel einer Liste (4*enumerate)	7
2.2.3 Beispiel einer Liste (description)	8
2.2.3.1 Beispiel einer Liste (4*description)	8

1

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 „Hua-dest geburn“? 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 „Hua-dest geburn“? 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.

```

\documentclass[chapterprefix=on,parskip=half-,DIV=12,fontsize=12pt]{scrbook}
\DeclareNewSectionCommand[
  style=section,
  level=4,
  beforekip=-3.25ex plus -1ex minus -.2ex,
  afterskip=1.5ex plus .2ex,
  font=\normalsize,
  indent=0pt,
  counterwithin=subsubsection
]{subsubsection}
\RedeclareSectionCommand[
  level=5,
  toplevel=5,
  tocindent=13em,
  tocnumwidth=5.9em,
  counterwithin=subsubsubsection
]{paragraph}
\RedeclareSectionCommand[
  level=6,
  toplevel=6,
  tocindent=15em,
  tocnumwidth=6.8em
]{subparagraph}
\setcounter{secnumdepth}{\subsubsectionnumdepth}
\setcounter{tocdepth}{\subsubsectionnumdepth}

\tableofcontents
\chapter{Einführung}

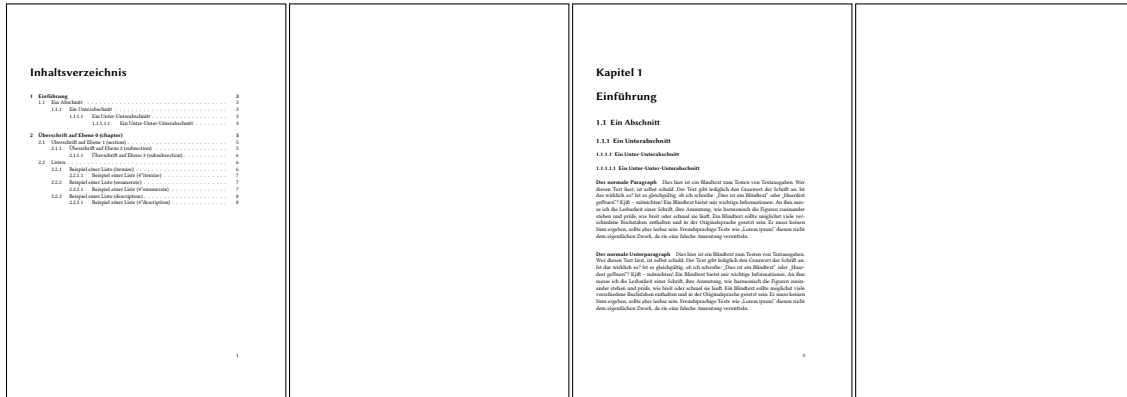
```

voss-26.tex

```

\section{Ein Abschnitt}
\subsection{Ein Unterabschnitt}
\subsubsection{Ein Unter-Unterabschnitt}
\subsubsubsection{Ein Unter-Unter-Unterabschnitt}
\paragraph{Der normale Paragraph}
\blindtext
\subparagraph{Der normale Unterparagraph}
\blindtext
\blindedocument

```



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

```
\documentclass[chapterprefix=on,parskip=half-,DIV=12,fontsize=12pt]{scrbook}
\DeclareNewSectionCommand[
  style=section,
  level=4,
  beforekip=-3.25ex plus -1ex minus -.2ex,
  afterskip=1.5ex plus .2ex,
  font=\normalsize,
  indent=0pt,
  counterwithin=subsubsection
]{subsubsubsection}
```

```
\tableofcontents
\chapter{Einführung}
\section{Ein Abschnitt}
\subsection{Ein Unterabschnitt}
\subsubsection{Ein Unter-Unterabschnitt}
\subsubsubsection{Ein Unter-Unter-Unterabschnitt}
\blindtext
```

6 Defining new marker

Suppose you do not want for a L^AT_EX 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

```
\DeclareNewSectionCommand[
  style=section,
  level=4,
  beforekip=-3.25ex plus -1ex minus -.2ex,
  afterskip=1.5ex plus .2ex,
  font=\normalsize,
  indent=0pt,
  counterwithin=subsubsection
]{subsubsubsection}
```

```
\subsubsubsection{Ein Unter-Unter-Unterabschnitt}
```

Inhaltsverzeichnis

1	Einführung	2
1.1	Ein Abschnitt	2
1.1.1	Ein Unterabschnitt	2
1.1.1.1	Ein Unter-Unterabschnitt	2
1.1.1.1.1	Ein Unter-Unter-Unterabschnitt	2

7 Supported engines

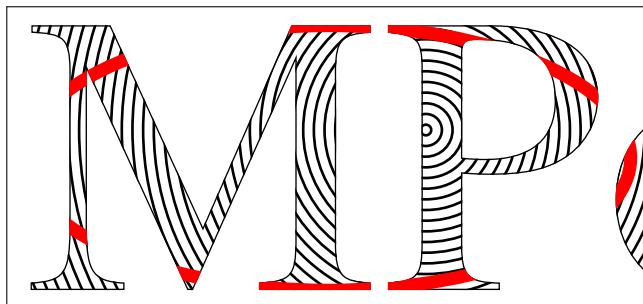
7.1 METAPOST example

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

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

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 ");
```

voss-29.mp



For METAPOST exists an optional argument `mposttex` which is preset to `tex`. If you want to run the METAPOST part with $\text{L}^{\text{A}}\text{T}_{\text{E}}\text{X}$ instead of $\text{T}_{\text{E}}\text{X}$ then use `mposttex=latex`.

7.2 plain $\text{T}_{\text{E}}\text{X}$ example

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

```
\footline={\footsc the electronic journal of combinatorics
  {\footbf 16} (2009), \#R00\hfil\footrm\folio}

\font\bigrm=cmr12 at 14pt
\centerline{\bigrm An elementary proof of the reconstruction conjecture}

\bigskip\bigskip
\centerline{D. Remifa\footnote*{Thanks to the editors of this journal!}}
\smallskip
\centerline{Department of Inconsequential Studies}
\centerline{Solatido College, North Kentucky, USA}
\centerline{\tt remifa@dis.solatido.edu}
\bigskip
\centerline{\footrm
Submitted: Jan 1, 2009; Accepted: Jan 2, 2009; Published: Jan 3, 2009}
\centerline{\footrm Mathematics Subject Classifications: 05C88, 05C89}
\bigskip\bigskip
\centerline{\bf Abstract}
\smallskip
{\narrower\noindent
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 Stanislaw 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
```

voss-30.tex

```
computer program that implements Pipletti's classification theorem
for torsion-free Aramaic groups with symplectic socles can then
finish the remaining cases.}
```

```
\bigskip
\beginsection 1. Introduction.
```

```
This is the start of the introduction.
```

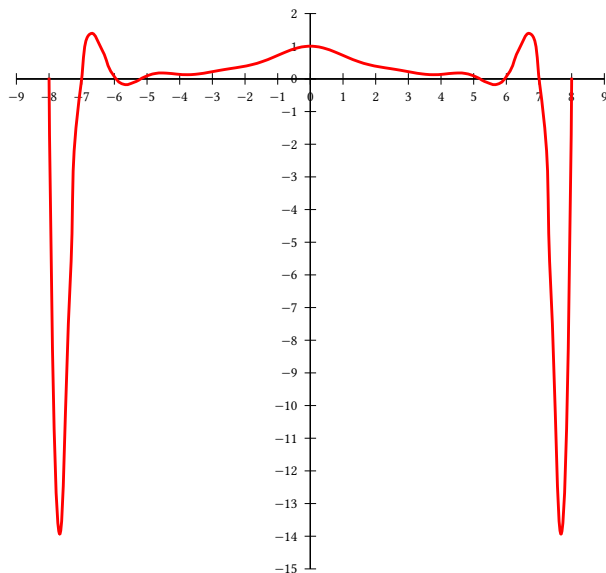


7.3 Lua \LaTeX example

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

```
voss-31.tex
\usepackage{fontenc}\usepackage{libertinus}
\usepackage{pst-all}

\psset{unit=0.8cm}
\begin{pspicture}(-9,-15)(9,2)
\psaxes(0,0)(-9,-15)(9,2)
\psplot[algebraic,plotstyle=curve,curvature=1 1 0,
linewidth=2pt,linecolor=red]{-8}{8}{
1 - 3876218985722260225*x^2/10892114744073986176
+ 14975974793271450625*x^4/174273835905183778816
- 317095420958296875*x^6/26811359370028273664
+ 194412970920703125*x^8/214490874960226189312
- 2090988251953125*x^10/53622718740056547328
+ 99480224609375*x^12/107245437480113094656
- 7879638671875*x^14/697095343620735115264
+ 152587890625*x^16/2788381374482940461056}
\end{pspicture}
```

7.4 ConTEXt example

```

\definehead
  [myhead]
  [section]
\setuphead
  [myhead]
  [numberstyle=bold,
   textstyle =bold,
   before    =\hairline\blank,
   after     =\nowhitespace\hairline]

\startstandardmakeup
\midaligned{From Hasselt to America}
\midaligned{by}
\midaligned{J. Jonker and C. van Marle}
\stopstandardmakeup
\placecombinedlist[content]
\chapter{Introduction}
\input knuth \input knuth
\chapter[rensselaer]{The Rensselaer family}
\input knuth
\section{The first born}
\input knuth
\section{The early years}
... in those days Hasselt was ...
\input knuth
\section{Living and workin in America}
\input knuth
\chapter[lansing]{The Lansing family}
... the Lansing family was also ...
\input knuth
\chapter[cuyler]{The Cuyler family}
... much later Tydeman Cuyler ...
\input knuth
\myhead[headlines]{And the end of all}
foo

```

voss-32.tex

8 Running external commands

<p>From Hasselt to America by J. Jonker and C. van Marle</p>	<p>1</p> <p>1 Introduction 2 2 The Rensselaer family 3 2.1 The first born 3 2.2 The early years 3 2.3 Living and workin in America 4 3 The Lansing family 5 4 The Cuyler family 6</p>	<p>2</p> <p>1 Introduction</p> <p>This, 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. 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.</p>
<p>3</p> <p>2 The Rensselaer family</p> <p>This, 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.</p> <p>2.1 The first born</p> <p>This, 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.</p> <p>2.2 The early years</p> <p>... 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. 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.</p>	<p>4</p> <p>2.3 Living and workin in America</p> <p>This, 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.</p>	<p>5</p> <p>3 The Lansing family</p> <p>... 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.</p>

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 4768
drwxr-xr-x 20 voss staff 640 27 Mär 19:34 .
drwxr-xr-x 143 voss staff 4576 22 Mär 20:29 ..
drwxr-xr-x 3 voss staff 96 24 Apr 2022 .ctan
drwxr-xr-x 4 voss staff 128 27 Apr 2022 .test
-rw-r--r-- 1 voss staff 2625 27 Mär 17:11 Changes
drwxr-xr-x 104 voss staff 3328 27 Mär 19:34 Exa
-rwxr-xr-x 1 voss staff 1183 22 Nov 13:28 Makefile
-rw-r--r-- 1 voss staff 711 19 Sep 2023 README
-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 27 Mär 19:34 hvextern.aux
-rw-r--r-- 1 voss staff 8192 27 Mär 19:34 hvextern.idx
-rw-r--r-- 1 voss staff 630 27 Mär 17:44 hvextern.ilg
-rw-r--r-- 1 voss staff 9170 27 Mär 17:44 hvextern.ind
```

```

-rw-r--r-- 1 voss staff 98862 27 Mär 19:34 hvextern.log
-rw-r--r-- 1 voss staff 727 20 Jun 2022 hvextern.lua
-rw-r--r--@ 1 voss staff 1301957 27 Mär 19:34 hvextern.pdf
-rw-r--r-- 1 voss staff 47791 27 Mär 16:55 hvextern.sty
-rw-r--r-- 1 voss staff 53653 27 Mär 19:33 hvextern.tex
-rw-r--r-- 1 voss staff 0 27 Mär 19:34 hvextern.toc

```

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

```

1264 ./test
6232 ./Exa
96 ./ctan/hvextern/latex
8 ./ctan/hvextern/script
3032 ./ctan/hvextern/doc
8 ./ctan/hvextern/lualatex
3160 ./ctan/hvextern
3160 ./ctan
15424 .

```

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 15.

force=false can speed up the compiling 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. This option is not valid if the package option `checkCode` exists.

cleanup the auxiliary files of a L^AT_EX-run are deleted, preset to `aux, log`. It must be a comma separated 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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