

# Writing, running and including the output of external documents from within a main L<sup>A</sup>T<sub>E</sub>X document –v. 0.35

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22. August 2023

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\*Thanks to Karl Berry; Werner Lemberg; Rolf Niepraschk

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## 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,  $\TeX$ , Con $\TeX$ t, L $\TeX$ , Lua $\TeX$ , LuaL $\TeX$ , X $\TeX$ , X $\LaTeX$ , Lua, Perl, Java and/or Python source code, which will then be run via shell escape to create a PDF oder text output to include it into the main L $\TeX$  document.

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 main document *must* be run with the `--shell-escape` option, otherwise it won't work, e.g.:

```
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 $\TeX$  document with lualatex with the `--shell-escape` option.*

## 3 First examples

### 3.1 Without showing the code

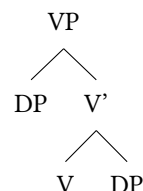
This document was run with LuaL $\TeX$ . Suppose you want to insert the output of a document which needs for several reasons a X $\LaTeX$  run. Instead of created and running a document outside of the main document and then to insert the output we can do this from within this LuaL $\TeX$  document itself. The external document is compiled with X $\LaTeX$  and the output is insert as pdf image: 美好的一天.

Another example which needs a pdfL $\TeX$  run. The source code itself is also not shown by the environment `externalDocument`.

```

\begin{externalDocument}[
  compiler=pdflatex,force=true,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,

```

```

    force=true,
    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

```

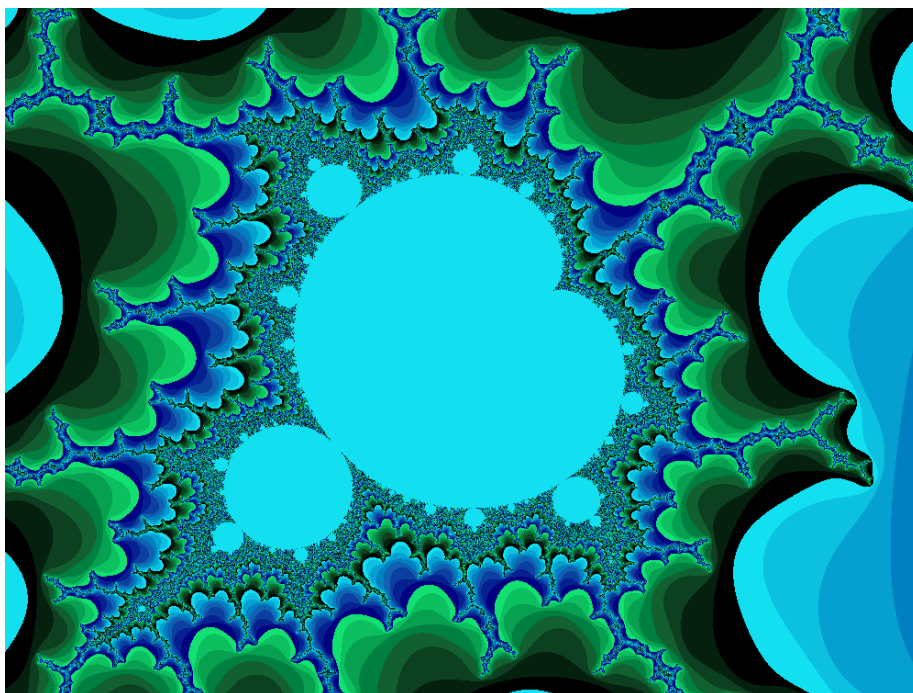
```

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)

```

python-3.py

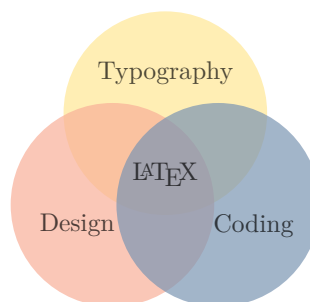


The external filename, extended by a consecutive number, can be printed in the margin by setting the keyword `showFilename`. In general it is printed in the outer margin or in twocolumn mode in the outer column. If the example is set in twocolumn mode but inside a starred floating environment over both 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{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 `L\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 `hvxextern` 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 progpah should only in some rare cases needed. In general all used compilers will be found by the system. A given progpah must be end with a slash, e.g. ./bin/

```

\define@key{hv}{progpah}[]{\def\hv@extern@progpah{#1}}
\define@key{hv}{compiler}[pdfatex]{\def\hv@extern@compiler{#1}}
\define@key{hv}{runsequence}[]{\def\hv@extern@runsequence{#1}}
\define@key{hv}{runs}[1]{\setcounter{hv@extern@runs}{#1}}

```

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
\blinddocument

```

voss-5.tex



[illegible]

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-6.java

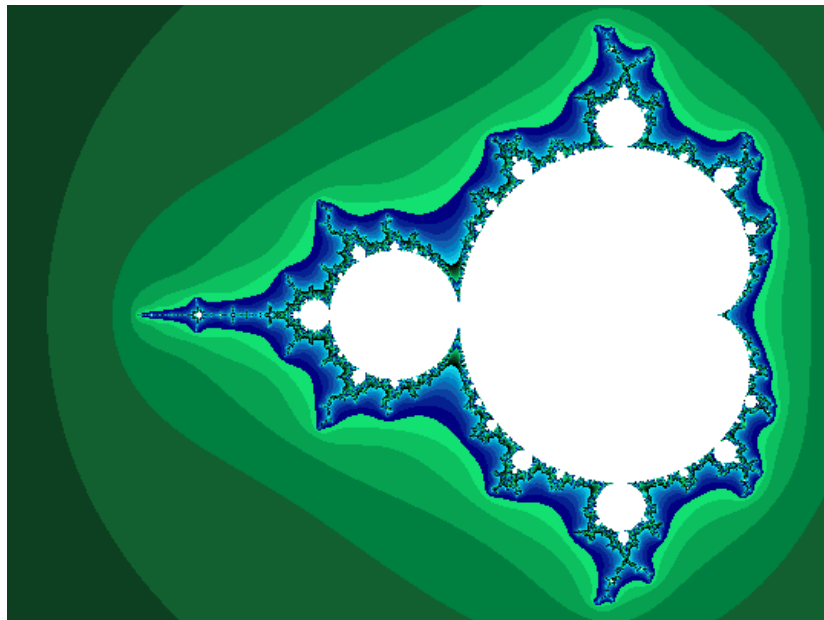
```

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
```



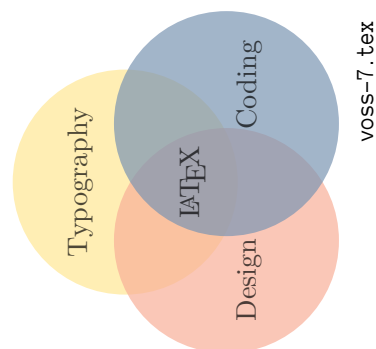
## 5.2 Grafik options

```
\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.

```
\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}
```



### 5.3 Listings options

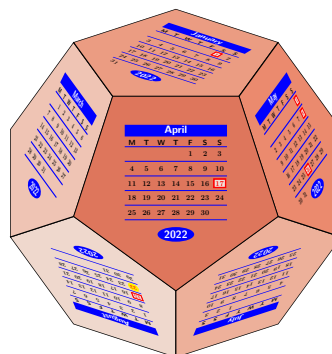
```
\define@key{hv}{lstOptions}[]{\def\hv@extern@lstOptions{#1}}
```

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

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

voss-8.tex

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



### 5.4 Background color

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

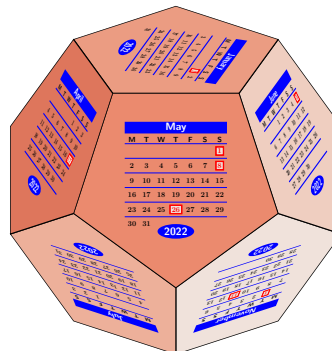
```
\define@key{hv}{BGpreamble}[black!2]{\def\hv@extern@BGpreamble{#1}}
\define@key{hv}{BGbody}[black!8]{\def\hv@extern@BGbody{#1}}
\define@key{hv}{BOpreamble}[black!2]{\def\hv@extern@BOpreamble{#1}}
\define@key{hv}{BObody}[black!8]{\def\hv@extern@BObody{#1}}
```

The options are passed to `tcolorbox` and preset to `black"!2` 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-9.tex

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



## 5.5 Type of the source code

The current version of hvextern supports code written as METAPOST, plain T<sub>E</sub>X, L<sup>A</sup>T<sub>E</sub>X, ConT<sub>E</sub>Xt, 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:

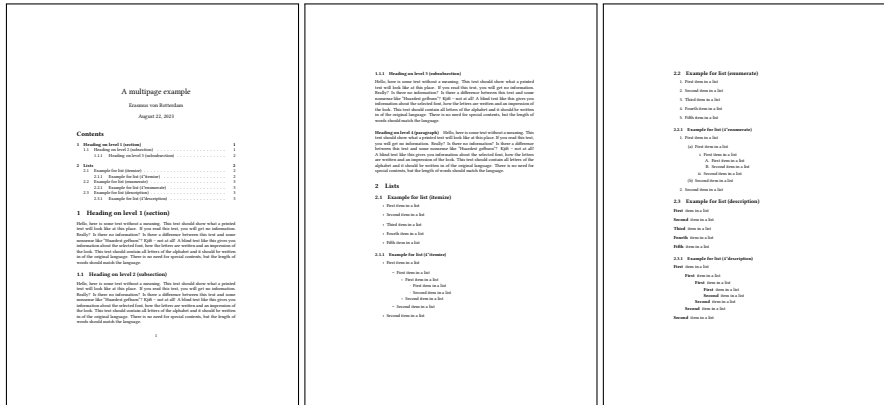
```
pages={1,2,3},
pagesep=2pt,
grfOptions={width=0.3\linewidth},
compiler=lualatex, runs=2, % for the TOC
frame,
```

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

## 5 OPTIONAL ARGUMENTS 5.7 Output as floating object with caption and label

```
\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}
```

### 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
```

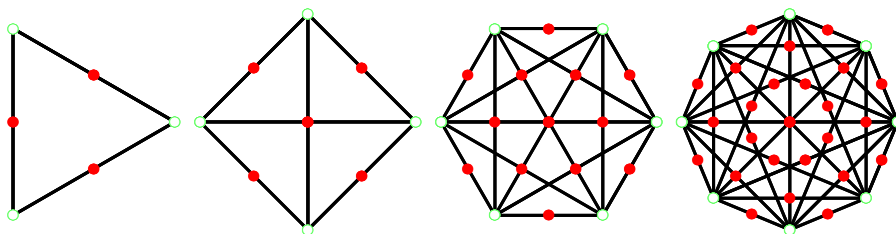


Abbildung 1: An example for Coxeter images

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 following 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
```

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

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

voss-12.tex

		1 HEADING ON LEVEL 1 (SECTION)	2	1 HEADING ON LEVEL 1 (SUBSECTION)	3
A multipage example					
Erasmus van Rotterdam					
August 22, 2023					
Contents					
1 Heading on level 1 (section)	1				
1.1 Heading on level 2 (subsection)	2				
2 Lists	3				
2.1 Example for list (enumeration)	4				
2.2 Example for list (enumeration)	5				
2.3 Example for list (enumeration)	6				
2.4 Example for list (description)	12				
1 Heading on level 1 (section)					
Hells, 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 "Husandert gheftig"? Kijgh – not at all! A blind text like this gives you information about the selected fact, how the letters are written and an impression of the book. This text should contain all letters of the alphabet and it should be written in the original language. There is no need for special contents, but the length of words should match the language.					
This is the second paragraph. Hells, 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 "Husandert gheftig"? Kijgh – not at all! A blind text like this gives you information about the selected fact, how the letters are written and an impression of the book. This text should contain all letters of the alphabet and it should be written in the original language. There is no need for special contents, but the length of words should match the language.					
After the second paragraph follows the third paragraph. Hells, 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 "Husandert gheftig"? Kijgh – not at all! A blind text like this gives you information about the selected fact, how the letters are written and an impression of the book. This text should contain all letters of the alphabet and it should be written in the original language. There is no need for special contents, but the length of words should match the language.					
1.1 Heading on level 2 (subsection)					
And after the second paragraph follows the third paragraph. Hells, 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 "Husandert gheftig"? Kijgh – not at all! A blind text like this gives you information about the selected fact, how the letters are written and an impression of the book. This text should contain all letters of the alphabet and it should be written in the original language. There is no need for special contents, but the length of words should match the language.					
After the second paragraph follows the third paragraph. Hells, 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 "Husandert gheftig"? Kijgh – not at all! A blind text like this gives you information about the selected fact, how the letters are written and an impression of the book. This text should contain all letters of the alphabet and it should be written in the original language. There is no need for special contents, but the length of words should match the language.					
After the second paragraph follows the third paragraph. Hells, 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 "Husandert gheftig"? Kijgh – not at all! A blind text like this gives you information about the selected fact, how the letters are written and an impression of the book. This text should contain all letters of the alphabet and it should be written in the original language. There is no need for special contents, but the length of words should match the language.					

## 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

```
\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}[
  compiler=xelatex, inline, runs=2, grfOptions={height=8pt},
  crop, cropmargin=0, cleanup, force=true, 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:
```

## 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-20.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

```

```
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 L<sup>A</sup>T<sub>E</sub>X 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}

```

```

\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

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

voss-22.tex

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-23.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
\blinddocument
```

<p>Dies hier ist ein Blindtext zum Testen von Textausgaben. Wer diesen Text liest, ist selbst schuld. Der Text gibt lediglich den Gauswert der Schrift an. Ist das wirklich so? Ist es gleichgültig, ob ich schreibe „Dies ist ein Blindtext“ oder „Hundert gefühn“? Kjält – simuliert! Ein Blindtext bietet nur wichtige Informationen. An ihm messe ich die Lesbarkeit einer Schrift, ihre Anmutung, wie harmonisch die Figuren zueinander stehen und prüfen, wie leicht oder schwer sie laufen. Ein Blindtext sollte möglichst viele verschiedene Buchstaben enthalten und in der Originalsprache gesetzt sein. Er muss keinen Sinn ergeben, sollte aber leicht von 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>1</p>		<p><b>Index</b></p> <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>3</p>
	<p><b>Literatur</b></p> <p>[1] José L. Almendro u. a. “Eichkromagnetisches Signalhorn”. EU-200211951 (FR, GB, DE), 1998.</p> <p>[2] Arnold Angenendt. “In Honore Salvatoris – Vom Sinn und Unsinn der Patrozinienkunde”. In: <i>Revue d’histoire ecclésiastique</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 P. H. Wicksteed und F. M. Cornford. New York: G. P. Putnam, 1929.</p> <p>[5] Aristotile. <i>Physics</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 Howard Cape</i>. Hrsg. und komm. von Edward Meredith Cape. 3 Bde. Cambridge University Press, 1977.</p> <p>[7] Robert L. Augustine. <i>Heterogeneous catalysts for the synthesis chemist</i>. New York: Marcel Dekker, 1995.</p> <p>[8] Averroes. <i>Zwei Abhandlungen über die Conjunction des separaten Intellekts mit dem Menschen</i>. Von Averroes (Ibn al-Baytar und Sohn), aus dem Arabischen übersetzt von Samuel ibn Tibbon. Hrsg. und übers. von J. Horst. Berlin: S. Hermann, 1869.</p> <p>5</p>	<p><i>Literatur</i></p> <p>[9] Averroes. <i>The Epistle on the Possibility of Conjunction with the Active Intellect by the Booklet with the Commentary of Moses Narboni</i>. Hrsg. und übers. von Kalman P. Bland. Monograph. Studies in Jewish History, Literature and Thought 7. New York: Jewish Theological Seminary of America, 1982.</p> <p>[10] Averroes. <i>Die Averrois Abhandlung: “Über die Möglichkeit der Conjunction” oder “Über den materiellen Intellekt”</i>. Hrsg., übers. und erklärt von Ludwig Hanneke. Halle an der Saale: C. A. Koesner, 1892.</p> <p>[11] John C. Baez and Aaron D. Lauda. <i>Higher-Dimensional Algebra V: 2-Groups</i>. Version 3. 27. Okt. 2004. <a href="http://arXiv:math/0307209v3">arXiv: math/0307209v3</a>.</p> <p>[12] John C. Baez and Aaron D. Lauda. “Higher-Dimensional Algebra V: 2-Groups”. Version 3. In: <i>Theory and Applications of Categories</i> 12 (2006), S. 423–491. <a href="http://arXiv:math/0307209v3">arXiv: math/0307209v3</a>.</p> <p>[13] Aaron Abrams and Richard Worthen. “Gromov–Witten invariants for holomorphic maps on Riemann surfaces”. In: <i>J. Amer. Math. Soc.</i> 9:2 (1996), S. 529–571.</p> <p>[14] Abarer von Brühl und Erich Hoffmann. “Die muslimischen Länder von der Mitte des 11. Jahrhunderts bis 1448”. In: <i>Europa im Hoch- und Spätmittelalter</i>. Hrsg. von Ferdinand Schöb. 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, IL: University of Chicago Press, 2003. isbn: 0-226-10403-6.</p> <p>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
]{subsubsubsection}
\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}{\subsubsubsectionnumdepth}
\setcounter{tocdepth}{\subsubsubsectionnumdepth}

```

```

\tableofcontents
\chapter{Einführung}
\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
\blinddocument

```

voss-24.tex

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<b>1 Einführung</b>	<b>3</b>
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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 „Hundert geboren“? Kjff - münchisch! Ein Blindtext bietet nur 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 Annutung 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 „Hundert geboren“? Kjff - münchisch! Ein Blindtext bietet nur 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 Annutung vermitteln.

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

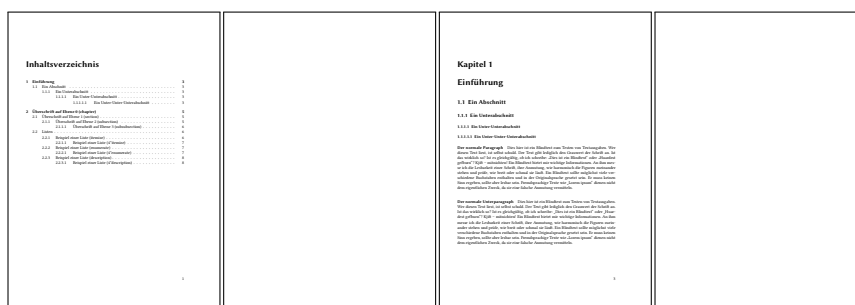
```
\documentclass[chapterprefix=on,parskip=half-,DIV=12,fontsize=12pt]{scrbook}
\DeclareNewSectionCommand[
  style=section,
  level=4,
  before=skip=-3.25ex plus -1ex minus -.2ex,
  after=skip=1.5ex plus .2ex,
  font=\normalsize,
  indent=0pt,
  counterwithin=subsubsection
]{subsubsubsection}
\RedeclareSectionCommand[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

\tableofcontents
\chapter{Einführung}
```

```

\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
\blinddocument

```



## 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-26.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  $\text{\LaTeX}$  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:

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

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

voss-27.tex

### Inhaltsverzeichnis

<b>1</b>	<b>Einführung</b>	<b>2</b>
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

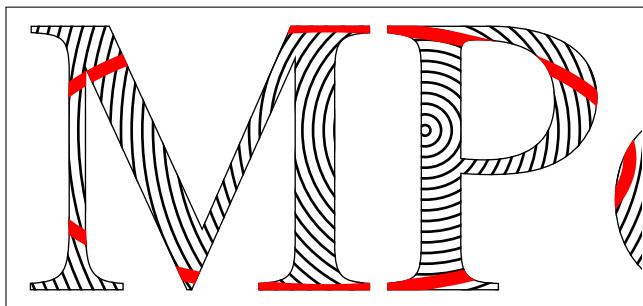
Needs the run sequence setting to get a pdf from the created dvi output. It is already internally defined.

```
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-28.mp





## 7.2 plain $\TeX$ example

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

voss-29.tex

```
\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 Stanis\l aw 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 symplectic socles can then
finish the remaining cases.}

\bigskip
\beginsection 1. Introduction.

This is the start of the introduction.
```



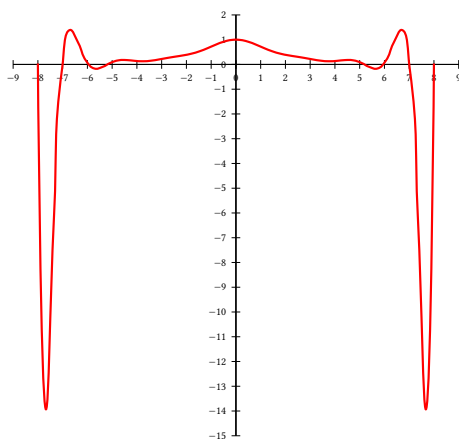
### 7.3 Lua $\text{\LaTeX}$ example

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

```
\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}
```

voss-30.tex



## 7.4 ConT<sub>E</sub>Xt example

voss-31.tex

```

\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

<p>From Hough to Amies by J. Baker and C. van Mele</p>	<p>1 Introduction 2</p> <p>2 The Rensselaer family 3</p> <p>2.1 The first house 3</p> <p>2.2 The early years 4</p> <p>2.3 Living and working in America 5</p> <p>3 The Lansing family 6</p> <p>4 The Copley family 6</p>	<p>1 Introduction</p> <p>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.</p> <p>The separation of any of these four components would have hurt 75% 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.</p> <p>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 rest can begin as people with many different viewpoints undertake their own experiments.</p> <p>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.</p> <p>The separation of any of these four components would have hurt 75% 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.</p> <p>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 rest can begin as people with many different viewpoints undertake their own experiments.</p>
<p>2 The Rensselaer family</p> <p>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.</p> <p>The separation of any of these four components would have hurt 75% 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.</p> <p>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 rest can begin as people with many different viewpoints undertake their own experiments.</p> <p>2.1 The first house</p> <p>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.</p> <p>The separation of any of these four components would have hurt 75% 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.</p> <p>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 rest can begin as people with many different viewpoints undertake their own experiments.</p> <p>2.2 The early years</p> <p>... In these three houses ... 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.</p> <p>The separation of any of these four components would have hurt 75% 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.</p> <p>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 rest can begin as people with many different viewpoints undertake their own experiments.</p>	<p>2.3 Living and working in America</p> <p>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.</p> <p>The separation of any of these four components would have hurt 75% 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.</p> <p>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 rest can begin as people with many different viewpoints undertake their own experiments.</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.</p> <p>The separation of any of these four components would have hurt 75% 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.</p> <p>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 rest can begin 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 11544
drwxr-xr-x 118 voss staff 3776 22 Aug 20:03 .
drwxr-xr-x 191 voss staff 6112 22 Aug 19:53 ..
-rw----- 1 voss staff 12627 27 Mär 2022 .credit.menu
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 2029 22 Aug 19:53 Changes
drwxr-xr-x 102 voss staff 3264 22 Aug 19:46 Exa
-rwxrwxrwx 1 voss staff 1170 27 Mai 2022 Makefile
-rw-rw-rw- 1 voss staff 713 27 Mai 2022 README
-rwxrwxrwx 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 22 Aug 20:03 hvextern.aux
```

## 8 RUNNING EXTERNAL COMMANDS

---

```

-rw-r--r-- 1 voss staff      8192 22 Aug 20:03 hvextern.idx
-rw-r--r-- 1 voss staff 160306 22 Aug 20:03 hvextern.log
-rw-r--r-- 1 voss staff    727 20 Jun 2022 hvextern.lua
-rw-r--r--@ 1 voss staff 1291392 22 Aug 20:03 hvextern.pdf
-rw-r--r-- 1 voss staff 44759 22 Aug 19:53 hvextern.sty
-rw-r--r-- 1 voss staff 52101 22 Aug 20:01 hvextern.tex
-rw-r--r-- 1 voss staff    0 22 Aug 20:01 hvextern.toc
-rw-r--r-- 1 voss staff 2027 22 Aug 20:02 java-6.java
-rw-r--r-- 1 voss staff 34248 22 Aug 20:02 java-6.png
-rw-r--r-- 1 voss staff 237938 22 Aug 20:01 python-3.png
-rw-r--r-- 1 voss staff 876 22 Aug 20:01 python-3.py
-rw-r--r-- 1 voss staff 5569 22 Aug 20:01 voss-1.pdf
-rw-r--r-- 1 voss staff 91 22 Aug 20:01 voss-1.tex
-rw-r--r-- 1 voss staff 18482 22 Aug 20:02 voss-10.pdf
-rw-r--r-- 1 voss staff 295 22 Aug 20:02 voss-10.tex
-rw-r--r-- 1 voss staff 967 22 Aug 20:02 voss-10.toc
-rw-r--r-- 1 voss staff 4582 22 Aug 20:02 voss-11.pdf
-rw-r--r-- 1 voss staff 475 22 Aug 20:02 voss-11.tex
-rw-r--r-- 1 voss staff 216635 22 Aug 20:02 voss-12.pdf
-rw-r--r-- 1 voss staff 298 22 Aug 20:02 voss-12.tex
-rw-r--r-- 1 voss staff 966 22 Aug 20:02 voss-12.toc
-rw-r--r-- 1 voss staff 1391 22 Aug 20:02 voss-13.pdf
-rw-r--r-- 1 voss staff 100 22 Aug 20:02 voss-13.tex
-rw-r--r-- 1 voss staff 1391 22 Aug 20:02 voss-14.pdf
-rw-r--r-- 1 voss staff 100 22 Aug 20:02 voss-14.tex
-rw-r--r-- 1 voss staff 1392 22 Aug 20:02 voss-15.pdf
-rw-r--r-- 1 voss staff 100 22 Aug 20:02 voss-15.tex
-rw-r--r-- 1 voss staff 1391 22 Aug 20:02 voss-16.pdf
-rw-r--r-- 1 voss staff 101 22 Aug 20:02 voss-16.tex
-rw-r--r-- 1 voss staff 1391 22 Aug 20:02 voss-17.pdf
-rw-r--r-- 1 voss staff 101 22 Aug 20:02 voss-17.tex
-rw-r--r-- 1 voss staff 1391 22 Aug 20:02 voss-18.pdf
-rw-r--r-- 1 voss staff 101 22 Aug 20:02 voss-18.tex
-rw-r--r-- 1 voss staff 4428 22 Aug 20:02 voss-19.pdf
-rw-r--r-- 1 voss staff 90 22 Aug 20:02 voss-19.tex
-rw-r--r-- 1 voss staff 84918 22 Aug 20:01 voss-2.pdf
-rw-r--r-- 1 voss staff 295 22 Aug 20:01 voss-2.tex
-rw-r--r-- 1 voss staff 874 22 Aug 20:02 voss-20.pl
-rw-r--r-- 1 voss staff 148 22 Aug 20:02 voss-20.txt
-rw-r--r-- 1 voss staff 590 22 Aug 20:02 voss-21.lua
-rw-r--r-- 1 voss staff 630 22 Aug 20:02 voss-21.txt
-rw-r--r-- 1 voss staff 574 22 Aug 20:02 voss-22.idx
-rw-r--r-- 1 voss staff 618 22 Aug 20:02 voss-22.ilg
-rw-r--r-- 1 voss staff 727 22 Aug 20:02 voss-22.ind
-rw-r--r-- 1 voss staff 29024 22 Aug 20:02 voss-22.pdf
-rw-r--r-- 1 voss staff 1008 22 Aug 20:02 voss-22.tex
-rw-r--r-- 1 voss staff 107775 22 Aug 20:03 voss-23.bcf
-rw-r--r-- 1 voss staff 266 22 Aug 20:03 voss-23.idx
-rw-r--r-- 1 voss staff 618 22 Aug 20:02 voss-23.ilg
-rw-r--r-- 1 voss staff 395 22 Aug 20:02 voss-23.ind
-rw-r--r-- 1 voss staff 73475 22 Aug 20:03 voss-23.pdf
-rw-r--r-- 1 voss staff 2398 22 Aug 20:03 voss-23.run.xml
-rw-r--r-- 1 voss staff 575 22 Aug 20:02 voss-23.tex
-rw-r--r-- 1 voss staff 3155 22 Aug 20:03 voss-24.aux

```

```

-rw-r--r-- 1 voss staff 15339 22 Aug 20:03 voss-24.log
-rw-r--r-- 1 voss staff 300926 22 Aug 20:03 voss-24.pdf
-rw-r--r-- 1 voss staff 1080 22 Aug 20:03 voss-24.tex
-rw-r--r-- 1 voss staff 1732 22 Aug 20:03 voss-24.toc
-rw-r--r-- 1 voss staff 3155 22 Aug 20:03 voss-25.aux
-rw-r--r-- 1 voss staff 15339 22 Aug 20:03 voss-25.log
-rw-r--r-- 1 voss staff 300926 22 Aug 20:03 voss-25.pdf
-rw-r--r-- 1 voss staff 1080 22 Aug 20:03 voss-25.tex
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-rw-r--r-- 1 voss staff 385403 22 Aug 20:03 voss-26.pdf
-rw-r--r-- 1 voss staff 978 22 Aug 20:03 voss-26.tex
-rw-r--r-- 1 voss staff 464 22 Aug 20:03 voss-26.toc
-rw-r--r-- 1 voss staff 1226 22 Aug 20:03 voss-27.aux
-rw-r--r-- 1 voss staff 14004 22 Aug 20:03 voss-27.log
-rw-r--r-- 1 voss staff 384898 22 Aug 20:03 voss-27.pdf
-rw-r--r-- 1 voss staff 1062 22 Aug 20:03 voss-27.tex
-rw-r--r-- 1 voss staff 464 22 Aug 20:03 voss-27.toc
-rw-r--r-- 1 voss staff 1043 22 Aug 20:03 voss-28.1
-rw-r--r-- 1 voss staff 8147 22 Aug 20:03 voss-28.eps
-rw-r--r-- 1 voss staff 426 22 Aug 20:03 voss-28.mp
-rw-r--r-- 1 voss staff 13071 22 Aug 20:03 voss-28.pdf
-rw-r--r-- 1 voss staff 1980 22 Aug 20:03 voss-29.dvi
-rw-r--r-- 1 voss staff 205 22 Aug 20:03 voss-29.log
-rw-r--r-- 1 voss staff 24768 22 Aug 20:03 voss-29.pdf
-rw-r--r-- 1 voss staff 137465 22 Aug 20:03 voss-29.ps
-rw-r--r-- 1 voss staff 1710 22 Aug 20:03 voss-29.tex
-rw-r--r-- 1 voss staff 32 22 Aug 20:03 voss-30.aux
-rw-r--r-- 1 voss staff 82396 22 Aug 20:03 voss-30.log
-rw-r--r-- 1 voss staff 5604 22 Aug 20:03 voss-30.pdf
-rw-r--r-- 1 voss staff 760 22 Aug 20:03 voss-30.tex
-rw-r--r-- 1 voss staff 13886 22 Aug 20:03 voss-31.log
-rw-r--r-- 1 voss staff 17042 22 Aug 20:03 voss-31.pdf
-rw-r--r-- 1 voss staff 878 22 Aug 20:03 voss-31.tex
-rw-r--r-- 1 voss staff 11692 22 Aug 20:03 voss-31.tuc
-rw-r--r-- 1 voss staff 0 22 Aug 20:03 voss-32.txt
-rw-r--r-- 1 voss staff 7385 22 Aug 20:01 voss-4.pdf
-rw-r--r-- 1 voss staff 619 22 Aug 20:01 voss-4.tex
-rw-r--r-- 1 voss staff 107775 22 Aug 20:02 voss-5.bcf
-rw-r--r-- 1 voss staff 266 22 Aug 20:02 voss-5.idx
-rw-r--r-- 1 voss staff 614 22 Aug 20:01 voss-5.ilg
-rw-r--r-- 1 voss staff 395 22 Aug 20:01 voss-5.ind
-rw-r--r-- 1 voss staff 73925 22 Aug 20:02 voss-5.pdf
-rw-r--r-- 1 voss staff 2391 22 Aug 20:02 voss-5.run.xml
-rw-r--r-- 1 voss staff 617 22 Aug 20:01 voss-5.tex
-rw-r--r-- 1 voss staff 7385 22 Aug 20:02 voss-7.pdf
-rw-r--r-- 1 voss staff 619 22 Aug 20:02 voss-7.tex
-rw-r--r-- 1 voss staff 11275 22 Aug 20:02 voss-8.pdf
-rw-r--r-- 1 voss staff 275 22 Aug 20:02 voss-8.tex
-rw-r--r-- 1 voss staff 11128 22 Aug 20:02 voss-9.pdf
-rw-r--r-- 1 voss staff 273 22 Aug 20:02 voss-9.tex

```

```
\runExtCmd[redirect,verbose,lstOptions={basicstyle=\ttfamily\small}]{df}{voss}
```

Filesystem	Available	Capacity	Used	Free	%Used	Mounted on	512-blocks	Used
/dev/disk3s3s1	355517816	6%	382374	1777589080	0%	/	965595304	19142640
devfs	0	100%	710	0	100%	/dev	410	410
/dev/disk3s6	355517816	1%	1	1777589080	0%	/System/Volumes/VM	965595304	2097192
/dev/disk3s4	355517816	4%	1157	1777589080	0%	/System/Volumes/Preboot	965595304	11079448
/dev/disk3s2	355517816	1%	44	1777589080	0%	/System/Volumes/Update	965595304	145824
/dev/disk1s2	981560	2%	1	4907800	0%	/System/Volumes/xarts	1024000	12328
/dev/disk1s1	981560	2%	32	4907800	0%	/System/Volumes/iSCPreboot	1024000	12504
/dev/disk1s3	981560	1%	71	4907800	0%	/System/Volumes/Hardware	1024000	7888
/dev/disk3s1	355517816	62%	3044752	1777589080	0%	/System/Volumes/Data	965595304	575583616
map auto_home	0	100%	0	0	-	/System/Volumes/Data/home	0	0
//Herbert%20Voß@AirPort%20Chicago._afpovertcp._tcp.local./Data	1986132568	50%	239587775	248266571	49%	/Volumes/.timemachine/AirPort	3902834784	1916702216
Chicago._afpovertcp._tcp.local./6FBC89A2-29D6-421E-9F5A-955B0EB0D5CC/Data								
/dev/disk5s1	1986132568	47%	2653461	9930662840	0%	/Volumes/Backups von Herberts	3707283368	1707704000
MacBook Pro								
com.apple.TimeMachine.2022-10-27-123947.backup@/dev/disk5s1	1986132568	14%	2079093	9930662840	0%		3707283368	310367432
/Volumes/.timemachine/F1EA5025-1F5A-4C49-B333-040D92413749/2022-10-27-123947.backup								

## 9 Other options

**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<sup>A</sup>T<sub>E</sub>X-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** name of a directory for the examples, must first be created by the user himself

**ExampleDir** move all examples into a directory

**tblbox=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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