

Package `canoniclayout`

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Version number v.0.5; last revision 2020-04-09.
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Abstract

This package is a small extension that allows to determine the page parameters for a canonical layout where the text block is placed onto the page in such a way as: (a) its diagonal coincides with the page relevant diagonal, and (b) the circle inscribed within the text block is tangent to the page sides. The text block width to height ratio is kept equal to the page ratio, as well as the inner to outer and the upper to lower margin ratios.

The canonical layout determined by this package is laid down on this very page; of course the actual text block fits the text block grid, because this documentation is typeset by means of the `ltxdoc` document class, that by itself would use other layout parameters, but that is has been arranged so as to invoke this very package. This allows you to immediately evaluate this traditional layout and see if it fits your requirements.

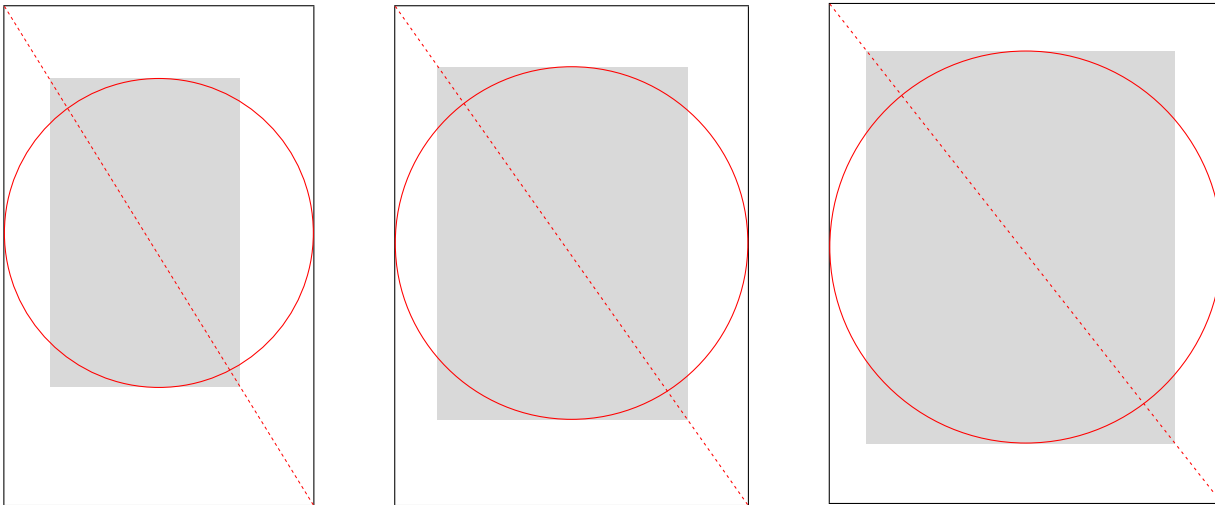
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1 Introduction

As any user of the `memoir` class knows well, this class allows to customise the page layout virtually without any limitation; such limitations are connected mainly with the user inconsistent data that miss to specify necessary information or give unnecessary or conflicting information. Also other classes and/or packages allow the customised design of the page layout; some other classes, such as the standard ones, do not have any facility to customise the page geometry, unless the user invokes suitable packages, such as `geometry` or `tyeparea`, just to male a couple of well known examples.

Many packages exist in order to specify a named layout; this package `canoniclayout` is another one that computes the page parameters to determine the horizontal and vertical dimensions of the margins and the text block. All other details shall be specified by the user, for example the dimensions of the stock paper, the trimming widths, and therefore the position of the page onto the stock paper; and so on. This package deals only with the trimmed page, not with the page and stock paper relationship.

Warning This package works well only with a modern installation of the `TEX` system; in particular it uses the facilities of the `xfp` package, that is an interface between the end user and the lower level language known as `LATEX 3` (`L3` for short). This implies a `LATEX`kernel implementation dated



Golden number canonical layout

ISO canonical layout

Letter paper canonical layout

Figure 1: A right page with the relevant diagonal, the text block and the canonical circle. In this figure it is important to notice the page proportions, not the scale; matter of fact the letter paper height is 17.6 mm shorter than the A4 paper, but the drawings to the same height emphasise the relative proportions of the various page parts.

at least 2029-01-01, and a complete installation of the \TeX system. In particular the availability of the `xfp` package is checked, and if the typesetting program cannot fetch it, it issues a message and interrupts loading this package. It is a clear message that your installation is obsolete; you might have your good reasons for not using a modern release of the \TeX system, but either you upgrade your installation or you cannot use this package.

Figure 1 depicts the situation described above; the grey rectangle represents the type block; the dotted page diagonal, as it can be seen, passes through the diagonal vertices of the type block; at the same time the circle is tangent to both the type block and the page contour.

It must also be noticed, in the sketch on the left, that the page rectangle is a golden one; therefore also the type block is a golden rectangle; the inner to the outer margin ratio is the golden section value so as this same ratio exists between the upper and the lower margin. This canonical layout implies that the type block height is equal to the page width.

Therefore this canonical layout is not suited when the page width is too small compared to the page height: with the golden section¹ this ratio is 0.618, with the ISO paper shape, in the sketch on the center, this ratio is 0.707, and so on.

But it is equally unsuitable with squarish pages, such as the sketch on the right where the page proportions conform with the USA letter paper size: the type block leaves little space for the margins, as it is evident from the properties of the canonical circle, which is tangent to the page lateral sides and to the type block horizontal sides; to the limit in a square page the type block is so large that there is no room for the margins.

¹Here we denote $\phi = 1,618\dots$ with the name of *golden number*, and its reciprocal $\varphi = 0,618\dots$ with the name of *golden section*.

2 The mathematics of the canonical layout

If one plays a little with the drawing of figure 1 and applies what has been described in the Introduction, may easily derive the following formulas:

$$\text{Page shape ratio:} \quad x = b/h \quad (1)$$

$$\text{Inner margin:} \quad I = bx(1-x)/(1+x) \quad (2)$$

$$\text{External margin:} \quad E = b(1-x)/(1+x) \quad (3)$$

$$\text{Top margin:} \quad T = hx(1-x)/(1+x) \quad (4)$$

$$\text{Bottom margin:} \quad B = h(1-x)/(1+x) \quad (5)$$

$$\text{Text width:} \quad W = xb \quad (6)$$

$$\text{Text height:} \quad H = b \quad (7)$$

$$\text{Circle center abscissa:} \quad C_x = 0.5b \quad (8)$$

$$\text{Circle center ordinate:} \quad C_y = h(1-x)/(1+x) + b/2 \quad (9)$$

$$\text{Circle radius:} \quad R = 0.5b \quad (10)$$

whose results are summarised in table 1 for three common values of the shape factor and for the letter paper shape ratio.

Actually the formulas 1–10, and their numerical evaluations reported in table 1, are just for general information. The actual computations are performed by this package, either by means of the `memoir` built-in facilities or by explicit computations that exploit the `xfp` functions. But it can be easily seen that as the trimmed page becomes more squarish, the page size ratio tends to one, and the margins become smaller and smaller. Therefore it seems that this layout is better suited for intermediate page ratios, such as the ISO one or the common European book size of 170 mm × 240 mm with a ratio of 0,708.

3 Usage

This package is invoked as usual with:

Table 1: Canonical layout ratios referred to the base (or width, b) and the height (h) of the trimmed page.

Shape ratio	Canon			
	$\phi : 1$	$3 : 2$	$\sqrt{2} : 1$	$11 : 8.5$
Page shape ratio	0,618	0,666	0,707	0,773
Inner margin	$0,146b$	$0,133b$	$0,121b$	$0,099b$
External margin	$0,236b$	$0,200b$	$0,172b$	$0,128b$
Upper margin	$0,146h$	$0,133h$	$0,121h$	$0,099h$
Lower margin	$0,236h$	$0,200h$	$0,172h$	$0,128h$
Text block width	$0,618b$	$0,666b$	$0,707b$	$0,773b$
Text block height	b	b	b	b
Circle center abscissa	$b/2$	$b/2$	$b/2$	$b/2$
Circle center ordinate	$0,545h$	$0,533h$	$0,526h$	$0,515h$
Circle radius	$b/2$	$b/2$	$b/2$	$b/2$

Table 2: Text line lengths measured in average number of characters in different fonts

Font collection	A4 paper size			A5 paper size			B5 paper size		
	10 pt	11 pt	12 pt	10 pt	11 pt	12 pt	10 pt	11 pt	12 pt
Times eXtended	<i>92</i>	<i>84</i>	<i>77</i>	64	<i>59</i>	<i>54</i>	<i>77</i>	70	64
Latin Modern	<i>86</i>	<i>79</i>	<i>73</i>	60	<i>55</i>	<i>51</i>	72	66	61
Kepler Project	<i>83</i>	<i>76</i>	69	<i>58</i>	<i>53</i>	<i>48</i>	69	63	<i>58</i>
Palatino eXtended	<i>82</i>	<i>75</i>	69	<i>58</i>	<i>53</i>	<i>48</i>	69	63	<i>57</i>

`\usepackahe{canoniclayout}`

No options are necessary; but it is necessary to invoke the package only after the actual page dimensions are known, be they specified by an option passed to the class, such as, for example, `a4paper`, or by means of a `page<size>` specification, for example `pagebv` for calling the ISO B5 size.

At any convenient moment after calling this package, the trimming margins with respect to the stock paper may be computed and the layout rechecked and fixed for consistency.

4 Font normal size

At the same time if this page layout is chosen, the font normal size should be selected on the actual text block width; it is possible that the golden ratio type block, on a golden rectangle paper obtained by trimming an ISO A4 stock paper, might be suitable with a 10pt normal font size (exactly 66 characters per line with 10pt Latin Modern fonts), while a full ISO A4 paper yields a type block that might be more suited for a 12pt normal font size (86 characters with 10pt Latin Modern fonts is too much). The computations might be left to the `memoir` class commands, but it's better the user is aware of this particular point. For his/her sake this package provides the command `\currentfontletters` (to be used only after `\begin{document}`), because specific font packages might be loaded after the page layout has been computed; in any case the command is “text producing”, therefore it can't be used while in the preamble!) that types out a sentence such as “The number of characters in one text line with the current font is *nn*”, where the *nn* is the actual number printed out. If such number is much larger than the ideal Bringhurst range of 66 ± 6 , it's wiser to chose a larger normal font size. In any case the alternative command `\charactersperpage` types out the same information, the number of lines and the estimated number of characters per page. These commands are supposed to be useful while setting up the complete preliminary parameters for the page layout.

Just to have a comparison, table 2 displays the number of characters in one text line for several fonts and for page sizes A4, A5, and B5. As you see, although that Bringhurst range comes from socio-psychological studies and therefore has a large standard deviation, It appears that for the larger papers only those fonts with wider lowercase letters are suitable for this canonical layout; with smaller paper sizes, quite understandably, more font collections are suited. This very document, typeset with this canonical layout on A4 paper with a Latin Modern 10pt font size, has long text lines that stress the readers eyes.

It can be seen that the bold measures satisfy the Bringhurst rule with a number of characters in the range 66 ± 6 ; the measures typeset in medium series type are out of the optimal Bringhurst range, but may be considered acceptable; the measures typeset in italics are completely out of the interval 66 ± 10 and should not be considered acceptable. This means that the large A4 paper size may be best used with intrinsically large fonts such as the Palatino eXtended (package `newpxtext`)

and the Kepler Project (package `kpfonts`). With the smaller A5 paper size with 10 pt size fonts the best ones are the Times eXtended (package `newtxtext`), and the Latin Modern ones (package `lmodern`) but substantially all the examined fonts are acceptable, while with 12 pt fonts none are acceptable.

With an intermediate sized paper, such as a B5 ISO size, all the considered fonts are acceptable inside or just outside the optimal Bringhurst interval.

Many books are trimmed to a size close the B5 paper size, therefore the page layout produced with this package is most useful with medium and smaller sizes (at least with ISO sizes).

5 Conclusion

I don't think this package should set also the header and footer distances, for example, or should set any specification for the page "decorations", such as underlined headers, or over lined footers, or the size, font family, series and shape of the header and footer contents. These specifications are of course important, but have nothing to do with the relationship between the paper size, the page size and the type block size.

As a final remark it's worth noting that a single pass of `pdflatex` on this `canoniclayout.dtx` file produces at the same time both the `canoniclayout.sty` package file and the documentation `canoniclayout.pdf` file, besides a `README.txt` required for uploading to the CTAN archives. After running `pdflatex` move `canoniclayout.sty` to a `tex/latex/canoniclayout/` folder and `canoniclayout.pdf` to a `doc/latex/canoniclayout/` one; if such folders don't exist, create them on your personal T_EX tree. After moving these files and if you have a MikT_EX installation, remember to refresh the file name data base.

6 Documented code

The package preliminaries are already in place. We are going to make some computations in order to determine the page shape factor x ; to this end we exploit the dimensional computing capabilities package `xft`, that are already available in the most recent L^AT_EX kernel files; in facts, the L^AT_EX 3 (L3) language computing facilities have been available for several years, but the simple and efficient user interface package `xfp` has been available since the 2018 autumn. If these facilities are not available, either because the T_EX distribution is a little too old, or because the real *tex* typesetting engine, not *pdftex*, is being used, then, this entire package contents is skipped and nothing is done, except issuing a suitable warning.

```

1 \IfFileExists{xfp.sty}{\RequirePackage{xfp}}{%
2 \PackageError{canoniclayout}{\MessageBreak%
3 The xfp package is not available\MessageBreak
4 and this package cannot work without\MessageBreak}{
5 Reading of this package is skipped\MessageBreak
6 Expect a different layout form the canonical one\Messagebreak
7 Update your TeX system installation!\expandafter\endinput}}
```

In order to have this layout work with the `memoir` class or with any other class we have to test the fact that this package has been loaded within the preamble of a `memoir` styled document; according to the result of this test we can exploit the `memoir` facilities for determining the page geometry, or we have to carry out the complete computations ourselves.

```

8 \@ifclassloaded{memoir}{%
```

Working with the `memoir` facilities, we can determine the page shape factor and we save it into the control sequence `\CLshape`.

```

9 \edef\CLshape{\fpeval{\paperwidth / \paperheight}}
10 \edef\CLinvshape{\fpeval{1/\CLshape}}

```

We then assign the text height, thanks to the fact that the canonical layout has the block height just as long as the page width, due to the circle property mentioned in the Introduction; in any case the formulas 1–10 and table 1 confirm this property for any shape.

```
11 \textheight=\paperwidth
```

This done, we can use the internal memoir commands to determine the other layout dimensions.

```

12 \settypeblocksize{\textheight}{*}{\CLshape}
13 \setlrmargins{*}{*}{\CLinvshape}
14 \setulmargins{*}{*}{\CLinvshape}
15 \setmarginnotes{7pt}{\dimexpr \foremargin-3\marginparsep}{\onelineskip}
16

```

We now use the `\checkandfixthelayout` so that it adjusts the type block dimensions to an integer number of lines in the normal font and eventually prints the page parameters to the `.log` file.

```
17 \checkandfixthelayout
```

At this point we are finished with the computations if the `memoir` class is the active one, but we need to perform the complete calculations in case we are not working with the `memoir` class.

```
18 }%
```

We start by defining the lengths registers that hold the real inner, outer and upper margins, without the one inch shift and without taking into consideration the headings and their spacings, that must be specified before calling this package.

```

19 \newlength\innermargin
20 \newlength\outermargin
21 \newlength\uppermargin

```

Then we use some macros where to store some constant values; we compute them using the rimmed page width and height;

```

22 \edef\CLpageratio{\fpeval{\paperwidth/\paperheight}} % x
23 \edef\CLlargeratio{\fpeval{(1-\CLpageratio)/(1+\CLpageratio)}} % y
24 \edef\CLsmallratio{\fpeval{\CLpageratio*\CLlargeratio}} % z

```

We compute the type block dimensions:

```

25 \textheight\paperwidth
26 \textwidth=\CLpageratio\textheight

```

We then compute the real margins between the page sides and the type block:

```

27 \innermargin=\CLsmallratio\paperwidth
28 \outermargin=\CLlargeratio\paperwidth
29 \uppermargin=\CLsmallratio\paperheight

```

But the typesetting engine does not use the net margins, due to the historical one inch shift of the original \TeX implementation and, for the upper margin, due to the fact that by default this layout implies the headings and the footers outside the type block. Since we have the real outer margin dimension, we compute the actual default marginal note measure:

```

30 \marginparwidth=\fpeval{0.8\outermargin-\marginparsep}pt
31 \evensidemargin=\fpeval{\outermargin -(1in)}pt
32 \oddsidemargin=\fpeval{\innermargin-(1in)}pt
33 \topmargin=\fpeval{\uppermargin-(1in)-\headheight-\headsep}pt

```

When using different classes from the memoir one, we adjust the type block dimensions so that the type block contains an integer number of lines; we use the normal size `\baselineskip` value and compute the number of lines contained in the initial type block minus the first line standard height equal to `\topskip`; notice that the integer value expression is a rounded value, not a truncated one, therefore the actual type block height might get enlarged or reduced by a very little bit that will not be noticed with naked eye when one examines a typeset page; eventually we recompute the `\textheight` taking into account the height of the first line.

```
34 \normalfont\textheight=%
35 \fpeval{round((\textheight - \topskip)/\baselineskip, 0) * \baselineskip + \topskip}pt%
36 \normalbaselineskip\baselineskip
and we eventually close the second action depending on the use of the memoir class:
37 }% end of test on the class being used
```

Just for testing the number of characters in a line, the following macros are provided. A couple of variables will be used `\CLaux` and `\CLabcwidth`; `\CLabcwidth` will hold the current lowercase alphabet length, while `\CLaux` will hold several values in succession. The scratch variable `\CLcharcount` will receive the final result to be printed out.

Another service macro for the user's sake is `\charactersperpage`; this macro typesets the average number of characters per line, the numbers of lines per page, and eventually their product, a good estimate of the number of characters per page.

Many text editors have facilities for counting a “compuscript” number of words and characters; with this further information the user may easily estimate the number of pages of his/her document; of course s/he must allow a certain allowance for the front and back matter pages, so that s/he can evaluate the total amount of signatures of the whole typeset document; of course, by typesetting it with *(pdf)latex* s/he knows exactly the number of pages of the final document, but the typography shop generally wants to know a good estimate before the source T_EX files are finished.

```
38 \newlength\abc@width
39 \settowidth\abc@width{abcdefghijklmnopqrstuvwxyz}%
40 \edef\CLcharcount{\fpeval{round(\textwidth * 26 / \abc@width,0)}}
41 \newcommand*\currentfontletters{%
42 \par The number of characters in one text line with the current font is
43   \CLcharcount.\par}
44 %
45 \newcommand*\charactersperpage{%
46 \edef\CLlinesperpage{\fpeval{round(\textheight / \baselineskip,0)}}
47 \edef\CLcharsperpage{%
48   \fpeval{\CLcharcount * \CLlinesperpage}}
49 \begin{quote} The average number of characters in one text line
50   with the current font is \CLcharcount;
51   this text block contains \CLlinesperpage\ lines;
52   a rough estimate of the number of characters per page is
53   \CLcharsperpage.\par
54   This information may be useful to evaluate the total number
55   of pages in a document.
56 \end{quote}}
57
```

Using these macros, we can type out the information relative to this specific documentation.

The average number of characters in one text line with the current font is 86; this text block contains 50 lines; a rough estimate of the number of characters per page is 4300.

This information may be useful to evaluate the total number of pages in a document.

58 Canoniclayout is a small extension package that allows to design
59 a canonic layout based on the great circle inscribed within the
60 page and tangent to the horizontal sides of the type block rectangle.
61 The margins reflect the trimmed page shape ratio, therefore the
62 type block principal diagonal coincides with the corresponding
63 page diagonal; this layout is especially good for ISO page shapes
64 but it can be used with many other traditional book page shapes.
65
66 This new version is completely new, in the sense that its code
67 calculations are performed by means of the 2018 xfp package
68 facilities. For this reason it cannot be used with any TeX
69 distribution preceding the year 2018 and updated by the end of
70 that year; should this happen this very package aborts its own
71 input while advising the user by means of an Error Message.
72
73 This work is released under the Latex Project Public Licence
74 v.1.3c. The LPPL is distributed with any TeX system distribution
75 and can be found also in any CTAN archive.
76
77 Claudio Beccari 2020
78 claudio dot beccari at gmail dot com