zTool 接口文档

Eureka

由于本人时间有限,目前此宏包的开发暂停.

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3 1 基本介绍

1 基本介绍

 ΔT_{EX} 宏集已独立实现了一个 ztool 宏包,此宏包中包含原来已被废弃的 l3sysshell 中的所有命令. 除此之外,ztool 提供了 box 操作,文件 IO 以及基本图形绘制相关的函数. 在 ztool 的协助下, ΔT_{EX} 能够避免或减少命令行 -shell-escape 参数或其它相关宏包的调用 (如 robust-externalize 宏包).

本宏包在 Github 上的地址如下:

https://github.com/zongpingding/zTeX_bundle

该仓库中包含本宏集的源码与用户手册; 当前宏集的稳定版本于 2025 年 09 月发布, 最新的开发版请切换到"dev"分支; 本手册适用于当前最新的开发版.

2 宏包选项 4

宏包选项 $\mathbf{2}$

ztool 分为了 "shell-escape, file-io, box, zdraw" 四个库, 每一个库之间互 不影响, 均可单独加载. 默认情况下, ztool 不会加载任何一个库.

ztool/shell-escape ztool/file-io ztool/box

ztool/zdraw

file-io = (false|true)......初始值: false box

= **(false**|true**)**......初始值: false

zdraw

= (false|true)......初始值: false

这四个选项为 ztool 宏包的选项, 可以在加载 ztool 宏包时使用, 一个基本的使用 样例如下,该示例加载了 ztool 的 shell-escape 库和 box 库:

\usepackage[shell-escape, box=true]{ztool}

例 1

\ztoolloadlib

New: 2025-05-22

 $\ztoolloadlib {\langle library \rangle}$

New: 2025-05-22

此命令用于加载 ztool 库, 〈library〉为库的名称, 可选值有: "shell-escape, file-io, box, zdraw".

一个基本的使用样例如下, 该示例加载了 ztool 的 shell-escape 库和 box 库:

\ztoolloadlib{shell-escape, box}

例 2

5 3 L3SYS-SHELL

3 l3sys-shell

本部分主要介绍 ztool 中实现的原始 l3sys-shell 宏包中的命令. 所以使用本部分的命令时需在编译 LATEX 文档时启用 -shell-escape 参数, 否则此系列命令将不会执行任何操作.

WARNING: 请谨慎使用此部分的命令, 部分不当操作可能会导致一些无法挽救的后果.

\ztool_shell_escape:n

 $\ztool_shell_escape:n {\langle command \rangle}$

\ztool_shell_escape:e

当 -shell-escape 参数启用时,此命令会在 shell 中执行〈command〉,如果 -shell-escape 参数未启用,此命令将不会执行任何操作.

Updated: 2024-12-05

\ztool_shell_mkdir:n
\ztool_shell_mkdir:e

or_sherr_mkdir.e

Updated: 2024-12-05

 $\ztool_shell_mkdir:n \{\langle dir \rangle\}$

当 -shell-escape 参数启用时,此命令会创建一个目录 $\langle dir \rangle$,如果 -shell-escape

参数未启用, 此命令将不会执行任何操作.

\ztool_shell_cp:nn

\ztool_shell_cp:(ee|ne|en)

Updated: 2024-12-05

 $\verb|\ztool_shell_cp:nn| \{\langle source \rangle\} \{\langle target \rangle\}|$

当 -shell-escape 参数启用时, 此命令将把文件 (source) 复制为文件 (target),

如果 -shell-escape 参数未启用, 此命令将不会执行任何操作.

\ztool_shell_mv:nn

\ztool shell mv:(ee|ne|en)

Updated: 2024-12-05

 $\verb|\ztool_shell_mv:nn| \{\langle source \rangle\} \{\langle target \rangle\}|$

当 -shell-escape 参数启用时, 此命令将把文件 (source) 移动到目录 (target),

如果 -shell-escape 参数未启用, 此命令将不会执行任何操作.

\ztool_shell_rm:n

 $\ztool_shell_rm:n \{\langle file \rangle\}$

\ztool_shell_rm:e

当 -shell-escape 参数启用时, 此命令将删除文件 \file\, 如果 -shell-escape

Updated: 2024-12-05 参数未启用, 此命令将不会执行任何操作.

\ztool_shell_rmdir:n

 $\ztool_shell_rmdir:n \{\langle dir \rangle\}$

\ztool_shell_rmdir:e

当 -shell-escape 参数启用时, 此命令将删除目录 ⟨dir⟩, 如果 -shell-escape

Updated: 2024-12-05 参数未启用, 此命令将不会执行任何操作.

\ztool_get_shell_pwd:N

 $\ztool_get_shell_pwd:N \langle t1 \rangle$

\ztool_get_shell_pwd:c

当 -shell-escape 参数启用时, 此命令将返回当前的工作目录, 并将其存放在

Updated: 2024-12-05 〈tl〉中, 如果 -shell-escape 参数未启用, 此命令将不会执行任何操作.

6 3 L3SYS-SHELL

 $\verb|\ztool_shell_split_ls:nN| \\$

 $\verb|\ztool_shell_split_ls:nN| \{\langle dir \rangle\} \langle t1 \rangle|$

Updated: 2024-12-05

当 -shell-escape 参数启用时,此命令将返回目录〈dir〉下的所有文件名,并将其存放在〈t1〉中,如果 -shell-escape 参数未启用,此命令将不会执行任何操作.

4 File IO

本部分主要介绍 ztool 中实现的文件 IO 操作,包括:读取文件,写入文件,追加文件等操作.本部分的系列命令均不需要启用-shell-escape 参数.

\ztool_file_new:nn

 $\ztool_file_new:nn {\langle bool \rangle} {\langle file \rangle}$

Updated: 2024-12-05

此命令用于创建一个名为 $\langle file \rangle$ 的新文件,如果 $\langle file \rangle$ 不存在,则会创建一个名为 $\langle file \rangle$ 的新文件.若文件已存在,那么当 $\langle bool \rangle$ 为 $\langle c_{true_bool}$ 时,会覆盖原文件,否则不会进行任何操作.

\ztool_read_file_as_seq:nnN

 $\ztool_read_file_as_seq:nnN {\langle bool \rangle} {\langle file \rangle} {\langle seq \rangle}$

\ztool_read_file_as_seq:(neN|nnc|nec)

Updated: 2024-12-05

此命令用于读取文件〈file〉的内容,并将其存放在〈seq〉中,如果〈file〉不存在,则〈seq〉会被置为空.〈bool〉用于控制是否保留**行尾**的空格,可选值有:\c_-true_bool, \c_false_bool; 如果〈bool〉为 \c_true_bool,则保留**行尾**的空格,否则不保留.

NOTE:

- 1. \(seq\) 的定义是局部的;
- 2. 由于命令 \ior_map_inline: Nn 的限制, 该命令无法获取行首的"空格"或 "Tab":
- 3. 〈seq〉中内容的 catcode 为当前的 catcode.

\ztool_read_file_as_seq_keep_spaces:nnN

\ztool_read_file_as_seq_keep_spaces:nnN

 $\label{lem:local_read_file_as_seq_keep_spaces:(neN|nnc|nec)} \{\langle bool \rangle\} \{\langle file \rangle\} \langle seq \rangle$

New: 2025-09-01

此命令用于读取文件〈file〉的内容,**会保留内部空格**,并将其存放在〈seq〉中,如果〈file〉不存在,则〈seq〉会被置为空.〈bool〉用于控制是否保留**行首**的空格,可选值有:\c_true_bool, \c_false_bool; 如果〈bool〉为 \c_true_bool,则保留**行首**的空格,否则不保留.

NOTE:

- 1. 〈seq〉的定义是局部的;
- 2. 由于命令 \ior_str_map_inline:Nn 的限制,该命令无法获取行末的"空格"或"Tab";
- 3. \(\seq\) 中内容的 catcode 被修改为 \c_document_cctab.

\ztool_gread_file_as_seq:nnN

 $\verb|\tread_file_as_seq:nnN| \{\langle bool \rangle\} \{\langle file \rangle\} \langle seq \rangle|$

\ztool gread file as seq:(neN|nnc|nec)

Updated: 2025-01-05

此命令用于读取文件〈file〉的内容,并将其存放在〈seq〉中,如果〈file〉不存在,则〈seq〉会被置为空.〈bool〉用于控制是否保留**行尾**的空格,可选值有:\c_-true_bool, \c_false_bool;如果〈bool〉为 \c_true_bool,则保留**行尾**的空格,否则不保留.

NOTE:

- 1. \(\seq\)\的定义是全局的;
- 2. 由于命令 \ior_map_inline: Nn 的限制, 该命令无法获取行首的"空格"或 "Tab":
- 3. ⟨seq⟩ 中内容的 catcode 为当前的 catcode.

\ztool_gread_file_as_seq_keep_spaces:nnN

\ztool_gread_file_as_seq_keep_spaces:nnN

\ztool_gread_file_as_seq_keep_spaces:(neN|nnc|nec)

 ${\langle bool \rangle} {\langle file \rangle} {\langle seq \rangle}$

New: 2025-09-01

此命令用于读取文件〈file〉的内容, **会保留内部空格**, 并将其存放在〈seq〉中, 如果〈file〉不存在, 则〈seq〉会被置为空.〈bool〉用于控制是否保留**行首**的空格, 可选值有:\c_true_bool, \c_false_bool; 如果〈bool〉为 \c_true_bool, 则保留**行首**的空格, 否则不保留.

NOTE:

- 1. (seq) 的定义是全局的;
- 2. 由于命令 \ior_str_map_inline:Nn 的限制, 该命令无法获取行末的 "空格"或 "Tab";
- 3. $\langle seq \rangle$ 中内容的 catcode 被修改为 \c_document_cctab.

\ztool_write_seq_to_file:nNn

 $\label{lem:lem:nn} $$ \vec{\varphi} : nNn {\langle bool \rangle} \langle seq \rangle {\langle file \rangle} $$$

\ztool_write_seq_to_file:(nNe|nNV|nce|ncV)

New: 2025-05-27

此命令用于将〈seq〉按行写入到文件〈file〉中,如果〈file〉不存在,则会创建一个名为〈file〉的新文件;若〈file〉已经存在,则可以使用〈bool〉控制当前的写入模式:〈bool〉为 \c_true_bool 时,覆盖写入;〈bool〉为 \c_false_bool 时,追加写入;如果〈seq〉为空,则不会进行任何操作.

\ztool_append_to_file:nn

 $\verb|\ttool_append_to_file:nn| \{\langle file \rangle\} \{\langle content \rangle\}|$

 $\ztool_append_to_file:(no|nf|ee)$

Updated: 2025-01-05

此命令用于将〈content〉追加到文件〈file〉中,如果〈file〉不存在,则会创建一个名为〈file〉的新文件,并将〈content〉写入其中.

\ztool_replace_file_line:nnn

 $\label{line:nnn} $$ \vec{\phi} : \mathbf{file} = \mathbf{file} : \mathbf{file} \\ {\vec{\phi} : \vec{\phi} : \vec{\phi}$

\ztool_replace_file_line:(enn|ene|eee)

Updated: 2025-01-05

此命令用于将文件〈file〉中的第〈line〉行替换为〈content〉,如果〈file〉不存在,则不会进行任何操作.

\ztool_insert_to_file:nnn

 $\verb|\ztool_insert_to_file:nnn| \{\langle file \rangle\} \{\langle line \rangle\} \{\langle content \rangle\}|$

\ztool_insert_to_file:(nen|nfn|een)

Updated: 2025-01-05

此命令用于将〈content〉插入到文件〈file〉的第〈line〉行之前,如果〈file〉不存在,则不会进行任何操作.

下面一个示例展示了如何使用 ztool 中的几个文件 IO 操作命令:

```
% \usepackage{verbatim}
                                                                      例 3
\ExplSyntaxOn
\ztool_file_new:nn {\c_true_bool}{testIO.txt}
\seq_new:N \l_ztool_tmp_seq \seq_clear:N \l_ztool_tmp_seq
\ztool_append_to_file:nn {testIO.txt} {|APPEND-CONTENT|}
\ztool_insert_to_file:nnn {testIO.txt} {1} {|INSERT-~-CONTENT|}
\ztool_append_to_file:nn {testIO.txt} {|APPEND-CONTENT-II|}
\ztool_replace_file_line:nnn {testIO.txt} {3} {|REPLACE-CONTENT|}
\ztool_gread_file_as_seq:nnN {\c_false_bool} {testIO.txt}
\l ztool tmp seq
\seq_use:Nn \l_ztool_tmp_seq {\par}
\ExplSyntaxOff
\verbatiminput*{testI0.txt}
|INSERT-CONTENT|
|APPEND-CONTENT|
|REPLACE-CONTENT|
|INSERT-|-CONTENT|
| APPEND-CONTENT |
| REPLACE-CONTENT |
```

下面这个示例展示了 ztool 中 file to seq 这一系列命令对空格的处理方式. 文件 testSpaces.txt 中的内容如下:

```
AAAA

BB<sub>LLL</sub>BB

LLCCLCCLLL

DDDD
```

```
\ExplSyntaxOn
\def\TTTa#1{
\seq_clear:N \l_ztool_tmp_seq
```

```
\ztool read file as seq:nnN {\c true bool} {#1} \l ztool tmp seq
  \seq_show: N \l_ztool_tmp_seq
\def\TTTb#1{
 \seq_clear:N \l_ztool_tmp_seq
  \ztool_read_file_as_seq:nnN {\c_false_bool} {#1} \l_ztool_tmp_seq
 \seq_show:N \l ztool tmp_seq
\def\TTTc#1{
 \seq_clear:N \l_ztool_tmp_seq
 \ztool_read_file_as_seq_keep_spaces:nnN {\c_true_bool} {#1}
\l_ztool_tmp_seq
 \seq_show:N \l_ztool_tmp_seq
\def\TTTd#1{
 \seq_clear:N \l_ztool_tmp_seq
 \ztool_read_file as_seq_keep_spaces:nnN {\c false bool} {#1}
\l_ztool_tmp_seq
  \seq_show:N \l_ztool_tmp_seq
\TTTa{testSpaces.txt}
\TTTb{testSpaces.txt}
\TTTc{testSpaces.txt}
\TTTd{testSpaces.txt}
\ExplSyntaxOff
\TTTa{testSpaces.txt}
\TTTb{testSpaces.txt}
\TTTc{testSpaces.txt}
\TTTd{testSpaces.txt}
```

各种情况在命令行下显示结果(做了一定程度的简化):

\TTTa: outside expl3, true	\TTTb: outside expl3, false			
{AAAA⊔}	{AAAA}			
{BB⊔BB⊔}	{BB⊔BB}			
$\{CC_{\square}CC_{\square}\}$	{CC⊔CC}			
{DDDD⊔}.	{DDDD}.			
\TTTa: inside expl3, true	\TTTb: inside expl3, false			
{AAAA}	{AAAA}			
{BBBB}	{BBBB}			
{CCCC}	{CCCC}			
{DDDD}.	{DDDD}.			
\TTTc: outside expl3, true	\TTTd: outside expl3, false			
\TTTc: outside expl3, true	\TTTd: outside expl3, false			
\TTTc: outside expl3, true {AAAA}	\TTTd: outside expl3, false {AAAA}			
\TTTc: outside expl3, true {AAAA} {BB⊔BB}	\TTTd: outside expl3, false $ \{ AAAA \} \\ \{ BB \sqcup BB \} $			
\TTTc: outside expl3, true {AAAA} {BB_BB} {_CC_CC}	\TTTd: outside expl3, false {AAAA} {BB_BB} {CC_CC}			
\TTTc: outside expl3, true {AAAA} {BB_BB} {_CC_CC} {DDDD}.	\TTTd: outside expl3, false {AAAA} {BB⊔BB} {CC∪CC} {DDDD}.			
\TTTc: outside expl3, true {AAAA} {BB_BB} {_CC_CC} {DDDD}. \TTTc: inside expl3, true	\TTTd: outside expl3, false {AAAA} {BB∟BB} {CC∟CC} {DDDD}. \TTTd: inside expl3, false			
\TTTc: outside expl3, true {AAAA} {BB∟BB} {□CC□CC} {DDDD}. \TTTc: inside expl3, true {AAAA}	\TTTd: outside expl3, false {AAAA} {BB∟BB} {CC∟CC} {DDDD}. \TTTd: inside expl3, false {AAAA}			

5 盒子操作

本部分介绍 ztool 中实现的 Box 操作,包括 box 的测量以及 box 的简单变换.

\ztool_get_ht:Nn

\ztool get ht:Nn $\langle dim \rangle \{\langle content \rangle\}$

\ztool_get_ht:(Ne|ce)

此命令用于将〈content〉的高度保存在〈dim〉这一寄存器中.

Updated: 2024-12-05

\ztool_get_ht_plus_dp:Nn

 $\time {\time dim} {\content}$

\ztool_get_ht_plus_dp:(Ne|ce)

Updated: 2024-12-05

此命令用于将〈content〉的高度和深度的和保存在〈dim〉这一寄存器中.

\ztool_get_wd:Nn

 $\verb|\ztool_get_wd:Nn| \langle \textit{dim} \rangle \{\langle \textit{content} \rangle\}|$

\ztool_get_wd:(Ne|ce)

此命令用于将〈content〉的宽度保存在〈dim〉这一寄存器中.

Updated: 2024-12-05

\ztool_get_dp:Nn

 $\ztool_get_dp:Nn \langle dim \rangle \{\langle content \rangle\}$

\ztool_get_dp:(Ne|ce)

此命令用于将 (content) 的深度保存在 (dim) 这一寄存器中.

Updated: 2024-12-05

\ztool_gget_ht:Nn

\ztool_gget_ht:Nn \dim\{\content\}

\ztool_gget_ht:(Ne|ce)

此命令用于将〈content〉的高度保存在〈dim〉这一寄存器中,并且此操作是全局

Updated: 2024-12-05 的.

\ztool_gget_wd:Nn

\ztool_gget_wd:Nn \dim\{\content\}

\ztool_gget_wd:(Ne|ce)

此命令用于将〈content〉的宽度保存在〈dim〉这一寄存器中,并且此操作是全局

Updated: 2024-12-05 的.

\ztool_gget_dp:Nn

 $\ztool_gget_dp:nn \langle dim \rangle \{\langle content \rangle\}$

\ztool_gget_dp:(Ne|ce)

此命令用于将〈content〉的深度保存在〈dim〉这一寄存器中,并且此操作是全局

Updated: 2024-12-05 的.

\ztool_set_to_wd:nn

 $\verb|\ztool_set_to_wd:nn| \{\langle \textit{dim} \rangle\} \{\langle \textit{content} \rangle\}|$

 $\ztool_set_to_wd:(en|ne)$

此命令用于将〈content〉的宽度调整为〈dim〉, 然后排版出来.

Updated: 2024-12-05

\ztool_set_to_ht:nn

 $\time {\dim} {\dim} {\dim} {\dim}$

\ztool set to ht:(en|ne)

此命令用于将 (content) 的高度调整为 (dim), 然后排版出来.

Updated: 2024-12-05

\ztool autoset to wd and ht:nnn

\ztool_autoset_to_wd_and_ht:nn

\ztool_autoset_to_wd_and_ht:(nne|een|eee)

 ${\langle width \rangle} {\langle height \rangle} {\langle content \rangle}$

Updated: 2025-04-29

此命令用于将〈content〉的宽度调整为 min(〈width〉, 〈height〉), 然后排版出来.

\ztool_rotate:nn

 $\ztool_rotate:nn {\langle angle \rangle} {\langle content \rangle}$

 $\ztool_rotate:(en|ne|ee)$

此命令用于将 (content) 旋转 (angle) 度, 然后排版出来.

New: 2025-04-29

\ztool_scale_to_wd:nn

\ztool scale to wd:nn $\{\langle dim \rangle\}\{\langle content \rangle\}$

\ztool_scale_to_wd:(en|ne|ee)

New: 2025-04-29

此命令用于将〈content〉的宽度调整为〈dim〉,但是不对盒子的高度做任何的调整,然后排版出来.

\ztool_scale_to_ht:nn

 $\verb|\times| \{\langle dim \rangle\} \{\langle content \rangle\}|$

\ztool_scale_to_ht:(en|ne|ee)

New: 2025-04-29

此命令用于将〈content〉的高度 + 深度整体调整为〈dim〉,但是不对盒子的宽度做任何的调整,然后排版出来.

\ztool_scale_to_wd_and_ht:nnn

 $\ztool_scale_to_wd_and_ht:nnn {\langle width \rangle} {\langle height \rangle} {\langle content \rangle}$

\ztool_scale_to_wd_and_ht:(nno|nne|eee)

New: 2025-04-29

此命令用于将〈content〉的宽度调整为〈width〉, 高度 + 深度整体调整为〈height〉, 然后排版出来.

\ztool_box_item_align:Nnnn

\ztool_box_item_align:Nnnn

\ztool_box_item_align:(cnnn|Nnno|cnno|Nnen|Nnee)

 $\langle cmd \rangle \{\langle width \rangle\} \{\langle content \rangle\} \{\langle align \rangle\}$

Updated: 2025-05-13

此命令用于将〈content〉的宽度调整为〈width〉,然后排版出来,〈align〉用于控制对齐方式,可选值有: left, center, right, scatter.〈cmd〉为一个命令,其接受一个参数,它将应用到〈content〉的每一个 Token 上. 注意:〈content〉中的空格会被忽略,如果需要空格,请使用"\」"或"~"替代.

\ztool_fp_to_rad:n

\ztool_fp_to_rad:n {\langle\}

New: 2025-05-12

此命令用于将 (angle) 从弧度制转换为角度制.

\ztoolboxaffine

 $\ztoolboxaffine[\langle key-value \rangle] \{\langle content \rangle\} \{\langle matrix \rangle\}$

New: 2025-05-12

上述 $\langle content \rangle$ 表示仿射变换作用的对象; $\langle matrix \rangle$ 为一个 2×2 的矩阵, 表示对应的仿射变换矩阵. 若 $\langle matrix \rangle = \{a,b,c,d\}$, 则其对应的仿射变换矩阵 Λ 如下:

$$\Lambda = \begin{bmatrix} a & c \\ b & d \end{bmatrix}.$$

若 $\det \Lambda = 0$, 则此变换无意义, ztool 会在终端输出一条警告, 最后将 $\langle content \rangle$ 中的内容原样输出到 PDF. **备注**: 此命令封装自下述的 $\langle transformation: Nnnnn 命令.$

\ztool_affine_transformation:Nnnnn

\ztool_affine_transformation:Nnnnn

\ztool_affine_transformation:(Neeee|cnnnn|ceeee)

 $\langle \mathit{coffin} \rangle \{\langle a \rangle\} \{\langle b \rangle\} \{\langle c \rangle\} \{\langle d \rangle\}$

New: 2025-05-12

此命令用于对 $\langle coffin \rangle$ 进行任意的仿射变换(线性变换), 具体的使用方法可以 参见前述的 $\langle ztoolboxaffine$ 命令; 上述参数对应的仿射变换矩阵 Λ 为

$$\Lambda = \begin{bmatrix} a & c \\ b & d \end{bmatrix}.$$

关于上述函数 \ztool_affine_transformation:Nnnnn 的一些技术细节: 给 定任意一个仿射变换 Λ, 不妨设

$$\Lambda = \begin{bmatrix} A_{11} & A_{12} \\ A_{21} & A_{22} \end{bmatrix}.$$

我们可以做如下的分解 (与 SVD 分解类似), 令 m = 2x, 则有:

$$\Lambda = \begin{bmatrix} A_{11} & A_{12} \\ A_{21} & A_{22} \end{bmatrix} = \begin{bmatrix} \cos \theta & -\sin \theta \\ \sin \theta & \cos \theta \end{bmatrix} \begin{bmatrix} 1 & m \\ 0 & 1 \end{bmatrix} \begin{bmatrix} s_x & 0 \\ 0 & s_y \end{bmatrix}
= \begin{bmatrix} \cos \theta & -\sin \theta \\ \sin \theta & \cos \theta \end{bmatrix} \begin{bmatrix} \cos \phi & -\sin \phi \\ \sin \phi & \cos \phi \end{bmatrix} \begin{bmatrix} S_x & 0 \\ 0 & S_y \end{bmatrix} \begin{bmatrix} \cos \omega & -\sin \omega \\ \sin \omega & \cos \omega \end{bmatrix} \begin{bmatrix} s_x & 0 \\ 0 & s_y \end{bmatrix}.$$
(5.1)

我们给出如下的记号:

• $T_1(\theta)$: 旋转矩阵, 绕原点逆时针旋转 θ 角;

• $T_2(x)$: 缩放矩阵, 把 x 轴方向的所有向量变为原来的 x 倍;

T₃(y): 缩放矩阵, 把 y 轴方向的所有向量变为原来的 y 倍;

那么我们可以认为 $\{\mathbf{T}_1(\theta), \mathbf{T}_2(x), \mathbf{T}_3(y)\}$ 就是 $A_{2\times 2}$ 的基. 所以我们可以把上面的 方程 (5.1) 写成如下表达式:

$$\Lambda = \mathbf{T}_1(\theta) \cdot \mathbf{T}_1(\phi) \cdot \mathbf{T}_2(S_x) \cdot \mathbf{T}_3(S_y) \cdot \mathbf{T}_1(\omega) \cdot \mathbf{T}_2(S_x) \cdot \mathbf{T}_3(S_y). \tag{5.2}$$

根据矩阵乘法的结果, 我们可以知道上述的 m, s_x, S_x, ϕ 等参数如下:

$$s_x = \sqrt{A_{11}^2 + A_{21}^2}, \qquad \theta = \arctan\left(\frac{A_{21}}{A_{11}}\right).$$

 s_y 和 m 的求解结果如下:

$$ms_y = A_{12}\cos\theta + A_{22}\sin\theta,$$
 $s_y = \begin{cases} \frac{ms_y\cos\theta - A_{12}}{\sin\theta} & \text{如果}\sin\theta \neq 0, \\ \frac{A_{22} - ms_y\sin\theta}{\cos\theta} & \text{如果}\sin\theta = 0; \end{cases}$

那么此时很容易知道 $m = ms_y/s_y$. 对 shear matrix 的分解结果如下:

$$S_x = \sqrt{\frac{m^2}{4} + 1} - \frac{m}{2}, \qquad S_y = \sqrt{\frac{m^2}{4} + 1} + \frac{m}{2},$$

 $\phi = -\frac{\pi}{4} - \frac{1}{2}\arctan(\frac{m}{2}), \qquad \omega = \frac{\pi}{4} - \frac{1}{2}\arctan(\frac{m}{2}).$

最后我们只需要从右到左将这一系列的变换应用到〈box〉上即可. 从上面也可以看出, 命令 \ztool_affine_transformation:Nnnnn 仅依赖于 IATEX3 中的 \coffin_scale:Nnn 和 \coffin_rotate:Nn 两个函数. 命令 \ztool_affine_-transformation:Nnnnn 实现过程中相关的参考链接如下:

- https://math.stackexchange.com/a/3521141/1235323;
- https://math.stackexchange.com/a/281087/1235323.

如果原 TEX 引擎提供了 shear transformation 相关的 primitive, 那么上述对 shear matrix 的分解就是不必要的. 部分的引擎中原始提供了仿射变换矩阵这一 primitive, 比如 pdfTeX 中的 \pdfsetmatrix 命令.

下面的示例展示了如何使用这一章节中的几个 Box 操作命令:

```
\ExplSyntaxOn
\setlength{\fboxsep}{Opt}
% get dim of content
\dotfill\par
\dim new:N \l ztool tmp H dim
\dim new:N \l ztool tmp W dim
\ztool_get_ht:Nn \l_ztool_tmp_H_dim {Hello,~world!}
\ztool_get_wd:Nn \l_ztool_tmp_W_dim {Hello,~world!}
\dim_use:N \l_ztool_tmp_H_dim \quad \dim_use:N \l_ztool_tmp_W_dim\par
% set content to dim
\dotfill\par
Hello,~world|
\ztool_set_to_ht:nn {.5cm} {Hello,~world}|
\ztool_set_to_wd:nn {40pt} {Hello,~world}\par
% scale one dimension
\dotfill\par
\ztool_scale_to_wd:nn {2em}{\fbox{AA}}\par
\ztool_scale_to_wd:nn {2em}{\fbox{AAA}}\par
\ztool_scale_to_wd:nn {2em}{\fbox{AAAAA}}\par
\ztool\ scale\ to\ ht:nn\ \{2.5em\}\{\fbox\{\vbox\{\hbox\{A\}\}\}\}\
\ztool scale to ht:nn \{2.5em\}\{\fbox\{\vbox\{\hbox\{A\}\hbox\{A\}\}\}\}\}\quad
\par
% box item align
\dotfill\par
\def\boxItemCmd#1{\textcolor{blue}{|#1|}}
\underline{
 \ztool box item align:Nnnn \boxItemCmd{15em}{{Tom}{Amy}{Jennery}}{scatter}
```

```
}\par
\underline{
 }\par
% affine transform
\dotfill\par
\hcoffin_set:Nn \l_tmpa_coffin {\rule{2em}{2em}}
\coffin_typeset:Nnnnn \l_tmpa_coffin {1}{b}{0pt}{0pt}
\label{lem:nnnn} $$ \vec{1}_0.5^{1} = \frac{1}{0}.5^{1} ... $$
\coffin_typeset:Nnnnn \l_tmpa_coffin {1}{b}{0pt}{0pt}
\ExplSyntaxOff
7.8402pt 60.87103pt
                        ......
{\rm Hello,\ world}|Hello,\ world|_{\rm Hello,\ world}
AA
AAA
AAAAA
       |Amy|
                 |Jennery|
    |Tom||Amy|| ||Jennery|
```

6 zdraw

这部分主要包含一些图像绘制命令, 这系列的命令并不依赖于 tikz 宏包, 它们的 主要依赖项如下:

- $\text{IMT}_{\text{E}} X 2_{\varepsilon}$ 内置 picture 环境;
- pict2e: $\[Mathbb{IMT}_{PX}\]$ 2 $\[Epsilon]$ 内置 picture 环境的增强版, 提供了更好的绘图功能;
- bxeepic: 可以用于提供 dash line 支持, 目前未引入该宏包.

zpic

New: 2025-05-13

此环境基于 \LaTeX 2ε 内置 picture 环境定义,

ztool/draw/picture/unit	unit	= 〈长度〉初始值: 1	cm
ztool/draw/picture/width	width	= 〈浮点数〉初始值:	0
ztool/draw/picture/height	height	= 〈浮点数〉初始值:	0
ztool/draw/picture/xoffset	xoffset	= 〈浮点数〉初始值:	0
ztool/draw/picture/yoffset	yoffset	= 〈浮点数〉初始值:	0
ztool/draw/picture/opacity-color	opacity	-color = 〈颜色〉初始值: whi	ıte

上述的〈opacity-color〉选项用于设置当前 zpic 环境中的"透明"色彩, 也就是和当前文档默认背景色相同的色彩; 所以可能会出现〈opacity-color〉覆盖到其它 object 上的情况.

\put

\put $(\langle x, y \rangle)$ $\{\langle content \rangle\}$

New: 2025-05-13

此命令与 $I
ightharpoonup I
ightharpoonup X 2 <math>\varepsilon$ 内置 picture 环境中的 \put 命令相同. **注意**: 此命令需要在 picture 或 zpic 环境中使用.

\zline

\zline $[\langle key-value \rangle](\langle coor-1 \rangle)(\langle coor-2 \rangle)$

New: 2025-05-13

此命令用于绘制一条从〈coor-1〉到〈coor-2〉的线段,〈key-value〉用于设置线条的属性,可用选项请参见后续的〈parent=ztool/draw/picture/line〉.

ztool/../line/draw
ztool/../line/width
ztool/../line/dash

 draw = 〈颜色〉
 初始值: black

 width = 〈长度〉
 初始值: .4pt

 dash = 〈true|false〉
 初始值: false

上述〈width〉用于设置线条的宽度、〈draw〉用于设置线条的颜色、〈dash〉用于设置线条是否为虚线. **注意**:目前〈dash〉选项还未适配, **处于不可用的状态**.

\zvector

 $\zvector [\langle key-value \rangle] (\langle coor-1 \rangle) (\langle coor-2 \rangle)$

New: 2025-05-13

此命令用于绘制向量,该向量的起点为〈coor-1〉,终点为〈coor-2〉;〈key-value〉用于设置该向量的外观属性,其继承自〈parent=ztool/draw/picture/line〉,其余的可用选项请参见后续〈parent=ztool/draw/picture/line/vector〉.

ztool/../vector/>

> = (latex|pst)......初始值: latex

此选项用于控制箭头的样式,默认为 LATEX 样式,即 \ltxarrows; \(\rho pst\),即 PsTricks,对应于 \(\rho pstarrows\) 命令.

\zdraw

 $\zdraw [\langle key-value \rangle] (\langle coor-1 \rangle) \dots (\langle coor-n \rangle);$

New: 2025-05-13

此命令将绘制一条从点〈coor-1〉到点〈coor-n〉的折线段,〈key-value〉继承自〈parent=ztool/draw/picture/line〉,可以用于设置线条的属性,额外可用的选项请参见后续的〈parent=ztool/draw/picture/zdraw〉.

注意: 此命令末尾的";"是不能省略的, 否则会报错.

ztool/../zdraw/vector
ztool/../zdraw/cycle
ztool/../zdraw/fill
ztool/../zdraw/shift

 vector = \(false | true \)
 初始值: false

 cycle = \(false | true \)
 初始值: false

 fill = \(false | true | 颜色 \)
 初始值: false

 shift = \(\{\varphi \), \(\varphi \)

当 $\langle fil1 \rangle$ 设置为 true 时, $\langle cycle \rangle$ 会自动设置为 true; $\langle vector \rangle$ 用于设置是 否将每一个子线段替换为向量. $\langle shift \rangle$ 分别表示 x 和 y 方向的偏移量. **注意**: $\langle shift \rangle$ 选项中的 {} 不能省略.

\zarc

\zarc[(key-value)]((浮点数,浮点数))

New: 2025-05-13

此命令用于绘制一个圆弧,(〈浮点数,浮点数〉)为其圆心,默认绘制 $\frac{1}{4}$ 圆弧; $\langle \text{key-value} \rangle$ 继承自 $\langle \text{parent=ztool/draw/picture/line} \rangle$,可以用于设置线条的属性,额外可用的选项请参见后续的 $\langle \text{parent=ztool/draw/picture/zarc} \rangle$.

ztool/../zarc/radius
ztool/../zarc/start
ztool/../zarc/end
ztool/../zarc/fill

 radius = 〈浮点数〉
 初始值: .5

 start = 〈浮点数〉
 初始值: 0

 end = 〈浮点数〉
 初始值: 90

 fill = 〈false|true|颜色〉
 初始值: false

 ⟨start⟩按照逆时针旋转到角度〈end〉结束;〈radius〉为圆弧的半径;〈fill〉用于设置圆弧的填充颜色。

\zcircle

\zcircle[\langle key-value \rangle](\(\cop\) [点数, 浮点数\)

New: 2025-05-13

此命令基于上述的 \zarc 命令, 默认情况下将以(〈浮点数, 浮点数〉) 为圆心绘制一个完整的圆; 〈key-value〉和上述的 \zrac 命令中的〈key-value〉选项相同,

\zrectangle

 $\zrectangle[\langle key-value \rangle](\langle coor-1 \rangle)(\langle coor-2 \rangle)$

New: 2025-05-13

此命令用于绘制矩形,(〈coor-1〉) 和 (〈coor-2〉) 为矩形对角线的两个端点坐标; 〈key-value〉继承自〈parent=ztool/draw/picture/line〉, 其余的〈key-value〉请参见后续〈parent=ztool/draw/picture/zrectangle〉.

ztool/../zrectangle/arc
ztool/../zrectangle/fill

\zpin

New: 2025-07-09

此命令用于给当前页面添加标注,参考点为当前页面的右下角,并且取向右向上为正方向.

为便于理解上述绘图命令的基本用法,现提供若干绘图示例. **案例 1**:基础的线段绘制命令.

```
\mbox{}\vskip2em

\begin{zpic} [unit=2em]

\zdraw[fill, cycle] (0, 0)(1, 0)(1, 1)(0, 1);

\zdraw[cycle, shift={2, 0}] (0, 0)(1, 0)(1, 1)(0, 1);

\zdraw[fill, shift={4, 0}] (0, 0)(1, 0)(1, 1)(0, 1);

\zdraw[draw=red, width=1pt, shift={6, 0}] (0, 0)(1, 0)(1, 1)(0, 1);

\zdraw[vector, shift={8, 0}] (0, 0)(1, 0)(1, 1)(0, 1);

\zdraw[vector, cycle, shift={10, 0}] (0, 0)(1, 0)(1, 1)(0, 1);

\zdraw[vector, fill, shift={12, 0}] (0, 0)(1, 0)(1, 1)(0, 1);

\zdraw[vector, cycle, fill, shift={14, 0}] (0, 0)(1, 0)(1, 1)(0, 1);

\end{zpic}
```

案例 2: 基本的几何元素绘制命令.

```
\mbox{}\vskip5em
                                                                            例 8
\begin{zpic}[unit=2cm, xoffset=2]
 % 1. rectangle
 \zrectangle[arc=.1, fill=gray!20](0, 0)(2, 1)
 \zrectangle[draw=green, width=1pt](.5, .25)(1.5, .75)
 % 2. line / vecter
 \zline[width=3pt, draw=red](0, .5)(2, .5)
 \zvector[>=pst](0, 0)(1, 1)
 \zvector[draw=blue, width=2pt](1, 1)(2, 0)
 % 3. arc / circle
 \zarc[draw=blue, end=45](0, 0) % fill=<empty>
 \z [draw=blue, width=2pt, end=15, fill=, draw=red](0, 0)
 \zcircle[radius=.25, fill, draw=purple](1, .5)
 \zcircle[radius=.25, fill=orange, draw=none](1.5, 1)
 \zcircle[radius=.25, fill=red, draw=](2, .5)
\end{zpic}
```

24 7 TODO

7 TODO

ztool 在将来也许会有改动,这里列出部分将来可能会完善的功能 (□ – 未完成; □ – 已完成; □ – 不考虑该功能):

- □ 重新实现 xsimverb 宏包中的 \xsim_file_write_start:nn 和 \xsim_file_write_stop: 命令, 使其和 ztool 宏包适配.
- ☑ 2025-05-22-已完成:修复\ztool_append_to_file:nn 文件首行空行的问题.
- ☑ 2025-09-01-已完成:针对命令 \ztool_read_file_as_seq:nnN, 有些情况下 需要保留源文件中的所有空格, 可以参考命令 \seq_set_split_keep_-spaces:Nnn.
- □ 使用的已实现的 \ztex_tl_replace_all:nnn 或 \ztex_tl_replace_once:nnn 命令实现 \ztool_replace_file_line_text:nnnn {⟨file⟩}{⟨line⟩}
 {⟨pattern⟩}{⟨text⟩}, 并且在 ⟨pattern⟩ 中实现简单的正则表达式功能,
 需要确保该命令是可展的.
- □ 使用 l3draw 封装一个类似 tikz 的前端, 需要其原生支持 3D 绘图, 自动调整遮挡关系.
- ☑ 2025-07-09-已完成:\zline 绘制垂直或水平线段时报错或结果不符合预期
- □ \zline 和 \zdraw 二者的效果不一致,在同一个坐标系绘制同一条线段, 二者无法重合(目前来看 \zline 命令才是正确的).

8 zTool 源码

8.1 ztool.sty

```
%% ztool.sty
                                                                             %
                                                                                              2
 3 %% Copyright 2024, 2025 Zongping Ding.
                                                                             %
                                                                                              3
                                                                             %
  %
 4
                                                                                              4
 5 % This work may be distributed and/or modified under the conditions of the
                                                                             %
                                                                                              5
 6 % LaTeX Project Public License, either version 1.3 of this license or any
                                                                             %
                                                                                              6
  % later version.
                                                                             %
                                                                                              7
  % The latest version of this license is in
9
                       http://www.latex-project.org/lppl.txt
                                                                             %
                                                                                              9
10 % and version 1.3 or later is part of all distributions of LaTeX
                                                                             %
                                                                                              10
11 % version 2005/12/01 or later.
                                                                             %
                                                                                              11
12 %
                                                                             %
                                                                                              12
13 % This work has the LPPL maintenance status `maintained'.
                                                                             %
                                                                                              13
                                                                             %
14
                                                                                              14
                                                                             %
15 % The Current Maintainer of this work is Zongping Ding.
                                                                                              15
                                                                             %
16 %
                                                                                              16
17 % ztool.sty consists of the parts:
                                                                             %
                                                                                              17
                                                                             %
18 %
                       shell-escape,
                                                                                              18
19 %
                       file-io,
                                                                             %
                                                                                              19
                                                                             %
20 %
                       box,
                                                                             %
21 %
                       zdraw.
   22
23
   \NeedsTeXFormat{LaTeX2e}
   \\\ProvidesExplPackage{ztool}{2025/05/20}{1.0.1}{A~pre-release~tool~package~for~LaTeX}
                                                                                              24
24
25
                                                                                              25
26
                                                                                              26
   %%%%%
           13keys intial patch begin
                                      %%%%%
                                                                                              27
   % 1. https://github.com/latex3/latex3/issues/1738
                                                                                              28
   % 2. https://tex.stackexchange.com/q/742604/294585
                                                                                              29
   \cs_set_protected:Npn \__keys_initialise:n #1
                                                                                              30
31
                                                                                              31
       \exp_after:wN \__keys_find_key_module:wNN
32
                                                                                              32
33
        \l keys path str \s keys stop
                                                                                              33
         \l_keys_key_tl \l_keys_key_str
34
                                                                                              34
       \tl_set_eq:NN \l_keys_key_tl \l_keys_key_str
35
                                                                                              35
       \tl_set:Nn \l_keys_value_tl {#1}
36
                                                                                              36
       \cs if exist:cTF { \c keys code root str \l keys path str }
37
                                                                                              37
38
                                                                                              38
           \str_clear:N \l keys_inherit_str
39
                                                                                              39
           \__keys_execute:nn \l_keys_path_str {#1}
40
                                                                                              40
        }
41
                                                                                              41
42
                                                                                              42
43
          \cs_if_exist:cT
                                                                                              43
            { \c_keys_inherit_root_str \_keys_parent:o \l_keys_path_str }
44
                                                                                              44
```

45

{ \ keys execute inherit: }

```
46
47
                                                                                                         47
   %%%%%
             13keys intial patch end
                                        %%%%%
48
                                                                                                         48
49
50
                                                                                                         50
   \clist new: N \g ztool library loaded clist
51
                                                                                                         51
52
   \clist_gclear:N \g_ztool_library_loaded_clist
                                                                                                         52
   \bool new: N \g ztool lib user load dupulicate bool
53
                                                                                                         53
   \bool_gset_false:N \g__ztool_lib_user_load_dupulicate_bool
                                                                                                         54
   \cs_new_nopar:Npn \__ztool_load_library:n #1
55
                                                                                                         55
56
                                                                                                         56
        \clist_map_inline:nn {#1} {
57
                                                                                                         57
          \clist_if_in:NnTF \g_ztool_library_loaded_clist {##1} {
58
                                                                                                         58
            \msg_set:nnn {ztool} {library-loaded}
59
                                                                                                         59
              {
60
                                                                                                         60
                ztool~library~"##1"~already~loaded,ignored~loading.
61
                                                                                                         61
                \msg_line_context:
62
                                                                                                         62
              }
63
                                                                                                         63
            \bool_if:NT \g__ztool_lib_user_load_dupulicate_bool
64
                                                                                                         64
              {
65
                                                                                                         65
                \msg_warning:nnn {ztool} {library-loaded} {##1}
66
                                                                                                         66
              }
67
                                                                                                         67
          }{
68
            \file_if_exist:nTF {library/ztool.library.##1.tex}{
69
70
              \clist_gput_right: Nn \g_ztool_library_loaded_clist {##1}
              \makeatletter\file input:n {library/ztool.library.##1.tex}
71
            }{
72
              \msg_set:nnn {ztool} {library-not-found} {ztool~library~`##1'~not~found.}
73
                                                                                                         73
              \msg_error:nnn {ztool} {library-not-found} {##1}
74
                                                                                                         74
            }
75
                                                                                                         75
76
                                                                                                         76
77
        }
                                                                                                         77
78
                                                                                                         78
   \NewDocumentCommand\ztoolloadlib{m}
79
80
                                                                                                         80
        \__ztool_load_library:n {#1}
81
                                                                                                         81
        \bool_gset_true:N \g__ztool_lib_user_load_dupulicate_bool
82
                                                                                                         82
        \ExplSyntaxOff
83
                                                                                                         83
      }
84
                                                                                                         84
   \keys_define:nn { ztool }
85
                                                                                                         85
86
                                                                                                         86
                                = { \ _ztool_load_library:n {shell-escape} },
87
        shell-escape .code:n
                                                                                                         87
88
        file-io
                      .code:n
                                = { \__ztool_load_library:n {file-io} },
                                                                                                         88
                                = { \_ztool_load_library:n {box} },
        box
                      .code:n
89
                                                                                                         89
                                = { \__ztool_load_library:n {zdraw} },
90
        zdraw
                      .code:n
                                                                                                         90
91
                                                                                                         91
   \ProcessKeyOptions [ ztool ]
                                                                                                         92
```

8.2 shell-escape

```
%%
                                                                                                        1
   %% This is file `ztool.library.shell-escape.tex'.
                                                                                                        2
   %% This file is based on the original source code with modifications.
                                                                                                        3
   %% The original disclaimer reads as follows:
                                                                                                        4
   %%
 5
                                                                                                        5
 6 %%
                                                                                                        6
7 %% This is file `l3sys-shell.sty',
                                                                                                        7
   %% generated with the docstrip utility.
                                                                                                        8
 9
                                                                                                        9
10 %% The original source files were:
                                                                                                        10
11 %%
                                                                                                        11
12 %% 13sys-shell.dtx (with options: `package')
                                                                                                        12
13
                                                                                                        13
14 %% Copyright (C) 2018,2019 The LaTeX3 Project
                                                                                                        14
15 %%
                                                                                                        15
16 %% It may be distributed and/or modified under the conditions of
                                                                                                        16
   %% the LaTeX Project Public License (LPPL), either version 1.3c of
                                                                                                        17
  %% this license or (at your option) any later version. The latest
                                                                                                        18
   %% version of this license is in the file:
                                                                                                        19
20
   %%
                                                                                                        20
21 %%
         http://www.latex-project.org/lppl.txt
                                                                                                        21
22 %%
23 %% This file is part of the "13experimental bundle" (The Work in LPPL)
24 %% and all files in that bundle must be distributed together.
25 %%
26 %% File: 13sys-shell.dtx
                                                                                                        26
   \ProvidesExplFile{ztool.library.shell-escape.tex}
                                                                                                        27
     {2025/09/06}{1.0.1}
28
                                                                                                        28
     {shell-escape~library~for~ztool}
                                                                                                        29
29
30
                                                                                                        30
31
                                                                                                        31
32 % ==> 13sys-shell tool
                                                                                                        32
   % windows path handle
                                                                                                        33
   \cs_new:Npn \ztool_sys_path_to_win:N #1
                                                                                                        34
35
                                                                                                        35
36
       \quark_if_nil:NF #1 {
                                                                                                        36
          \token_if_eq_meaning:NNTF #1 /
                                                                                                        37
37
            { \c backslash str }
38
                                                                                                        38
            {#1}
39
                                                                                                        39
          \ztool sys path to win:N
                                                                                                        40
40
       }
41
                                                                                                        41
     }
42
                                                                                                        42
   \cs_new:Npn \ztool_sys_path_to_win:w #1 ~ #2 \q_stop
43
                                                                                                        43
     {
44
                                                                                                        44
       \ztool_sys_path_to_win:N #1 \q_nil
45
                                                                                                        45
       \tl_if_empty:nF {#2}
46
                                                                                                        46
```

```
47
                                                                                                           47
48
            \c_space_tl
                                                                                                           48
            \__sys_path_to_win:w #2 \q_stop
49
                                                                                                           49
          }
50
                                                                                                           50
      }
51
                                                                                                           51
   \cs_new:Npn \ztool_sys_path_to_win:n #1
52
                                                                                                           52
53
                                                                                                           53
54
        \exp_after:wN \ztool_sys_path_to_win:w
                                                                                                           54
          \tl to str:n {#1} ~ \q stop
55
                                                                                                           55
      }
56
                                                                                                           56
   % respective commands
57
                                                                                                           57
   \cs_new_protected:Npn \ztool_shell_escape:n #1
58
                                                                                                           58
59
                                                                                                           59
        \sys if shell unrestricted:T
60
                                                                                                           60
          { \sys_shell_now:n {#1} }
61
                                                                                                           61
62
                                                                                                           62
   \cs_generate_variant:Nn \ztool_shell_escape:n {e}
63
                                                                                                           63
   \cs_new_protected:Npe \ztool_shell_mkdir:n #1
64
                                                                                                           64
      {
65
                                                                                                           65
        \ztool_shell_escape:e {
66
                                                                                                           66
          \sys_if_platform_unix:T
67
                                                                                                           67
            {mkdir~-p~\exp_not:N \tl_to_str:n {#1}}
68
                                                                                                           68
          \sys_if_platform_windows:T
69
            {mkdir~ \exp_not:N \ztool_sys_path_to_win:n {#1}}
70
        }
71
72
73
   \cs_new_protected:Npe \ztool_shell_cp:nn #1#2
74
                                                                                                           74
75
        \ztool_shell_escape:e {
                                                                                                           75
          \sys_if_platform_unix:T
76
                                                                                                           76
77
                                                                                                           77
              cp~-f~ \exp_not:N \tl_to_str:n {#1} ~
78
                                                                                                           78
                \exp_not:N \tl_to_str:n {#2}
79
                                                                                                           79
80
                                                                                                           80
          \sys_if_platform_windows:T
81
                                                                                                           81
            {% can NOT use wildcards in CMD
82
                                                                                                           82
              copy~/y~ \exp_not:N \ztool_sys_path_to_win:n {#1} ~
83
                                                                                                           83
                \exp_not:N \ztool_sys_path_to_win:n {#2}
84
                                                                                                           84
            }
85
                                                                                                           85
        }
86
                                                                                                           86
87
                                                                                                           87
    \cs_new_protected:Npe \ztool_shell_mv:nn #1#2
88
                                                                                                           88
      {
89
                                                                                                           89
        \ztool_shell_escape:e {
90
                                                                                                           90
91
          \sys_if_platform_unix:T
                                                                                                           91
92
                                                                                                           92
              mv~ \exp_not:N \tl_to_str:n {#1} ~
                                                                                                           93
93
94
                \exp_not:N \tl_to_str:n {#2}
                                                                                                           94
```

```
}
 95
 96
           \sys_if_platform_windows:T
 97
               copy~/y~ \exp_not:N \ztool_sys_path_to_win:n {#1} ~
 98
 99
                 \exp_not:N \ztool_sys_path_to_win:n {#2}
                 \token to str:N & \token to str:N &
100
                 del~/f~/q~\exp_not:N \ztool_sys_path_to_win:n {#1}
101
             }
102
        }
103
       }
104
    \cs_new_protected:Npe \ztool_shell_rm:n #1
105
106
        \ztool_shell_escape:e {
107
           \sys_if_platform_unix:T
108
             { rm~-f~ \exp_not:N \tl_to_str:n {#1} }
109
           \sys if platform windows:T
110
             { del~/f~/q~ \exp_not:N \ztool_sys_path_to_win:n {#1} }
111
        }
112
       }
113
    \cs_new_protected:Npe \ztool_shell_rmdir:n #1
114
115
        \ztool shell mkdir:n {#1}
116
        \ztool_shell_escape:e {
117
           \sys if platform unix:T
118
119
             { rm~-rf~ \exp_not:N \tl_to_str:n {#1} }
           \sys if platform windows:T
120
             { rmdir~/s~/q~ \exp_not:N \ztool_sys_path_to_win:n {#1} }
121
122
       }
123
    \tl_new:N \l__ztool_shell_tmp_tl
    \cs_new_protected:Npe \ztool_get_shell_pwd:N #1
125
126
        \exp_not:N \sys_get_shell:nnN
127
128
             \sys_if_platform_unix:T { pwd }
129
             \sys_if_platform_windows:T { cd }
130
          }{
131
             \char_set_catcode_other:N \exp_not:N \\
132
             \char_set_catcode_other:N \exp_not:N \#
133
             \char_set_catcode_other:N \exp_not:N \~
134
             \char_set_catcode_other:N \exp_not:N \%
135
             \char set catcode space:N \exp not:N \_%
136
137
             \tex_endlinechar:D -1 \scan_stop:
          }
138
139
        \exp_not:N \l__ztool_shell_tmp_tl
140
        \str_set:NV #1 \exp_not:N \l__ztool_shell_tmp_tl
       }
141
    \cs_new_protected:Npe \ztool_shell_split_ls:nN #1#2
```

```
143
      {
144
        \exp_not:N \sys_get_shell:nnN
145
            \sys_if_platform_unix:T { ls~-1~ #1 }
146
            \sys_if_platform_windows:T { dir~/b~ #1 }
147
          }{
148
149
            \ExplSyntaxOff
            \char set catcode other:N \exp not:N \\
150
            \char set catcode other:N \exp not:N \#
151
            \char_set_catcode_other:N \exp_not:N \~
152
153
            \char_set_catcode_other:N \exp_not:N \%
            \char_set_catcode_other:n { 13 }
154
155
156
          \exp not:N \l ztool shell tmp tl
        \str_set:NV \exp_not:N \l__sys_tmp_tl \exp_not:N \l__sys_tmp_tl
157
        \seq_set_split:NnV #2
158
          { \char_generate:nn { `\^^M } { 12 } }
159
160
          \exp_not:N \l__ztool_shell_tmp_tl
        \seq pop right:NN #2 \exp not:N \l sys tmp tl
161
      }
162
163 \cs_generate_variant:Nn \ztool_shell_mkdir:n {e}
164 \cs generate variant: Nn \ztool_shell_cp:nn { ee, ne, en }
165 \cs_generate_variant:Nn \ztool_shell_mv:nn { ee, ne, en }
166 \cs_generate_variant: Nn \ztool shell rm:n { e, f, o }
167 \cs_generate_variant:Nn \ztool_shell_rmdir:nn { e, f, o }
168 \cs_generate_variant:Nn \ztool_get_shell_pwd:N {c}
169 \cs generate variant: Nn \ztool shell split ls:nN {nc}
```

```
\ProvidesExplFile{ztool.library.file-io.tex}
                                                                                                         1
      {2025/09/06}{1.0.1}
 2
                                                                                                         2
 3
      {file-io~library~for~ztool}
                                                                                                         3
 4
                                                                                                         4
 5
                                                                                                         5
 6 % ==> file IO operations
                                                                                                         6
 7 % 1. create a new file
                                                                                                         7
   % 2. append to a file
                                                                                                         8
  % 3. read from file / write to file
                                                                                                         9
10 \ior_new:N \g_ztool_file_read_ior
                                                                                                         10
11 \ior_new:N \g_ztool_file_append_ior
                                                                                                         11
12 \iow_new:N \g ztool_file_append_iow
                                                                                                         12
13 \tl_new:N \l_ztool_current_line
                                                                                                         13
14 \str_clear:N \l_ztool_file_ori_content_str
                                                                                                         14
  \seq_new:N \l_ztool_file_seq
                                                                                                         15
16 \seq_new:N \l__ztool_tmp_seq
                                                                                                         16
17
   \cs_generate_variant:Nn \seq_use:Nn { Ne }
                                                                                                         17
18
                                                                                                         18
   % read file as seq(not keep internal spaces):
19
                                                                                                         19
   \cs new protected:Npn \ztool read file as seq:nnN #1#2#3
                                                                                                         20
      {\% #1: bool(True to keep spaces, False to trim); #2: file name; #3: seq
21
                                                                                                         21
22
        \seq_clear:N #3
        \file_if_exist:nT {#2}
23
24
            \ior_open:Nn \g_ztool_file_read_ior {#2}
25
            \ior_map_inline:Nn \g_ztool_file_read_ior
                                                                                                         26
26
27
                                                                                                         27
                \bool_if:nTF {#1}
28
                                                                                                         28
                  { \seq_put_right: Nn #3 {##1} }
29
                                                                                                         29
                  { \seq_put_right:Ne #3 {\tl_trim_spaces:n {##1}} }
30
                                                                                                         30
31
                                                                                                         31
32
            \ior_close:N \g_ztool_file_read_ior
                                                                                                         32
         }
33
                                                                                                         33
      }
34
                                                                                                         34
   \cs_new_protected:Npn \ztool_gread_file_as_seq:nnN #1#2#3
                                                                                                         35
36
      {% #1: bool(True to keep spaces, False to trim); #2: file name; #3: seq
                                                                                                         36
37
        \seq_gclear:N #3
                                                                                                         37
        \file_if_exist:nT {#2}
38
                                                                                                         38
39
                                                                                                         39
            \ior open: Nn \g ztool file read ior {#2}
40
                                                                                                         40
            \ior_map_inline:Nn \g_ztool_file_read_ior
41
                                                                                                         41
42
                                                                                                         42
                \bool if:nTF {#1}
43
                                                                                                         43
44
                  { \seq_gput_right: Nn #3 {##1} }
                                                                                                         44
45
                                                                                                         45
                    \seq_gput_right:Ne #3
46
                                                                                                         46
```

```
{ \tl_trim_spaces:n {##1} }
47
                  }
48
49
            \ior close:N \g ztool file read ior
50
         }
51
52
53
   \cs_generate_variant:\n\ztool_read_file_as_seq:nn\
      { ne, nnc, nec }
54
   \cs_generate_variant:Nn \ztool_gread_file_as_seq:nnN
55
      { ne, nnc, nec }
56
57
   % read file as seq(keep these internal spaces):
58
   \cs_new_protected:Npn \ztool_read_file_as_seq_keep_spaces:nnN #1#2#3
59
      {% #1: bool(True to keep trim spaces, False to trim); #2: file name; #3: seq
60
       \seq_gclear:N #3
61
       \file_if_exist:nT {#2}
62
63
            \ior_open: Nn \g_ztool_file_read_ior {#2}
64
            \ior str map inline: Nn \g ztool file read ior
65
66
                \tl_set_rescan:Nnn \l_tmpa_tl
67
                  {
68
                    \cctab_select:N \c_document_cctab
69
                    \char_set_catcode_space:n { 9 } % tab
70
71
                    \char_set_catcode_space:n { 32 } % space
                  }{ ##1 }
72
                \bool if:nTF {#1}
73
                  {
74
                    \exp_args:NNo \seq_put_right:Nn #3
75
                      { \l tmpa tl }
76
                  }{
77
                    \seq_put_right:Ne #3
78
                      { \exp_args:No \tl_trim_spaces:n {\l_tmpa_tl} }
79
                  }
80
81
            \ior_close:N \g_ztool_file_read_ior
82
         }
83
84
      }
   \cs_new_protected:Npn \ztool_gread_file_as_seq_keep_spaces:nnN #1#2#3
85
      {% #1: bool(True to keep trim spaces, False to trim); #2: file name; #3: seq
86
        \seq_gclear:N #3
87
       \file_if_exist:nT {#2}
88
          {
89
            \ior open: Nn \g ztool file read ior {#2}
90
            \ior_str_map_inline:Nn \g_ztool_file_read_ior
91
92
                \tl_set_rescan:Nnn \l_tmpa_tl
93
94
                  {
```

```
\cctab select:N \c document cctab
 95
 96
                     \char_set_catcode_space:n { 9 } % tab
                     \char_set_catcode_space:n { 32 } % space
 97
                   }{ ##1 }
98
99
                 \bool_if:nTF {#1}
                   {
100
                     \exp_args:NNo \seq_gput_right:Nn #3
101
                       { \l tmpa tl }
102
                   }{
103
                     \seq_gput_right:Ne #3
104
                       {
105
                          \exp_args:No \tl_trim_spaces:n
106
                            { \l tmpa tl }
107
108
                   }
109
110
             \ior_close:N \g_ztool_file_read_ior
111
          }
112
       }
113
    \cs_generate_variant:Nn \ztool_read_file_as_seq_keep_spaces:nnN
114
       { ne, nnc, nec }
115
    \cs generate variant: Nn \ztool gread file as seq keep spaces:nnN
116
117
       { ne, nnc, nec }
118
119
    % create file / append to file / write to file
    \cs new protected:Npn \ztool file new:nn #1#2
120
121
       {% #1: \c true bool to allow overwrite; #2: file name
122
         \bool_if:nT {#1}
          {
123
             \iow open: Nn \g ztool file append iow {#2}
124
             \iow_close:N \g_ztool_file_append_iow
125
          }
126
       }
127
    \cs new protected:Npn \ztool append to file:nn #1#2
128
       {% #1: file name; #2: content
129
         \seq_clear:N \l_ztool_file_seq
130
         \file if exist:nF {#1}
131
           { \ztool_file_new:nn {\c_true_bool}{#1} }
132
         \ior_open: Nn \g_ztool_file_append_ior {#1}
133
         \ior str map inline: Nn \g ztool file append ior
134
135
             \seq put right: Nn \l ztool file seq
136
               { ##1 }
137
138
139
         \iow_open: Nn \g_ztool_file_append_iow {#1}
         \seq_if_empty:NF \l_ztool_file_seq
140
141
142
             \iow_now:Ne \g_ztool_file_append_iow
```

```
143
144
                 \seq_use:Ne \l_ztool_file_seq
145
                   { \iow_newline: }
               }
146
          }
147
        \iow_now:Ne \g ztool file append iow {#2}
148
149
        \iow_close:N \g_ztool_file_append_iow
      }
150
151
    \cs generate variant:Nn \ztool append to file:nn
      { no, nf, ne, ee }
152
153
    \cs_new_protected:Npn \ztool_write_seq_to_file:nNn #1#2#3
154
      {% #1:bool; #2:seq; #3:file name
155
        \seq_clear:N \l_ ztool tmp_seq
156
        \bool_if:nTF { #1 }
157
158
             \seq_set_eq:NN \l_ztool_file_seq #2
159
160
             \ztool read file as seq:nnN
161
               { \c_true_bool }{ #3 }
162
163
               \l_ztool_tmp_seq
             \seq concat:NNN \l ztool file seq
164
165
               \l_ztool_tmp_seq #2
166
167
        \file_if_exist:nF {#3}
           { \ztool_file_new:nn {\c_true_bool}{#3} }
168
        \iow open:Nn \g tmpa iow { #3 }
169
        \seq_if_empty:NF \l_ztool_file_seq
170
          {
171
172
             \iow_now:Ne \g_tmpa_iow
173
                 \seq_use:Ne \l ztool file_seq
174
                   { \iow_newline: }
175
               }
176
177
        \iow_close:N \g_tmpa_iow
178
179
    \cs_generate_variant:Nn \ztool_write_seq_to_file:nNn
180
      { nNe, nNV, nce, ncV }
181
182
    \cs_new_protected:Npn \ztool_replace_file_line:nnn #1#2#3
183
      {% #1:file name; #2:line index; #3:replacement
184
185
        \seq_clear:N \l_ztool_file_seq
        \file_if_exist:nT {#1}{
186
187
           \ior_open: Nn \g_ztool_file_read_ior {#1}
           \ior_str_map_inline:Nn \g_ztool_file_read_ior
188
189
190
               \seq_put_right: Nn \l_ztool_file_seq {##1}
```

```
}
191
192
           \ior_close:N \g_ztool_file_read_ior
           \seq_set_item:Nnn \l_ztool_file_seq {#2}
193
             { #3 }
194
195
           \iow_open: Nn \g_ztool_file_append_iow {#1}
           \seq if empty:NF \l ztool file seq
196
197
               \iow now: Ne \g ztool file append iow
198
199
                   \seq_use:Ne \l_ztool_file_seq
200
                     { \iow newline: }
201
                 }
202
203
           \iow_close:N \g ztool file append iow
204
        }
205
       }
206
    \cs_generate_variant:Nn \seq_set_item:Nnn { Nne }
207
    \cs generate variant: Nn \ztool replace file line:nnn
208
       { e, ene, eee }
209
    \cs_new_protected:Npn \ztool_insert_to_file:nnn #1#2#3
210
       {% #1:file name; #2:line index; #3:content
211
        \seq clear:N \l ztool file seq
212
        \file_if_exist:nT {#1}{
213
           \ior open: Nn \g ztool file read ior {#1}
214
215
           \ior_str_map_inline:Nn \g_ztool_file_read_ior
216
217
               \seq put right: Nn \l ztool file seq {##1}
218
           \ior_close:N \g_ztool_file_read_ior
219
           \tl set:No \l ztool current line
220
             { \seq_item: Nn \l_ztool_file_seq {#2} }
221
           \seq_set_item: Nne \l_ztool_file_seq {#2}
222
             { #3\iow_newline:\l_ztool_current_line }
223
           \iow open: Nn \g ztool file append iow {#1}
224
           \iow_now:Ne \g_ztool_file_append_iow
225
226
               \seq use:Ne \l ztool file seq
227
                 { \iow_newline: }
228
             }
229
           \iow_close:N \g ztool file append iow
230
231
        }
       }
232
233 \cs_generate_variant:Nn \ztool_insert_to_file:nn
       { ne, nf, ee }
234
```

```
\ProvidesExplFile{ztool.library.box.tex}
                                                                                                         1
      {2025/09/06}{1.0.1}
 2
                                                                                                         2
      {box~library~for~ztool}
 3
                                                                                                         3
 4
                                                                                                         4
 5
                                                                                                         5
   % ==> box manipulation tool
                                                                                                         6
   \cs set:Nn \ ztool leave vmode:
                                                                                                         7
      { \ifvmode \leavevmode \fi }
 8
                                                                                                         8
   % catch box dimension
 9
                                                                                                         9
   \box_new:N \l_ztool_measure_box
                                                                                                         10
10
   \cs_new:Npn \ztool_box_set_to:NNn #1#2#3
                                                                                                         11
11
12
                                                                                                         12
        \hbox_set:Nn \l_ztool_measure_box {#3}
13
                                                                                                         13
        \dim set:Nn #2 {#1 \l ztool measure box}
14
                                                                                                         14
        \box_set_eq:NN \l_ztool_measure_box \c_empty_box
15
                                                                                                         15
      }
16
                                                                                                         16
17
   \cs_new:Npn \ztool_box_gset_to:NNn #1#2#3
                                                                                                         17
18
                                                                                                         18
        \hbox_set:Nn \l_ztool_measure_box {#3}
19
                                                                                                         19
        \dim_gset:Nn #2 {#1 \l_ztool_measure_box}
20
                                                                                                         20
        \box_set_eq:NN \l_ztool_measure_box \c_empty_box
21
                                                                                                         21
      }
22
   \cs_new:Npn \ztool_get_ht:Nn
23
24
      { \ztool box set to:NNn \box ht:N }
   \cs_new:Npn \ztool_get_ht_plus_dp:Nn
25
      { \ztool_box_set_to:NNn \box_ht_plus_dp:N }
26
                                                                                                         26
27
   \cs_new:Npn \ztool_get_wd:Nn
                                                                                                         27
      { \ztool_box_set_to:NNn \box_wd:N }
28
                                                                                                         28
   \cs_new:Npn \ztool_get_dp:Nn
29
                                                                                                         29
      { \ztool box set to:NNn \box dp:N }
30
                                                                                                         30
   \cs_new:Npn \ztool_gget_ht:Nn
                                                                                                         31
      { \ztool_box_gset_to:NNn \box_ht:N }
32
                                                                                                         32
   \cs_new:Npn \ztool_gget_wd:Nn
                                                                                                         33
33
34
      { \ztool box gset to:NNn \box wd:N }
                                                                                                         34
   \cs_new:Npn \ztool_gget_dp:Nn
                                                                                                         35
36
      { \ztool_box_gset_to:NNn \box_dp:N }
                                                                                                         36
37
   \cs_generate_variant:Nn \ztool_get_ht:Nn
                                                                                                         37
      { Ne, ce }
38
                                                                                                         38
   \cs_generate_variant:Nn \ztool_get_ht_plus_dp:Nn
39
                                                                                                         39
40
      { Ne, ce }
                                                                                                         40
   \cs_generate_variant:Nn \ztool_get_wd:Nn
41
                                                                                                         41
      { Ne, ce }
42
                                                                                                         42
   \cs_generate_variant:Nn \ztool_gget_ht:Nn
                                                                                                         43
43
44
      { Ne, ce }
                                                                                                         44
   \cs generate variant:Nn \ztool gget wd:Nn
                                                                                                         45
      { Ne, ce }
                                                                                                         46
46
```

```
47
                                                                                                         47
48
                                                                                                         48
   %% modify box content
49
                                                                                                         49
   % 1. auto scale and rotate (smaller of two)
                                                                                                         50
   \cs_new_protected:Npn \ztool_autoset_to_wd_and_ht:nnn #1#2#3
                                                                                                         51
      {% #1:width; #2:height; #3:object
52
                                                                                                         52
53
       \hbox_set:Nn \l_tmpa_box {#3}
                                                                                                         53
       \box_autosize_to_wd_and_ht:Nnn \l_tmpa_box {#1}{#2}
54
                                                                                                         54
       \ ztool leave vmode:
55
                                                                                                         55
       \box_use:N \l_tmpa_box
56
                                                                                                         56
57
                                                                                                         57
   \cs_new_protected:Npn \ztool_rotate:nn #1#2
58
                                                                                                         58
      {% #1:angle; #2:object
59
                                                                                                         59
       \hbox_set:Nn \1_tmpa_box {#2}
60
                                                                                                         60
       \box_rotate:Nn \l_tmpa_box {#1}
61
                                                                                                         61
       \ ztool leave vmode:
62
                                                                                                         62
       \box_use:N \l_tmpa_box
63
                                                                                                         63
64
                                                                                                         64
   \cs generate variant:Nn \ztool rotate:nn
65
                                                                                                         65
      { e, ne, ee }
66
                                                                                                         66
   \cs_generate_variant:Nn \ztool_autoset_to_wd_and_ht:nnn
67
                                                                                                         67
      { nne, een, eee }
68
                                                                                                         68
69
70 % 2. width/height scale to same time
   % TODO: if '\dim(content) < dim', spread it to 'dim'.
   \cs new protected: Npn \ztool set to wd:nn #1#2
72
      {% #1:width; #2:object
73
74
       \hbox_set:Nn \l_tmpa_box {#2}
                                                                                                         74
       \box_resize_to_wd:Nn \l_tmpa_box {#1}
75
                                                                                                         75
       \__ztool_leave_vmode:
76
                                                                                                         76
       \box_use:N \l_tmpa_box
77
                                                                                                         77
78
                                                                                                         78
   \cs_new_protected:Npn \ztool_set_to_ht:nn #1#2
79
                                                                                                         79
      {% #1:height; #2:object
80
                                                                                                         80
       \hbox_set:Nn \l_tmpa_box {#2}
81
                                                                                                         81
       \box_resize_to_ht:Nn \l_tmpa_box {#1}
82
                                                                                                         82
       \__ztool_leave_vmode:
83
                                                                                                         83
       \box_use:N \l_tmpa_box
84
                                                                                                         84
      }
85
                                                                                                         85
   \cs_generate_variant: Nn \ztool_set_to_wd:nn { e, ne, ee }
                                                                                                         86
   \cs_generate_variant:Nn \ztool_set_to_ht:nn { e, ne, ee }
87
                                                                                                         87
88
                                                                                                         88
89
   % 3. only scale one dimension
                                                                                                         89
   % NOTE: if boxwd{content} <= given dim, no manipulation
                                                                                                         90
   \cs_new_protected:Npn \ztool_scale_to_wd:nn #1#2
91
                                                                                                         91
92
                                                                                                         92
93
       \hbox_set:Nn \l_tmpa_box {#2}
                                                                                                         93
94
       \dim_set:Nn \l_tmpa_dim { \box_wd:N \l_tmpa_box }
                                                                                                         94
```

```
95
        \fp_set:Nn \l_tmpa_fp
 96
             \fp_eval:n { min(1, \dim_ratio:nn {#1}{\l_tmpa_dim}) }
 97
98
99
        \box_scale:Nnn \l_tmpa_box {\l_tmpa_fp}{1}
         \ ztool leave vmode:
100
101
        \box_use:N \l_tmpa_box
102
103 \cs new protected:Npn \ztool scale to ht:nn #1#2
      {% take depth into consideration
104
        \hbox_set:Nn \l_tmpa_box {#2}
105
        \dim_set:Nn \l_tmpa_dim { \box_ht_plus_dp:N \l_tmpa_box }
106
        \fp_set:Nn \l_tmpa_fp
107
108
             \fp_eval:n { min(1, \dim_ratio:nn {#1}{\l_tmpa_dim}) }
109
110
        \box_scale:Nnn \l_tmpa_box {1}{\l_tmpa_fp}
111
        \__ztool_leave_vmode:
112
        \box use:N \1 tmpa box
113
114
    \cs_new_protected:Npn \ztool_scale_to_wd_and_ht:nnn #1#2#3
115
      {% take depth into consideration
116
        \hbox_set:Nn \l_tmpa_box {#3}
117
        \dim set:Nn \l tmpa dim { \box_wd:N \l tmpa box }
118
119
        \dim_set:Nn \l_tmpb_dim { \box_ht_plus_dp:N \l_tmpa_box }
        \fp_set:Nn \l_tmpa_fp
120
121
             \fp_eval:n { min(1, \dim ratio:nn {#1}{\l_tmpa dim}) }
122
123
        \fp_set:Nn \l_tmpb_fp
124
125
             \fp_eval:n { min(1, \dim ratio:nn {#2}{\l tmpb_dim}) }
126
127
        \box scale: Nnn \l tmpa box {\l tmpa fp}{\l tmpb fp}
128
        \__ztool_leave_vmode:
129
        \box_use:N \l tmpa_box
130
131
    \cs_generate_variant:Nn \ztool_scale_to_wd:nn
132
      { e, ne, ee }
133
    \cs generate variant:Nn \ztool scale to ht:nn
134
135
136 \cs generate variant: Nn \ztool scale to wd and ht:nnn
      { nne, nno, eee }
137
138
139
140 %% box content align
141 \seq_new:N \l__ztool_boxitem_seq
142 \cs_set_protected:Npn \ztool_box_item_align:Nnnn #1#2#3#4
```

```
143
      {% #1:cmd, #2:width, #3:object, #4:align format(left, right, scatter, center)
144
        \hb@xt@#2{
          \tl_map_inline:nn {#3}
145
146
147
              \seq_put_right:No \l__ztool_boxitem_seq
                { \exp_not:N #1{##1} }
148
            }
149
          \str_case:nnF { #4 }
150
            {
151
                 152
              { right }{ \hfill\seq_use: Nn \l_ztool_boxitem_seq {} }
153
              { scatter}{ \seq_use:Nn \l__ztool_boxitem_seq {\\lambdafill}} }
154
              { center }{ \hfill\seq_use:\n\l_ztool_boxitem_seq {}\hfill }
155
              { tower }
156
                {
157
                  \\\delta eq@count{\seq count:N \l_ztool_boxitem_seq}
158
                  \seq_map_indexed_inline: Nn \l__ztool_boxitem_seq
159
                    {% ##1: index, ##2: content
160
                      %% Method II: plain
161
                      \\\def\\item@width{\dim_eval:n \{\pmu2/(\seq@count+1)\}\}
162
                      \hskip\item@width\clap{##2}
163
                    }\hskip\item@width\hss
164
                }
165
              { custom }
166
167
                {
                  \def\total@width{#2}
168
                  \def\align@cmd{#1}
169
                  \def\align@object{#3}
170
                  \def\align@format{#4}
171
                  \tl use:N \l ztex boxitem align custom tl
172
                }
173
            }{\relax}
174
        }
175
176
        \seq clear: N \l ztool boxitem seq
      }
177
    \cs generate variant:Nn \ztool box item align:Nnnn
178
      { c, Nnno, cnno, Nne, Nnee }
179
180
181
182 %% affine transformation
183 % REF:
184 % 1. https://math.stackexchange.com/a/3521141/1235323
185 % 2. https://math.stackexchange.com/a/281087/1235323
186 \cs_new:Npn \ztool_fp_to_rad:n #1
      { \fp_eval:n {#1/pi*180} }
187
   \cs_new:Npn \ztool_matrix_det:nnnn #1#2#3#4
188
189
        \fp_eval:n { #1*#4 - #2*#3 }
```

```
191
192 % (translation) + x-scale + y-scale + rotate
193 \fp_new:N \g_affine_precision_fp
194 \fp_set:Nn \g_affine_precision_fp {0.0001}
195 \fp_new:N \l__affine_@@_a_fp
196 \fp_new:N \l__affine_@@_b_fp
197 \fp_new:N \l__affine_@@_c_fp
198 \fp new:N \l affine @@ d fp
199 \msg set:nnn { ztool }{affine-det-zero}
200
      {
        current~determination~of~the~affine~transformation~
201
202
        matrix~equals~to~zero,~give~up~this~transformation
203
204
205 \coffin_new:N \l__affine_trans_coffin
    \cs generate_variant:Nn \coffin_typeset:Nnnnn { Nxxxx }
    \cs_new:Npn \ztool_affine_transformation:Nnnnn #1#2#3#4#5
207
      {\% \#1:box; \#2:\$a \{11\}\$; \#3:\$a \{21\}\$; \#4:\$a \{12\}\$; \#5:\$a \{22\}\$.
208
        \fp compare:nNnT
209
          { abs(\ztool_matrix_det:nnnn {#2}{#3}{#4}{#5}) }
210
             < { \g_affine_precision_fp }
211
          { \prg map break: Nn \l affine matrix det zero
212
             { \msg_warning:nn { ztool }{affine-det-zero} }}
213
        \fp set:Nn \l affine @@ a fp {#2}
214
215
        \fp_set:\n \l__affine_@@_b_fp {#3}
        \fp set:Nn \l affine @@ c fp {#4}
216
        \fp_set:Nn \l__affine_@@_d_fp {#5}
217
        \__box_affine_transform:N #1
218
        \prg_break_point:Nn \l__affine_matrix_det_zero { }
219
        \coffin typeset:Nxxxx \l affine trans coffin
220
          { \l_ztool_affine_pole_a_tl }
221
          { \l_ztool affine pole b tl }
222
          { \l_ztool_affine_xoffset_dim }
223
          { \l ztool affine yoffset dim }
224
225
    \cs generate variant: Nn \ztool affine transformation: Nnnnn
226
      { Neeee, cnnnn, ceeee }
227
    \cs new:Npn \ box affine transform:N #1
228
229
      {
        % transform debug
230
        \bool_if:NT \g_ztool_affine_debug_bool
231
232
233
             \noindent\dotfill\[\begin{bmatrix}
               \fp use:N \l affine @@ a fp & \fp use:N \l affine @@ c fp\\
234
235
               \fp_use:N \l_affine_@@_b_fp & \fp_use:N \l_affine_@@_d_fp
             \end{bmatrix}\]
236
237
238
        % get affine parameters
```

```
240
         \_affine_trans_get_theta:
                                                                                                         240
        \_affine_trans_get_sy:
241
                                                                                                         241
         \ affine trans get Sx:
242
                                                                                                         242
243
        \_affine_trans_get_Sy:
                                                                                                         243
         \ affine trans get phi:
244
                                                                                                         244
245
        \_affine_trans_get_omega:
                                                                                                         245
        % start transform box/coffin
246
                                                                                                         246
         \coffin scale:Nnn #1
247
                                                                                                         247
          { \l_box_affine_sx_fp }
248
                                                                                                         248
           { \l_box_affine_sy_fp }
249
                                                                                                         249
         \coffin rotate:Nn #1
250
                                                                                                         250
           { \ztool_fp_to_rad:n {\l__box_affine_omega_fp} }
251
                                                                                                         251
         \coffin scale:Nnn #1
252
                                                                                                         252
          { \l_box_affine_Sx_fp }
253
                                                                                                         253
           { \l_box_affine Sy_fp }
254
                                                                                                         254
         \coffin_rotate:Nn #1
255
                                                                                                         255
           { \ztool_fp_to_rad:n {\l__box_affine_phi_fp} }
256
                                                                                                         256
         \coffin rotate:Nn #1
257
                                                                                                         257
           { \ztool_fp_to_rad:n {\l__box_affine_theta_fp} }
258
                                                                                                         258
259
                                                                                                         259
    \keys_define:nn { ztool / affine }
260
                                                                                                         260
261
                                                                                                         261
                 .bool gset: N = \g ztool affine debug bool,
262
         debug
263
         debug
                 .initial:n
                              = false,
         debug
                 .default:n
                                                                                                         264
264
                              = true,
265
        pole-1 .tl set:N
                              = \l ztool affine pole a tl,
                                                                                                         265
266
        pole-2 .tl_set:N
                              = \l_ztool_affine_pole_b_tl,
                                                                                                         266
                              = \{ 1 \},
        pole-1 .initial:n
267
                                                                                                         267
        pole-2 .initial:n
                              = \{ b \},
268
                                                                                                         268
        xoffset .dim_set:N
                              = \l_ztool_affine_xoffset_dim,
269
                                                                                                         269
        yoffset .dim_set:N
                              = \l ztool affine yoffset dim,
270
                                                                                                         270
                              = { Opt },
         xoffset .initial:n
271
                                                                                                         271
         yoffset .initial:n
                              = { Opt },
272
                                                                                                         272
273
                                                                                                         273
    \NewDocumentCommand{\ztoolboxaffine}{O{}m>{\SplitList{,}}m}
274
                                                                                                         274
       {% #1:key-value; #2:content; #3:matrix.
275
                                                                                                         275
         \group_begin:
276
                                                                                                         276
277
           \keys_set:nn { ztool / affine } {#1}
                                                                                                         277
           \hcoffin set:Nn \l affine trans coffin {#2}
278
                                                                                                         278
           \ztool_affine_transformation: Nnnnn \l_affine_trans_coffin #3
279
                                                                                                         279
280
         \group end:
                                                                                                         280
281
       }
                                                                                                         281
282 % internal affine transform functions
                                                                                                         282
283
    \cs_new:Nn \__ztool_affine_debug_fp:N
                                                                                                         283
284
                                                                                                         284
285
         \bool_if:NTF \g_ztool_affine_debug_bool
                                                                                                         285
```

{ \string #1 % \show #1

__affine_trans_get_sx:

```
~=~\fp_use:N #1\\
287
288
          { \cdot } { \cdot }
289
290 \fp new:N \l box affine sx fp
    \cs_new:Nn \__affine_trans_get_sx:
292
293
        \fp_set:Nn \l__box_affine_sx_fp
          { \fp eval:n \{sqrt(\lambda affine @@ a fp^2 + \lambda affine @@ b fp^2)\} }
294
        \__ztool_affine_debug_fp:N \l__box_affine_sx_fp
295
      }
296
    \fp_new:N \l__box_affine_theta_fp
297
    \cs_new:Nn \__affine_trans_get_theta:
298
299
        \fp set:Nn \l box affine theta fp
300
          { \fp_eval:n {atan(\l_affine_00_b_fp/\l_affine_00_a_fp)} }
301
302
        \__ztool_affine_debug_fp:N \l__box_affine_theta_fp
303
304 \fp_new:N \l__box_affine_msy_fp
    \cs_new:Nn \__affine_trans_get_msy:
306
307
        \fp_set:Nn \l__box_affine_msy_fp
308
          { \fp_eval:n {
309
             \l_affine_@@_c_fp*cos(\l_box_affine_theta_fp)
310
311
             \l_affine_00_d_fp*sin(\l_box_affine_theta_fp)
312
313
         \__ztool_affine_debug_fp:N \l__box_affine_msy_fp
314
315 \fp_new:N \l__box_affine_sy_fp
    \cs_new:Nn \__affine_trans_get_sy:
317
318
        \ affine trans get msy:
        \bool_if:nTF
319
320
321
             \fp_compare_p:nNn { abs(sin(\l_box_affine_theta_fp)) }
               < {\c_zero_fp + \g_affine_precision_fp}
322
          }{
323
             \fp_set:Nn \l__box_affine_sy_fp
324
325
                 ( \l affine @@ d fp - \l box affine msy fp*sin(\l box affine theta fp) )
326
327
                 / cos(\l_box_affine_theta_fp)
328
329
          }{
             \fp set:Nn \l box affine sy fp
330
331
                 (\l_box_affine_msy_fp*cos(\l_box_affine_theta_fp) - \l_affine_@@_c_fp)
332
                 / sin(\l_box_affine_theta_fp)
333
334
```

```
335
336
        \__ztool_affine_debug_fp:N \l__box_affine_sy_fp
337
338 \fp new:N \l box affine m fp
    \cs_new:Nn \__affine_trans_get_m:
340
341
        \fp_set:Nn \l__box_affine_m_fp
          { \l box affine msy fp / \l box affine sy fp }
342
        \_ztool_affine_debug_fp:N \l__box_affine_m_fp
343
      }
344
345 \fp_new:N \l__box_affine_Sx_fp
346 \fp_new:N \l__box_affine_Sy_fp
347 \cs_new:\n\__affine_trans_get_Sx:
348
349
        \__affine_trans_get_m:
        \fp set:Nn \l box affine Sx fp
350
          { sqrt(\l_box_affine_m_fp^2/4 + 1) - \l_box_affine_m_fp/2 }
351
352
        \__ztool_affine_debug_fp:N \l__box_affine_Sx_fp
      }
353
354
    \cs_new:Nn \__affine_trans_get_Sy:
355
        \fp set:Nn \l box affine Sy fp
356
          { sqrt(\l_box_affine_m_fp^2/4 + 1) + \l_box_affine_m_fp/2 }
357
        \__ztool_affine_debug_fp:N \l__box_affine_Sy_fp
358
      }
359
360 \fp_new:N \l__box_affine_phi_fp
361 \fp_new:N \l__box_affine_omega_fp
362 \cs_new:Nn \__affine_trans_get_phi:
      {
363
        \fp set:Nn \l box affine phi fp
364
          { -pi/4 - 1/2*atan(\l_box_affine_m_fp/2) }
365
        \ ztool affine debug fp:N \l box affine phi fp
366
367
368
    \cs new:Nn \ affine trans get omega:
369
        \fp set:Nn \l box affine omega fp
370
          { pi/4 - 1/2*atan(\l box affine m fp/2) }
371
372
        \__ztool_affine_debug_fp:N \l__box_affine_omega_fp
      }
373
```

8.5 zdraw

```
\ProvidesExplFile{ztool.library.zdraw.tex}
                                                                                                         1
      {2025/09/06}{1.0.1}
 2
                                                                                                         2
      {zdraw~library~for~ztool}
 3
                                                                                                         3
 4
                                                                                                         4
 5
                                                                                                         5
 6 % ==> ztool draw (based on package 'pict2e' and 'picture' env)
                                                                                                         6
   \RequirePackage{pict2e}
                                                                                                         7
   \cs_new:Npn \_@@_begin_picture:nnnn #1#2#3#4
8
                                                                                                         8
      { \begin{picture}
 9
                                                                                                         9
10
          (\fp_eval:n {#1}, \fp_eval:n {#2})
                                                                                                         10
          (\fp_eval:n {-#3}, \fp_eval:n {-#4}) }
11
                                                                                                         11
   \cs new:Nn \ @@ end picture:
12
                                                                                                         12
      { \end{picture} }
13
                                                                                                         13
   \cs_new:Npn \__@@_pic_put:nnn #1#2#3
14
                                                                                                         14
      { \put(\fp_eval:n {#1}, \fp_eval:n {#2}){ #3 } }
15
                                                                                                         15
   \cs_generate_variant:Nn \_@@_begin_picture:nnnn
16
                                                                                                         16
      { VVVV, eeee }
17
                                                                                                         17
18
   \cs_generate_variant:Nn \__@@_pic_put:nnn
                                                                                                         18
      { VVV, een }
19
                                                                                                         19
20
   % picture environment alias
                                                                                                         21
   \keys_define:nn { ztool / draw / picture }
22
23
                .dim_set:N = \l__pic_unit_dim,
24
       unit
                .initial:n = \{ 1cm \},
25
       unit
                .fp_set:N = \l__pic_width_fp,
       width
                                                                                                         26
26
27
       width
               .initial:n = 0,
                                                                                                         27
       height .fp_set:N = \l__pic_height_fp,
28
                                                                                                         28
       height .initial:n = 0,
29
                                                                                                         29
       xoffset .fp set:N = \l pic xoffset fp,
30
                                                                                                         30
       xoffset .initial:n = 0,
31
                                                                                                         31
       yoffset .fp_set:N = \l__pic_yoffset_fp,
32
                                                                                                         32
33
       yoffset .initial:n = 0,
                                                                                                         33
34
       opacity-color .tl_set:N = \l__pic_opacity_color_tl,
                                                                                                         34
       opacity-color .initial:n = { white },
35
                                                                                                         35
36
      }
                                                                                                         36
37
   \NewDocumentEnvironment{zpic}{0{}}
                                                                                                         37
38
                                                                                                         38
       \group_begin:
39
                                                                                                         39
40
       \keys_set:nn { ztool / draw / picture } {#1}
                                                                                                         40
       \setlength\unitlength{ \l_pic_unit_dim }
41
                                                                                                         41
       \ @@ begin picture: VVVV
42
                                                                                                         42
43
         \l__pic_width_fp \l__pic_height_fp
                                                                                                         43
          \l__pic_xoffset_fp\l__pic_yoffset_fp
44
                                                                                                         44
     }{
45
                                                                                                         45
       \ @@ end picture:
                                                                                                         46
46
```

```
47
        \group_end:
48
49
50
51
   % picture commands alias
   \cs new:Npn \ coor st:n #1
52
53
     { \clist_item:nn {#1}{1} }
   \cs new:Npn \ coor nd:n #1
54
     { \clist item:nn {#1}{2} }
55
   \cs_new:Npn \__coor_rd:n #1#2
56
     { \clist_item:nn {#1}{3} }
57
   \cs_new:Npn \__coor_st_nd:n #1
58
59
       {\clist_item:nn {#1}{1}}
60
        { \clist_item:nn {#1}{2}}
61
     }
62
63
   \cs_new:Npn \__coor_st_nd_rd:n #1
64
       {\clist item:nn {#1}{1}}
65
       {\clist_item:nn {#1}{2}}
66
        {\clist_item:nn {#1}{3}}
67
     }
68
   \cs_generate_variant:Nn \__coor_st:n { V, e }
   \cs_generate_variant:Nn \__coor_nd:n { V, e }
   \cs_generate_variant:Nn \__coor_rd:n { V, e }
   \cs_generate_variant:Nn \__coor_st_nd:n { V, e }
   \cs_generate_variant:Nn \__coor_st_nd_rd:n { V, e }
73
74
   \bool_new:N \l__ztool_invalid_color_bool
75
   \cs new:Npn \ color safe use:n #1
77
     {
78
        \__color_if_valid:nT {#1}
          { \color{#1} }
79
80
   \prg_new_conditional:Npnn \__color_if_valid:n #1 {p, T, F, TF}
81
82
       \def\ztool@targer@color{#1}
83
       \def\ztool@color@none{none}
84
       \bool_if:eTF
85
86
            \tl_if_empty_p:e {#1} ||
87
            \tl if eq p:NN \ztool@color@none \ztool@targer@color
88
89
          }{ \prg_return_false: }
          { \prg_return_true: }
90
91
     }
   \prg_generate_conditional_variant:\nn \__color_if_valid:n
92
     { V, e }{ p, T, F, TF }
93
   \cs_generate_variant:Nn \__color_safe_use:n
```

```
96
                                                                                                           96
                                                                                                           97
97
98 % --> line/vector
                                                                                                           98
99 \fp_new:N \l__draw_vector_slope_fp
                                                                                                           99
100 \fp_new:N \l__draw_vector_normal_fp
                                                                                                           100
101 \fp_new:N \l__draw_vector_xysep_fp
                                                                                                           101
102 \cs new:Npn \ @@ pic line:nnn #1#2#3
                                                                                                           102
       {% #1:x; #2:y; #3:x-distance NOT the length
103
                                                                                                           103
         \left( \frac{\#1}{n} \right), \left( \#2 \right)
104
                                                                                                           104
           { \fp eval:n {#3} }
105
                                                                                                           105
106
                                                                                                           106
107 \cs_new:Npn \__@@_pic_vector:nnn #1#2#3
                                                                                                           107
       {\% #1:x; #2:y; #3:x-distance NOT the length}
108
                                                                                                           108
         \vector(\fp_eval:n {#1}, \fp_eval:n {#2})
109
                                                                                                           109
          { \fp_eval:n {#3} }
110
                                                                                                           110
111
                                                                                                           111
    \keys_define:nn { ztool / draw / picture / line }
112
                                                                                                           112
113
                                                                                                           113
         draw
                .tl_set:N = \l__pic_line_draw_color_tl,
114
                                                                                                           114
                .initial:n = { black },
        draw
115
                                                                                                           115
                           = { draw = #1 }, % alias for 'draw'
        % color .meta:n
116
                                                                                                           116
                .dim_set:N = \l__pic_line_width_dim,
117
                                                                                                           117
        width .initial:n = { .4pt },
118
119
         dash
                .bool_set:N = \l__pic_line_dash_bool,
                .initial:n = { false },
         dash
120
121
                                                                                                           121
    \cs_new_protected:\Nn \__pic_set_line_width:
122
                                                                                                           122
       {
123
                                                                                                           123
         \linethickness{ \l_pic_line_width_dim }
124
                                                                                                           124
125
                                                                                                           125
126 \cs_new_protected: Nn \__pic_set_line_color:
                                                                                                           126
       {
127
                                                                                                           127
         \__color_safe_use:V \l__pic_line_draw_color_tl
128
                                                                                                           128
129
                                                                                                           129
    \cs_new_protected:\Nn \__pic_set_fill_color:
130
                                                                                                           130
131
         \__color_safe_use:V \l__pic_region_fill_color_tl
132
                                                                                                           132
      }
133
                                                                                                           133
    \def\z@pic@vector@style{\ltxarrows}
134
                                                                                                           134
    \keys_define:nn { ztool / draw / picture }
135
                                                                                                           135
136
                                                                                                           136
137
         vector .inherit:n = { ztool/draw/picture/line },
                                                                                                           137
      }
138
                                                                                                           138
139
    \keys_define:nn { ztool / draw / picture / vector }
                                                                                                           139
       {
140
                                                                                                           140
         >
141
                      .choice:,
                                                                                                           141
```

.code:n = {\\def\\z@pic@vector@style{\ltxarrows}},

{ V, e }

> / latex

```
144
        > / unknown .code:n =
145
            \msg_set:nnn { ztool }{unknown-arrow-style}
146
147
              { Unknown~arrow~style,~use~'latex'~or~'pst'. }
            \msg_error:nn { ztool }{unknown-arrow-style}
148
          }
149
      }
150
    \tl new:N \l draw line type % 'horizontal', 'vertical', 'normal'
151
    \cs_new_protected:Npn \ztool_pic_line_vector:nnnn #1#2#3#4
152
      {% #1:line/vector; #2:key-value; #3:start coor; #4:end coor;
153
154
        \group_begin:
        \keys_set:nn { ztool / draw / picture / #1 }{#2}
155
        \tl set:Nn \l draw line type { normal }
156
        157
158
            \fp_set:Nn \l__draw_vector_slope_fp
159
              { (\__coor_nd:n {#4} - \__coor_nd:n {#3})
160
              / (\_coor_st:n {#4} - \_coor_st:n {#3}) }
161
            \fp_set:Nn \l__draw_vector_xysep_fp
162
              { abs(\__coor_st:n {#4} - \__coor_st:n {#3}) }
163
          }{
164
            % NOTE: we do NOT set slope infinte, just set it to '0'
165
            \fp_set:Nn \l__draw_vector_slope_fp {0}
166
167
            \fp_set:Nn \l__draw_vector_xysep_fp
              { abs(\_coor_nd:n {#4} - \_coor_nd:n {#3}) }
168
            \tl_set:Nn \l__draw_line_type { vertical }
169
170
        fp_compare:nNnT { abs(\_coor_nd:n {#4} - \_coor_nd:n {#3}) } < {0.001}
171
          { \tl_set:Nn \l__draw_line_type { horizontal } }
172
        \z@pic@vector@style
173
        \ pic set line width:
174
        \exp_last_unbraced:Ne \__00_pic_put:nnn {\__coor_st_nd:n {#3}}
175
176
177
            \__pic_set_line_color:
            \str_case:VnF \l__draw_line_type
178
179
                {vertical}{
180
                  \cs:w __@@_pic_#1:nnn\cs_end:
181
                    { \l_draw_vector_slope_fp }
182
                    { 1 }
183
                    { \l_draw_vector_xysep_fp }
184
185
                {horizontal}{
186
                  \cs:w __@@_pic_#1:nnn\cs_end:
187
                    { 1 }
188
                    { \l_draw_vector_slope_fp }
189
190
                    { \l__draw_vector_xysep_fp
```

.code:n = {\def\z@pic@vector@style{\pstarrows}},

> / pst

```
191
192
                 {normal}{
                   \cs:w __@@_pic_#1:nnn\cs_end: {1}
193
                     { \l_draw_vector_slope_fp }
194
195
                     { \l_draw_vector_xysep_fp
196
             { \ensuremath{ \ \ \ \ \ \ \ \ }}
197
198
         \group end:
199
       }
200
    \cs_generate_variant:Nn \ztool_pic_line_vector:nnnn {neee, nooo}
201
    \NewDocumentCommand{\zline}{O{}d()d()}
202
203
         \ztool_pic_line_vector:neee {line}{#1}{#2}{#3}
204
205
       }
    \NewDocumentCommand{\zvector}{O{}d()d()}
207
         \ztool_pic_line_vector:neee {vector}{#1}{#2}{#3}
208
      }
209
210
211
212 % --> \zdraw -- similar to \tikz command in tikz
213 % NOTE: these line/vector commands are identical to
214 \% 1. \Line (x_1, y_1)(x_2, y_2),
                                                \ensuremath{\text{Vector}}\ (x_1,y_1)(x_2,y_2)
215 % 2. \polyline(x_1, y_1) ... (x_n, y_n), \polyvector(x_1, y_1) ... (x_n, y_n)
216 % 3. \polygon (x_1, y_1) ... (x_n, y_n), when set 'cycle',
217 %
           \polygon*(x_1, y_1) \dots (x_n, y_n), when set 'fill' (auto cycle).
218 % 4. Trim leading space after '\polygon' or '*' to avoid error !!
219 \cs_new:Npn \__@0_pic_Line:nnnn #1#2#3#4
      { \Line (#1, #2)(#3, #4) }
220
    \cs_new:Npn \__@@_pic_Vector:nnnn #1#2#3#4
221
      { \Vector (#1, #2)(#3, #4) }
222
    \cs_new:Npn \__@@_pic_polyline:n #1
223
224
225
        \tl_set:Ne \l_tmpa_tl {\tl_trim_spaces:e {#1}}
         \exp last unbraced: NV \polyline \l tmpa tl
226
227
    \cs_new:Npn \__@@_pic_polyvector:n #1
228
229
       {
        \tl set:Ne \l tmpa tl {\tl trim spaces:e {#1}}
230
         \exp_last_unbraced:NV \polyvector \l_tmpa_tl
231
232
233
    \cs_new:Npn \__@@_pic_polygon:nn #1#2
      {
234
235
         \tl_set:Ne \l_tmpa_tl {\tl_trim_spaces:e {#1}}
         \tl_set:Ne \l_tmpb_tl {\tl_trim_spaces:e {#2}}
236
237
         \tl_set:Ne \l_tmpa_tl { \l_tmpa_tl\l_tmpb_tl }
238
         \exp_last_unbraced:NV \polygon \l_tmpa_tl
```

}

```
239
       }
240 \cs_generate_variant:Nn \__@@_pic_polygon:nn { nV, ne }
    \tl_new:N \l__pic_region_fill_color_tl
241
242 \bool new:N \l pic region fill bool
    \keys_define:nn { ztool / draw / picture / region }
243
244
245
        fill
                .choices:nn = { true, false }{
           \use:c { bool_set_ \l keys_choice_tl :N }
246
             \l pic region fill bool
247
        },
248
        fill
                            = { false },
249
                .initial:n
                             = { true
250
        fill
                .default:n
        fill / unknown .code:n = {
251
           \tl if empty:eF \l keys value tl
252
             { \bool_set_true:N \l__pic_region_fill_bool }
253
          \tl set:Ne \l pic region fill color tl { \l keys value tl }
254
255
        },
256
       }
    \keys define:nn { ztool / draw / picture }
257
258
        zdraw
                 .inherit:n
259
           ztool/draw/picture/line,
260
          ztool/draw/picture/vector,
261
          ztool/draw/picture/region,
262
263
        },
       }
264
    \keys define:nn { ztool / draw / picture / zdraw }
265
266
                .bool_set:N = \l__pic_draw_vector_bool,
267
        vector
                .initial:n = { false },
268
        vector
                .bool_set:N = \l__pic_draw_cycle_bool,
269
        cycle
                 .initial:n = { false },
270
        cycle
                 .tl_set:N = \l__pic_draw_shift_tl,
271
        shift
                 .initial:n = \{0, 0\},
272
        shift
      }
273
    \cs_new:Npn \__region_fill_color_miss:n #1
274
275
        \bool_if:eT {
276
           \l__pic_region_fill_bool &&
277
          \tl if empty p:N \l pic region fill color tl
278
        }{ \tl_set:Nn \l__pic_region_fill_color_tl {#1} }
279
280
281
    \cs_new_protected:Npn \ztool_pic_draw:nw #1#2;
       {% #1:key-value; #2:coors list (use ';' to end scan just like tikz)
282
283
        \group_begin:
        \keys_set:nn { ztool / draw / picture / zdraw }{#1}
284
        \_region_fill_color_miss:n { gray }
285
        \edef\coors@first
286
```

```
287
288
            \exp_last_unbraced:Ne
              \__coors_list_first:w {\tl_trim_spaces:e {#2}}
289
290
              \scan_stop:
291
        \edef\draw@flag
292
293
            \tl_map_function:nN {
294
              \l_pic_draw_vector_bool
295
              \l__pic_draw_cycle_bool
296
              \l__pic_region_fill_bool
297
           } \int_eval:n
298
299
        \ @@ pic put:nnn
300
          { \__coor_st:V \coors@first + \__coor_st:V \l__pic_draw_shift_tl }
301
          { \__coor_nd:V \coors@first + \__coor_nd:V \l__pic_draw_shift_tl }
302
303
            \__pic_set_line_width:
304
            \ pic set line color:
305
            \exp_after:wN \int_case:nnF \exp_after:wN {
306
307
               \exp_after:wN \int_from_bin:n \exp_after:wN
                  { \draw@flag }
308
             }{
309
               {#2} }
310
311
               {2}{ \__@@_pic_polygon:ne { }{#2} }
312
313
               {3}{ \__@@_pic_polygon:nn {*}{#2} }
               314
               {5}{
315
316
                 \__pic_set_fill_color:
                 \__@@_pic_polygon:nn {*}{#2}
317
                 \ pic set line color:
318
                  \exp_args:Ne \__@@_pic_polyvector:n {#2(\coors@first)}
319
320
               {6}{ \exp_args:Ne \__00_pic_polyvector:n {#2(\coors0first)} }
321
               {7}{
322
323
                 \__pic_set_fill_color:
                 \__@@_pic_polygon:nn {*}{#2}
324
325
                 \__pic_set_line_color:
                 \exp args:Ne \ @@ pic polyvector:n {#2(\coors@first)}
326
327
              }{\relax}
328
329
        \group_end:
330
331
332 \cs_new:Npn \__coors_list_first:w (#1)#2\scan_stop:
      { #1 }
333
334
   \NewDocumentCommand{\zdraw}{0{}}
```

```
335
       { \ztool_pic_draw:nw {#1} }
336
337
338 % --> arc / circle
339 \cs_new:Npn \__@@_pic_arc:nnnn #1#2#3#4
      {\mathcal{#} #1:fill bool; #2:start angle; #3:end angle; #4:radius
340
341
        \arc #1[\fp_eval:n {#2}, \fp_eval:n {#3}]
          { \fp_eval:n {#4} }
342
      }
343
344 \cs_new:Npn \__@@_pic_circel:nn #1#2
      {% #1:fill bool; #2:radius
345
        \ 00 pic arc:nnnn {#1}{0}{360}{#2}
346
347
348
349
350 % --> circle
    \keys_define:nn { ztool / draw / picture }
351
352
                                 {
353
        arc
               .inherit:n
          ztool/draw/picture/line,
354
          ztool/draw/picture/region,
355
        },
356
      }
357
    \keys_define:nn { ztool / draw / picture / arc }
358
359
      {
                           = \l pic arc radius fp,
         radius .fp_set:N
360
361
        radius .initial:n = .5,
362
        start
               .fp_set:N
                           = \l__pic_arc_start_fp,
363
               .initial:n = 0,
         start
364
         end
                .fp_set:N
                           = \l__pic_arc_end_fp,
                .initial:n = 90,
365
         end
366
    \prg_generate_conditional_variant:Nnn
367
       \bool_if:n { e } { p, T, F, TF }
368
369 \cs_new_protected:Npn \ztool_pic_arc:nn #1#2
      {% #1:key-value; #2:coor
370
         \group begin:
371
         \keys_set:nn { ztool / draw / picture / arc }{#1}
372
         \_region_fill_color_miss:n { gray }
373
         \ color if valid: VF \l pic region fill color tl
374
           { \bool_set_false:N \l__pic_region_fill_bool }
375
         \exp_last_unbraced:Ne \__@@_pic_put:nnn
376
377
          { \__coor_st_nd:n {#2} }
          {
378
379
             \__pic_set_line_width:
380
             \bool_if:eT \l__pic_region_fill_bool
381
382
                 \__pic_set_fill_color:
```

```
\exp_args:Ne \__@@_pic_arc:nnnn {*}
383
384
                   { \fp_use:N \l__pic_arc_start_fp }
                   { \fp_use:N \l__pic_arc_end_fp
385
                   { \fp use:N \l pic arc radius fp }
386
387
             % NOTE: border must over the fill
388
             \__pic_set_line_color:
389
             \exp args:Ne \ @@ pic arc:nnnn {}
390
               { \fp_use:N \l__pic_arc_start_fp
391
               { \fp_use:N \l__pic_arc_end_fp
392
               { \fp_use:N \l__pic_arc_radius_fp }
393
394
         \group_end:
395
396
    \NewDocumentCommand{\zarc}{O{}d()}
397
      {% #1:key-value; #2:coor
398
399
         \ztool_pic_arc:nn {#1}{#2}
400
      }
    \NewDocumentCommand{\zcircle}{O{}d()}
401
402
403
         \ztool_pic_arc:nn {start=0, end=360, #1}{#2}
      }
404
405
406
407 % --> oval / rectangle
408 % \oval[arc](full-x-width, full-y-width)[part]
409 % part: (1, r) x (t, b)
410 \cs_new:Npn \__@@_pic_oval:nnnn #1#2#3#4
      {% #1:arc; #2:part; #3:x-width; #4:y-width;
411
         \oval
412
           [\fp_eval:n {#1}]
413
           (\fp_eval:n {#3}, \fp_eval:n {#4})
414
           [ #2 ]
415
       }
416
    \keys_define:nn { ztool / draw / picture }
417
      {
418
        rectangle
                     .inherit:n =
419
          ztool/draw/picture/line,
420
          ztool/draw/picture/region,
421
        },
422
423
    \keys_define:nn { ztool / draw / picture / rectangle }
424
425
      {
                             = \l__pic_rec_arc_fp,
426
         arc
                 .fp_set:N
427
         arc
                 .initial:n = 0,
428
429 \int_new:N \l__pic_rec_quadrant_index_int
    \cs_new_protected:Npn \ztool_pic_rectangle:nnn #1#2#3
```

```
431
                        {% #1:key-value; #2:start coor; #3:end coor;
432
                               \group_begin:
                               \keys_set:nn { ztool / draw / picture / rectangle }{ fill=false }
433
                               \keys_set:nn { ztool / draw / picture / rectangle }{ #1 }
434
                               \edef\rec@arc { \fp_use:N \l__pic_rec_arc_fp
435
                               \underline{\det} \rec@width { \fp_eval:n {\__coor_st:n {#3} - \__coor_st:n {#2}} }
436
                               \ensuremath{\ensuremath{\text{dedef}}} \operatorname{\ensuremath{\text{coor}}} = \ensuremath{\ensuremath{\text{dedef}}} - \ensuremath{\ensuremath{\text{coor}}} = \ensuremath{\ensuremath{\text{dedef}}} > \ensuremath{\ensuremath
437
                               \_region_fill_color_miss:n { gray }
438
                               \__color_if_valid:VF \l__pic_region_fill_color_tl
439
440
                                             \bool_set_false:N \l__pic_region_fill_bool
441
                                             \prg_map_break:Nn \l__ztool_pic_rec_fill {}
442
443
                               %% begin fill rounded rectangle
444
                               \c 00_{pic_put:nnn} {\c coor_st:n {#2}}{\c coor_nd:n {#2}}
445
446
447
                                             \__pic_set_fill_color:
                                            \rule
448
                                                    {\fp eval:n {\rec@width *\dim to decimal:n {\l pic unit dim}}pt}
449
                                                    {\fp_eval:n {\rec@height*\dim_to_decimal:n {\l__pic_unit_dim}}pt}
450
451
                               \int set:Nn \l pic rec quadrant index int { 0 }
452
453
                               \tl map inline:nn
                                     {
454
455
                                             {\_coor_st:n {#2}+\rec@width-\rec@arc, \_coor_nd:n {#2}+\rec@height-\rec@arc}
                                            {\coor st:n {#2}+\coorsc}
                                                                                                                                                                                          \_coor_nd:n {#2}+\rec@height-\rec@arc}
456
457
                                            \{\ \cos st:n \ \{\#2\}+\ coorst:n \ \{\#2\},\ coorst:n 
                                                                                                                                                                                           \ coor nd:n {#2}+\rec@arc}
                                            {\__coor_st:n {#2}+\rec@arc, \__coor_nd:n {#2}+\rec@arc}
458
                                     }{
459
460
                                             \int_incr:N \l__pic_rec_quadrant_index_int
                                             \\\delta def \qu@drant@index{\int_use:N \l__pic_rec_quadrant_index_int}
 461
                                             \exp last unbraced:Ne \ @@ pic put:nnn
462
                                                    { \__coor_st_nd:n {##1} }
463
464
465
                                                           \__color_safe_use:V \l__pic_opacity_color_tl
                                                           \__00_pic_arc:nnnn {*}
466
                                                                  { (\qu@drant@index-1)*90 }
467
                                                                  { \qu@drant@index*90
468
                                                                   { sqrt(2)*\rec@arc
                                                                                                                                                          }
469
                                                           \ pic set fill color:
470
                                                           \__@@_pic_arc:nnnn {*}{0}{360}{\rec@arc}
471
472
473
                              %% end fill rounded rectangle
474
475
                               \prg_break_point:Nn \l__ztool_pic_rec_fill { }
                               \__@@_pic_put:nnn
476
                                     \{ \_ coor_st:n \ \{\#2\}+\rec@width/2 \}
477
                                      { \__coor_nd:n {#2}+\rec@height/2 }
478
```

```
\__pic_set_line_color:
480
             \__pic_set_line_width:
481
             \ @@ pic oval:nnnn
482
               { \rec@arc }{ }
483
               { \rec@width }
484
               { \rec@height }
485
486
        \group_end:
487
      }
488
    \NewDocumentCommand{\zrectangle}{O{}d()d()}
489
490
        \ztool_pic_rectangle:nnn { #1 }{#2}{#3}
491
492
493
494
495 % ==> absolute page coordinate (left, bottom) = (0, 0)
    \NewDocumentCommand{\zpin}{O{background}m}
496
497
        \hook_gput_next_code:nn {shipout/#1}
498
499
             \put(0pt, -\paperheight)
500
               { \makebox(0, 0)[b1]{#2} }
501
          }
502
      }
503
```

9 索引

斜体数字表示对应条目被解释说明的页面, 带下划线的数字指向该条目的定义, 其余数字表示该条目的使用位置.

Symbols	ztool//line/width 19
-shell-escape $3, 5-7$	ztool//vector/> 20
В	ztool//zarc/end
\begin	ztool//zarc/fill
bool commands:	ztool//zarc/radius
\c_false_bool	ztool//zarc/start
\c_true_bool	ztool//zdraw/cycle
(0_0100_0001	ztool//zdraw/fill 20
\mathbf{C}	ztool//zdraw/shift
cctab commands:	ztool//zdraw/vector
\c_document_cctab	ztool//zrectangle/arc 21
coffin commands:	ztool//zrectangle/fill
\coffin_rotate:Nn 16	ztool/draw/picture/height
\coffin_scale:Nnn 16	ztool/draw/picture/opacity-color 19
E	ztool/draw/picture/unit 19
\end	ztool/draw/picture/width 19
(end	ztool/draw/picture/xoffset 19
${f L}$	ztool/draw/picture/yoffset 19
\ltxarrows 20	ztool/box
_	ztool/file-io
P	ztool/shell-escape
\pdfsetmatrix	ztool/zdraw 4
\pstarrows	\zline 19, 24
\put	zpic 19
${f S}$	\zpin 21
seq commands:	\zrac 20
\seq_set_split_keep_spaces:Nnn 24	\zrectangle 20
	ztex commands:
${f T}$	\ztex_tl_replace_all:nnn 24
tl commands:	\ztex_tl_replace_once:nnn 24
\tl_analysis_map_inline:nn 24	ztool commands:
X	\ztool_affine_transformation:Nnnnn 15, 16
xsim commands:	\ztool_append_to_file:nn 9, 24
\xsim_file_write_start:nn 24	\ztool_autoset_to_wd_and_ht:nn 14
\xsim_file_write_stop: 24	\ztool_autoset_to_wd_and_ht:nnn 14
	\ztool_box_item_align:Nnnn 14
${f Z}$	\ztool_file_new:nn
\zarc 20	\ztool_fp_to_rad:n 15
\zcircle 20	\ztool_get_dp:Nn
\zdraw 20, 24	\ztool_get_ht:Nn
ztool//line/dash	\ztool_get_ht_plus_dp:Nn 13
ztool//line/draw	$\verb \ztool_get_shell_pwd:N$

\ztool_get_wd:\n 13	\ztool_scale_to_wd:nn 14
\ztool_gget_dp:Nn	\ztool_scale_to_wd_and_ht:nnn 14
\ztool_gget_dp:nn	\ztool_set_to_ht:nn 14
\ztool_gget_ht:Nn	\ztool_set_to_wd:nn 13
\ztool_gget_wd:Nn	\ztool_shell_cp:nn 5
\ztool_gread_file_as_seq:nnN 8	\ztool_shell_escape:n
\ztool_gread_file_as_seq_keep_spaces:nnN	\ztool_shell_mkdir:n 5
8	\ztool_shell_mv:nn 5
$\forall tool_insert_to_file:nnn \dots 9$	
\ztool_read_file_as_seq:nnN 7, 8, 24	\ztool_shell_rm:n 5
\ztool_read_file_as_seq_keep_spaces:nnN	$\ztool_shell_rmdir:n$ 5
	$\verb \ztool_shell_split_ls:nN 6$
\ztool_replace_file_line:nnn 9	\ztool_write_seq_to_file:nNn 8
\ztool_replace_file_line_text:nnnn 24	\ztoolboxaffine 15
\ztool_rotate:nn 14	\ztoolloadlib
\ztool_scale_to_ht:nn	\zvector 19