pytermor

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CONTENTS

(yet another) Python library designed for formatting terminal output using ANSI escape codes. Implements automatic *"soft"* format termination. Provides a registry of low-level SGR (Select Graphic Rendition) *sequences* and formatting *spans* (or combined sequences). Also includes a set of formatters for pretty output.

Key feature of this library is providing necessary abstractions for building complex text sections with lots of formatting, while keeping the application code clear and readable.

No dependencies besides Python Standard Library are required *(there are some for testing and docs building, though)*.

@TODO This is how you **should** format examples:

We put these pieces together to create a SGR command. Thus, `ESC[1m` specifies bold (or bright) text, and `ESC[31m` specifies red foreground text. We can chain together parameters; for example, `ESC[32;47m` specifies green foreground text on a white background.

The following diagram shows a complete example for rendering the word "text" in red with a single underline.

```
         CSI              Final Byte
        ┌───────┐         ┌──┐
\x1b[31;4mtext
ESC character   Parameters
in Hex ASCII
```

Notes

- For terminals that support bright foreground colors, `ESC[1;3Xm` is usually equivalent to `ESC[9Xm` (where `X` is a digit in 0-7). However, the reverse does not seem to hold, at least anecdotally: `ESC[2;9Xm` usually does not render the same as `ESC[3Xm`.
- Not all terminals support every effect.

Fig. 1: https://chrisyeh96.github.io/2020/03/28/terminal-colors.html#color-schemes

ONE

GUIDE

1.1 Getting started

1.1.1 Installation

```
pip install pytermor
```

1.1.2 Structure

Lvl	Module	Class(es)	Purpose
Hi	*render*	*Text*	Container consisting of text pieces each with attached `Style`. Renders into specified format keeping all the formatting.
		Style *Styles*	Reusable abstractions defining colors and text attributes (text color, bg color, *bold* attribute, *underlined* attribute etc).
		SGRRenderer *HtmlRenderer* *TmuxRenderer* etc.	SGRRenderer transforms `Style` instances into `Color`, `Span` and `SequenceSGR` instances and assembles it all up. There are several other implementations depending on what output format is required.
	color	*ColorDefault* *ColorIndexed* *ColorRGB*	Abstractions for color operations in different color modes (default 16-color, 256-color, RGB). Tools for color approximation and transformations.
		Colors	Color presets (see *Preset list*).
Lo	*ansi*	*Span*	Abstraction consisting of "opening" SGR sequence defined by the developer (or taken from preset list) and complementary "closing" SGR sequence that is built automatically.
		Spans	Registry of predefined instances in case the developer doesn't need dynamic output formatting and just wants to colorize an error message.
		SequenceSGR *Seqs*	Abstractions for manipulating ANSI control sequences and classes-factoriesm, plus a registry of preset SGRs.
		IntCodes	Registry of escape control sequence parameters.
	util	*	Additional formatters and common methods for manipulating strings with SGRs inside.

1.1.3 Features

One of the core concepts of the library is *Span* class. `Span` is a combination of two control sequences; it wraps specified string with pre-defined leading and trailing SGR definitions.

Example code:

```
from pytermor import Spans

print(Spans.RED('Feat') + Spans.BOLD('ures'))
```

Content-aware format nesting

Compose text spans with automatic content-aware span termination. Preset spans can safely overlap with each other (as long as they require different *breaker* sequences to reset).

```
from pytermor import Span

span1 = Span('blue', 'bold')
span2 = Span('cyan', 'inversed', 'underlined', 'italic')

msg = span1(f'Content{span2("-aware format")} nesting')
print(msg)
```
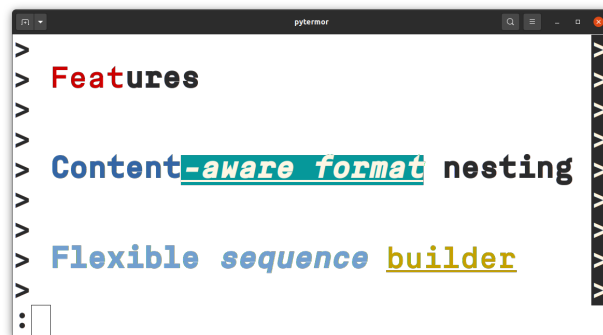

Flexible sequence builder

Create your own *SGR sequences* using default constructor, which accepts color/attribute keys, integer codes and even existing *SGRs*, in any amount and in any order. Key resolving is case-insensitive.

```
from pytermor import Seqs, SequenceSGR

seq1 = SequenceSGR('hi_blue', 1)  # keys or integer codes
seq2 = SequenceSGR(seq1, Seqs.ITALIC)  # existing SGRs
seq3 = SequenceSGR('underlined', 'YELLOW')  # case-insensitive

msg = f'{seq1}Flexible{Seqs.RESET} ' + \
      f'{seq2}sequence{Seqs.RESET} ' + \
      str(seq3) + 'builder' + str(Seqs.RESET)
print(msg)
```

256 colors / True Color support

The library supports extended color modes:

- XTerm 256 colors indexed mode (see *Preset list*);
- True Color RGB mode (16M colors).

```python
from pytermor import SequenceSGR, Seqs

start_color = 41
for idx, c in enumerate(range(start_color, start_color+(36*6), 36)):
    print(f'{SequenceSGR.init_color_indexed(c)}{Seqs.COLOR_OFF}', end='')

print('\n')
for idx, c in enumerate(range(0, 256, 256//17)):
    r = max(0, 255-c)
    g = max(0, min(255, 127-(c*2)))
    b = c
    print(f'{SequenceSGR.init_color_rgb(r, g, b)}{Seqs.COLOR_OFF}', end='')
```


Customizable output formats

@TODO

String and number formatters

@TODO

1.2 High-level abstractions

1.2.1 Colors and Styles

1.2.2 Output format control

1.2.3 Color mode fallbacks

1.2.4 Core API

@EXAMPLES
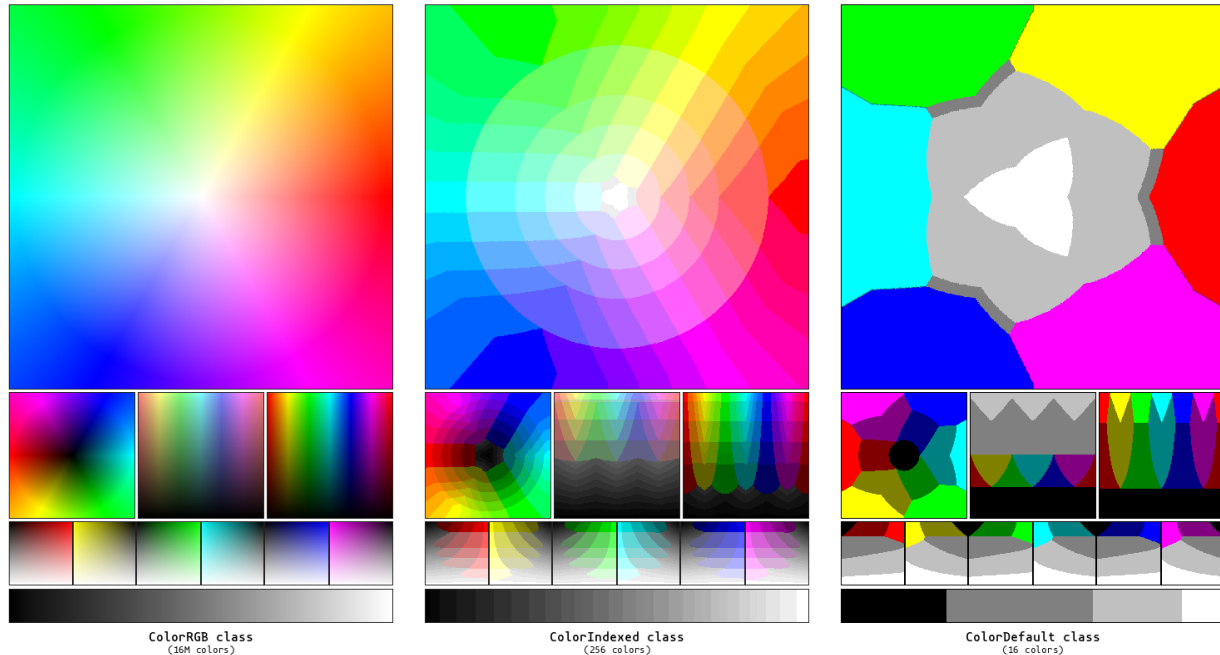
Fig. 1: Color approximations for indexed modes

1.3 Low-level abstractions

So, what's happening under the hood?

1.3.1 Format soft reset

There are two ways to manage color and attribute termination:

- hard reset (SGR-0 or `e[0m`)

- soft reset (SGR-22, 23, 24 etc.)

The main difference between them is that *hard* reset disables all formatting after itself, while *soft* reset disables only actually necessary attributes (i.e. used as opening sequence in *Span* instance's context) and keeps the other.

That's what `Span` class is designed for: to simplify creation of soft-resetting text spans, so that developer doesn't have to restore all previously applied formats after every closing sequence.

Example

We are given a text span which is initially *bold* and *underlined*. We want to recolor a few words inside of this span. By default this will result in losing all the formatting to the right of updated text span (because *RESET*, or `e[0m`, clears all text attributes).

However, there is an option to specify what attributes should be disabled or let the library do that for you:

```
1  from pytermor import Span, Spans, Seqs
2
3  # implicitly:
```

(continues on next page)

```
4   span_warn = Span(93, 4)
5   # or explicitly:
6   span_warn = Span.init_explicit(
7       Seqs.HI_YELLOW + Seqs.UNDERLINED,  # sequences can be summed up, remember?
8       Seqs.COLOR_OFF + Seqs.UNDERLINED_OFF,  # "counteractive" sequences
9       hard_reset_after=False
10  )
11
12  orig_text = Spans.BOLD(f'this is {Seqs.BG_GRAY}the original{Seqs.RESET} string')
13  updated_text = orig_text.replace('original', span_warn('updated'), 1)
14  print(orig_text, '\n', updated_text)
```
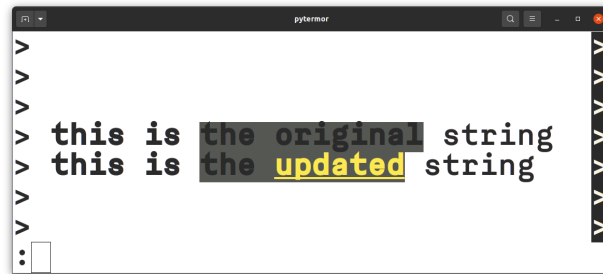

As you can see, the update went well – we kept all the previously applied formatting. Of course, this method cannot be 100% applicable; for example, imagine that original text was colored blue. After the update "string" word won't be blue anymore, as we used `Seqs.COLOR_OFF` escape sequence to neutralize our own yellow color. But it still can be helpful for a majority of cases (especially when text is generated and formatted by the same program and in one go).

1.3.2 Working with Spans

Use *Span* constructor to create new instance with specified control sequence(s) as a opening/starter sequence and **automatically composed** closing sequence that will terminate attributes defined in opening sequence while keeping the others (soft reset).

Resulting sequence params' order is the same as argument's order.

Each sequence param can be specified as:

- string key (see *Preset list*);

- integer param value;

- existing *SequenceSGR* instance (params will be extracted).

It's also possible to avoid auto-composing mechanism and create *Span* with explicitly set parameters using *Span. init_explicit()*.

1.3.3 Creating and applying SGRs

You can use any of predefined sequences from *Seqs* registry or create your own via standard constructor. Valid argument values as well as preset constants are described in *Preset list* page.

Important: SequenceSGR with zero params was specifically implemented to translate into an empty string and not into e[m, which would make sense, but also could be very entangling, as terminal emulators interpret that sequence as e[0m, which is *hard* reset sequence.

There is also a set of methods for dynamic SequenceSGR creation:

- *init_color_indexed()* will produce sequence operating in 256-colors mode (for a complete list see *Preset list*);

- *init_color_rgb()* will create a sequence capable of setting the colors in True Color 16M mode (however, some terminal emulators doesn't support it).

To get the resulting sequence chars use *assemble()* method or cast instance to *str*.

```python
from pytermor import SequenceSGR

seq = SequenceSGR(4, 7)
msg = f'({seq})'

print(msg + f'{SequenceSGR(0).assemble()}')
print(str(msg.assemble()))
print(msg.assemble().hex(':'))
```
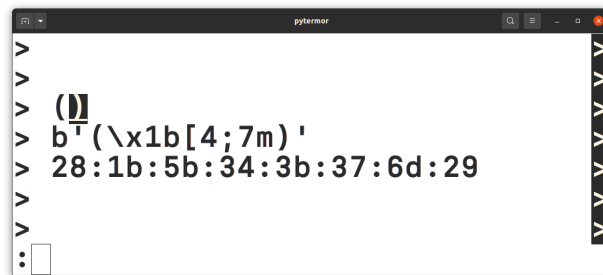

- First line is the string with encoded escape sequence;

- Second line shows up the string in raw mode, as if sequences were ignored by the terminal;

- Third line is hexademical string representation.

1.3.4 SGR sequence structure

1. \x1b is ESC *control character*, which opens a control sequence.

2. [is sequence *introducer*; it determines the type of control sequence (in this case it's CSI (Control Sequence Introducer)).

3. 4 and 7 are *parameters* of the escape sequence; they mean "underlined" and "inversed" attributes respectively. Those parameters must be separated by ;.

4. m is sequence *terminator*; it also determines the sub-type of sequence, in our case SGR. Sequences of this kind are most commonly encountered.

1.3.5 Combining SGRs

One instance of *SequenceSGR* can be added to another. This will result in a new `SequenceSGR` with combined params.

```
from pytermor import SequenceSGR, Seqs

combined = SequenceSGR(1, 31) + SequenceSGR(4)
print(f'{combined}combined{Seqs.RESET}', str(combined).assemble())
```

1.3.6 Core API

- @TODO
- *SequenceSGR* constructor
- *SequenceSGR.init_color_indexed()*
- *SequenceSGR.init_color_rgb()*
- *Span* constructor
- *Span.init_explicit()*

1.4 Preset list

Preset lists are omitted from API docs to avoid unnesessary duplication; summary list of all presets defined in the library (not including `util.*`) is displayed here.

`@TODO` USAGE - list all memthods that accept string keys of those prsets.

There are two types of color palettes used in modern terminals – first one containing 16 colors (library references that palette as *default*, see `ColorDefault`), and second one consisting of 256 colors (referenced as *indexed*, e.g. `ColorIndexed`). There is also True Color mode (referenced as *RGB* mode), but it is not palette-based.

Legend

- INT (intcode module -- 1st or 3rd SGR param value)
- SEQ (sequence module)
- SPN (span module)
- CLR (color module)
- STY (style module)

1.4.1 Meta, attributes, breakers

Name	INT	SEQ	SPN	CLR	STY	Description
Meta						
NOOP		V	V	V	V	No-operation; always assembled as empty string
RESET	0	V				Reset all attributes and colors
Attributes						
BOLD	1	V	V		V[1]	Bold or increased intensity
DIM	2	V	V		V	Faint, decreased intensity
ITALIC	3	V	V		V	Italic; *not widely supported*
UNDERLINED	4	V	V		V	Underline
BLINK_SLOW	5	V			V[2]	Set blinking to < 150 cpm
BLINK_FAST	6	V				Set blinking to 150+ cpm; *not widely supported*
INVERSED	7	V	V		V	Swap foreground and background colors
HIDDEN	8	V				Conceal characters; *not widely supported*
CROSSLINED	9	V			V	Strikethrough
DOUBLE_UNDERLINED	21	V				Double-underline; *on several terminals disables BOLD instead*
COLOR_EXTENDED	38					Set foreground color [*indexed/RGB* mode]; *use init_color_indexed and init_color_rgb instead*
BG_COLOR_EXTENDED	48					Set background color [*indexed/RGB* mode]; *use init_color_indexed and init_color_rgb instead*
OVERLINED	53	V	V		V	Overline; *not widely supported*
Breakers						
BOLD_DIM_OFF	22	V				Disable BOLD and DIM attributes. *Special aspects... It's impossible to reliably disable them on a separate basis.*
ITALIC_OFF	23	V				Disable italic
UNDERLINED_OFF	24	V				Disable underlining
BLINK_OFF	25	V				Disable blinking
INVERSED_OFF	27	V				Disable inversing
HIDDEN_OFF	28	V				Disable concealing
CROSSLINED_OFF	29	V				Disable strikethrough
COLOR_OFF	39	V				Reset foreground color
BG_COLOR_OFF	49	V				Reset background color
OVERLINED_OFF	55	V				Disable overlining

---

[1] for this and subsequent items in "Attributes" section: as boolean flags.

[2] as blink.

1.4.2 Default colors

	Name	INT	SEQ	SPN	CLR	STY	RGB code	XTerm name
	Foreground *default* colors							
■	BLACK	30	V	V	V		#000000	Black
■	RED	31	V	V	V		#800000	Maroon
■	GREEN	32	V	V	V		#008000	Green
■	YELLOW	33	V	V	V		#808000	Olive
■	BLUE	34	V	V	V		#000080	Navy
■	MAGENTA	35	V	V	V		#800080	Purple
■	CYAN	36	V	V	V		#008080	Teal
■	WHITE	37	V	V	V		#c0c0c0	Silver
	Background *default* colors							
■	BG_BLACK	40	V	V	V		#000000	Black
■	BG_RED	41	V	V	V		#800000	Maroon
■	BG_GREEN	42	V	V	V		#008000	Green
■	BG_YELLOW	43	V	V	V		#808000	Olive
■	BG_BLUE	44	V	V	V		#000080	Navy
■	BG_MAGENTA	45	V	V	V		#800080	Purple
■	BG_CYAN	46	V	V	V		#008080	Teal
■	BG_WHITE	47	V	V	V		#c0c0c0	Silver
	High-intensity foreground *default* colors							
■	GRAY	90	V	V	V		#808080	Grey
■	HI_RED	91	V	V	V		#ff0000	Red
■	HI_GREEN	92	V	V	V		#00ff00	Lime
■	HI_YELLOW	93	V	V	V		#ffff00	Yellow
■	HI_BLUE	94	V	V	V		#0000ff	Blue
■	HI_MAGENTA	95	V	V	V		#ff00ff	Fuchsia
■	HI_CYAN	96	V	V	V		#00ffff	Aqua
	HI_WHITE	97	V	V	V		#ffffff	White
	High-intensity background *default* colors							
■	BG_GRAY	100	V	V	V		#808080	Grey
■	BG_HI_RED	101	V	V	V		#ff0000	Red
■	BG_HI_GREEN	102	V	V	V		#00ff00	Lime
■	BG_HI_YELLOW	103	V	V	V		#ffff00	Yellow
■	BG_HI_BLUE	104	V	V	V		#0000ff	Blue
■	BG_HI_MAGENTA	105	V	V	V		#ff00ff	Fuchsia
■	BG_HI_CYAN	106	V	V	V		#00ffff	Aqua
	BG_HI_WHITE	107	V	V	V		#ffffff	White

1.4.3 Indexed colors

	Name	INT	SEQ	SPN	CLR	STY	RGB code	XTerm name
■	XTERM_BLACK[3]	0			V		#000000	
■	XTERM_MAROON	1			V		#800000	
■	XTERM_GREEN	2			V		#008000	
■	XTERM_OLIVE	3			V		#808000	
■	XTERM_NAVY	4			V		#000080	
■	XTERM_PURPLE_5	5			V		#800080	**Purple**[4]
■	XTERM_TEAL	6			V		#008080	
■	XTERM_SILVER	7			V		#c0c0c0	
■	XTERM_GREY	8			V		#808080	
■	XTERM_RED	9			V		#ff0000	
■	XTERM_LIME	10			V		#00ff00	
■	XTERM_YELLOW	11			V		#ffff00	
■	XTERM_BLUE	12			V		#0000ff	
■	XTERM_FUCHSIA	13			V		#ff00ff	
■	XTERM_AQUA	14			V		#00ffff	
	XTERM_WHITE	15			V		#ffffff	
■	XTERM_GREY_0	16			V		#000000	
■	XTERM_NAVY_BLUE	17			V		#00005f	
■	XTERM_DARK_BLUE	18			V		#000087	
■	XTERM_BLUE_3	19			V		#0000af	
■	XTERM_BLUE_2	20			V		#0000d7	**Blue3**
■	XTERM_BLUE_1	21			V		#0000ff	
■	XTERM_DARK_GREEN	22			V		#005f00	
■	XTERM_DEEP_SKY_BLUE_7	23			V		#005f5f	**DeepSkyBlue4**
■	XTERM_DEEP_SKY_BLUE_6	24			V		#005f87	**DeepSkyBlue4**
■	XTERM_DEEP_SKY_BLUE_5	25			V		#005faf	**DeepSkyBlue4**
■	XTERM_DODGER_BLUE_3	26			V		#005fd7	
■	XTERM_DODGER_BLUE_2	27			V		#005fff	
■	XTERM_GREEN_5	28			V		#008700	**Green4**
■	XTERM_SPRING_GREEN_4	29			V		#00875f	
■	XTERM_TURQUOISE_4	30			V		#008787	
■	XTERM_DEEP_SKY_BLUE_4	31			V		#0087af	**DeepSkyBlue3**
■	XTERM_DEEP_SKY_BLUE_3	32			V		#0087d7	
■	XTERM_DODGER_BLUE_1	33			V		#0087ff	
■	XTERM_GREEN_4	34			V		#00af00	**Green3**
■	XTERM_SPRING_GREEN_5	35			V		#00af5f	**SpringGreen3**
■	XTERM_DARK_CYAN	36			V		#00af87	
■	XTERM_LIGHT_SEA_GREEN	37			V		#00afaf	
■	XTERM_DEEP_SKY_BLUE_2	38			V		#00afd7	
■	XTERM_DEEP_SKY_BLUE_1	39			V		#00afff	
■	XTERM_GREEN_3	40			V		#00d700	
■	XTERM_SPRING_GREEN_3	41			V		#00d75f	
■	XTERM_SPRING_GREEN_6	42			V		#00d787	**SpringGreen2**
■	XTERM_CYAN_3	43			V		#00d7af	
■	XTERM_DARK_TURQUOISE	44			V		#00d7d7	
■	XTERM_TURQUOISE_2	45			V		#00d7ff	
■	XTERM_GREEN_2	46			V		#00ff00	**Green1**

Table 2 – continued from previous page

	Name	INT	SEQ	SPN	CLR	STY	RGB code	XTerm name
■	XTERM_SPRING_GREEN_2	47			V		#00ff5f	
■	XTERM_SPRING_GREEN_1	48			V		#00ff87	
■	XTERM_MEDIUM_SPRING_GREEN	49			V		#00ffaf	
■	XTERM_CYAN_2	50			V		#00ffd7	
■	XTERM_CYAN_1	51			V		#00ffff	
■	XTERM_DARK_RED_2	52			V		#5f0000	**DarkRed**
■	XTERM_DEEP_PINK_8	53			V		#5f005f	**DeepPink4**
■	XTERM_PURPLE_6	54			V		#5f0087	**Purple4**
■	XTERM_PURPLE_4	55			V		#5f00af	
■	XTERM_PURPLE_3	56			V		#5f00d7	
■	XTERM_BLUE_VIOLET	57			V		#5f00ff	
■	XTERM_ORANGE_4	58			V		#5f5f00	
■	XTERM_GREY_37	59			V		#5f5f5f	
■	XTERM_MEDIUM_PURPLE_7	60			V		#5f5f87	**MediumPurple4**
■	XTERM_SLATE_BLUE_3	61			V		#5f5faf	
■	XTERM_SLATE_BLUE_2	62			V		#5f5fd7	**SlateBlue3**
■	XTERM_ROYAL_BLUE_1	63			V		#5f5fff	
■	XTERM_CHARTREUSE_6	64			V		#5f8700	**Chartreuse4**
■	XTERM_DARK_SEA_GREEN_9	65			V		#5f875f	**DarkSeaGreen4**
■	XTERM_PALE_TURQUOISE_4	66			V		#5f8787	
■	XTERM_STEEL_BLUE	67			V		#5f87af	
■	XTERM_STEEL_BLUE_3	68			V		#5f87d7	
■	XTERM_CORNFLOWER_BLUE	69			V		#5f87ff	
■	XTERM_CHARTREUSE_5	70			V		#5faf00	**Chartreuse3**
■	XTERM_DARK_SEA_GREEN_8	71			V		#5faf5f	**DarkSeaGreen4**
■	XTERM_CADET_BLUE_2	72			V		#5faf87	**CadetBlue**
■	XTERM_CADET_BLUE	73			V		#5fafaf	
■	XTERM_SKY_BLUE_3	74			V		#5fafd7	
■	XTERM_STEEL_BLUE_2	75			V		#5fafff	**SteelBlue1**
■	XTERM_CHARTREUSE_4	76			V		#5fd700	**Chartreuse3**
■	XTERM_PALE_GREEN_4	77			V		#5fd75f	**PaleGreen3**
■	XTERM_SEA_GREEN_3	78			V		#5fd787	
■	XTERM_AQUAMARINE_3	79			V		#5fd7af	
■	XTERM_MEDIUM_TURQUOISE	80			V		#5fd7d7	
■	XTERM_STEEL_BLUE_1	81			V		#5fd7ff	
■	XTERM_CHARTREUSE_2	82			V		#5fff00	
■	XTERM_SEA_GREEN_4	83			V		#5fff5f	**SeaGreen2**
■	XTERM_SEA_GREEN_2	84			V		#5fff87	**SeaGreen1**
■	XTERM_SEA_GREEN_1	85			V		#5fffaf	
■	XTERM_AQUAMARINE_2	86			V		#5fffd7	**Aquamarine1**
■	XTERM_DARK_SLATE_GRAY_2	87			V		#5fffff	
■	XTERM_DARK_RED	88			V		#870000	
■	XTERM_DEEP_PINK_7	89			V		#87005f	**DeepPink4**
■	XTERM_DARK_MAGENTA_2	90			V		#870087	**DarkMagenta**
■	XTERM_DARK_MAGENTA	91			V		#8700af	
■	XTERM_DARK_VIOLET_2	92			V		#8700d7	**DarkViolet**
■	XTERM_PURPLE_2	93			V		#8700ff	**Purple**
■	XTERM_ORANGE_3	94			V		#875f00	**Orange4**
■	XTERM_LIGHT_PINK_3	95			V		#875f5f	**LightPink4**

Table 2 – continued from previous page

	Name	INT	SEQ	SPN	CLR	STY	RGB code	XTerm name
■	XTERM_PLUM_4	96			V		#875f87	
■	XTERM_MEDIUM_PURPLE_6	97			V		#875faf	**MediumPurple3**
■	XTERM_MEDIUM_PURPLE_5	98			V		#875fd7	**MediumPurple3**
■	XTERM_SLATE_BLUE_1	99			V		#875fff	
■	XTERM_YELLOW_6	100			V		#878700	**Yellow4**
■	XTERM_WHEAT_4	101			V		#87875f	
■	XTERM_GREY_53	102			V		#878787	
■	XTERM_LIGHT_SLATE_GREY	103			V		#8787af	
■	XTERM_MEDIUM_PURPLE_4	104			V		#8787d7	**MediumPurple**
■	XTERM_LIGHT_SLATE_BLUE	105			V		#8787ff	
■	XTERM_YELLOW_4	106			V		#87af00	
■	XTERM_DARK_OLIVE_GREEN_6	107			V		#87af5f	**DarkOliveGreen3**
■	XTERM_DARK_SEA_GREEN_7	108			V		#87af87	**DarkSeaGreen**
■	XTERM_LIGHT_SKY_BLUE_3	109			V		#87afaf	
■	XTERM_LIGHT_SKY_BLUE_2	110			V		#87afd7	**LightSkyBlue3**
■	XTERM_SKY_BLUE_2	111			V		#87afff	
■	XTERM_CHARTREUSE_3	112			V		#87d700	**Chartreuse2**
■	XTERM_DARK_OLIVE_GREEN_4	113			V		#87d75f	**DarkOliveGreen3**
■	XTERM_PALE_GREEN_3	114			V		#87d787	
■	XTERM_DARK_SEA_GREEN_5	115			V		#87d7af	**DarkSeaGreen3**
■	XTERM_DARK_SLATE_GRAY_3	116			V		#87d7d7	
■	XTERM_SKY_BLUE_1	117			V		#87d7ff	
■	XTERM_CHARTREUSE_1	118			V		#87ff00	
■	XTERM_LIGHT_GREEN_2	119			V		#87ff5f	**LightGreen**
■	XTERM_LIGHT_GREEN	120			V		#87ff87	
■	XTERM_PALE_GREEN_1	121			V		#87ffaf	
■	XTERM_AQUAMARINE_1	122			V		#87ffd7	
■	XTERM_DARK_SLATE_GRAY_1	123			V		#87ffff	
■	XTERM_RED_4	124			V		#af0000	**Red3**
■	XTERM_DEEP_PINK_6	125			V		#af005f	**DeepPink4**
■	XTERM_MEDIUM_VIOLET_RED	126			V		#af0087	
■	XTERM_MAGENTA_6	127			V		#af00af	**Magenta3**
■	XTERM_DARK_VIOLET	128			V		#af00d7	
■	XTERM_PURPLE	129			V		#af00ff	
■	XTERM_DARK_ORANGE_3	130			V		#af5f00	
■	XTERM_INDIAN_RED_4	131			V		#af5f5f	**IndianRed**
■	XTERM_HOT_PINK_5	132			V		#af5f87	**HotPink3**
■	XTERM_MEDIUM_ORCHID_4	133			V		#af5faf	**MediumOrchid3**
■	XTERM_MEDIUM_ORCHID_3	134			V		#af5fd7	**MediumOrchid**
■	XTERM_MEDIUM_PURPLE_2	135			V		#af5fff	
■	XTERM_DARK_GOLDENROD	136			V		#af8700	
■	XTERM_LIGHT_SALMON_3	137			V		#af875f	
■	XTERM_ROSY_BROWN	138			V		#af8787	
■	XTERM_GREY_63	139			V		#af87af	
■	XTERM_MEDIUM_PURPLE_3	140			V		#af87d7	**MediumPurple2**
■	XTERM_MEDIUM_PURPLE_1	141			V		#af87ff	
■	XTERM_GOLD_3	142			V		#afaf00	
■	XTERM_DARK_KHAKI	143			V		#afaf5f	
■	XTERM_NAVAJO_WHITE_3	144			V		#afaf87	

Table 2 – continued from previous page

	Name	INT	SEQ	SPN	CLR	STY	RGB code	XTerm name
	XTERM_GREY_69	145			V		#afafaf	
	XTERM_LIGHT_STEEL_BLUE_3	146			V		#afafd7	
	XTERM_LIGHT_STEEL_BLUE_2	147			V		#afafff	**LightSteelBlue**
	XTERM_YELLOW_5	148			V		#afd700	**Yellow3**
	XTERM_DARK_OLIVE_GREEN_5	149			V		#afd75f	**DarkOliveGreen3**
	XTERM_DARK_SEA_GREEN_6	150			V		#afd787	**DarkSeaGreen3**
	XTERM_DARK_SEA_GREEN_4	151			V		#afd7af	**DarkSeaGreen2**
	XTERM_LIGHT_CYAN_3	152			V		#afd7d7	
	XTERM_LIGHT_SKY_BLUE_1	153			V		#afd7ff	
	XTERM_GREEN_YELLOW	154			V		#afff00	
	XTERM_DARK_OLIVE_GREEN_3	155			V		#afff5f	**DarkOliveGreen2**
	XTERM_PALE_GREEN_2	156			V		#afff87	**PaleGreen1**
	XTERM_DARK_SEA_GREEN_3	157			V		#afffaf	**DarkSeaGreen2**
	XTERM_DARK_SEA_GREEN_1	158			V		#afffd7	
	XTERM_PALE_TURQUOISE_1	159			V		#afffff	
	XTERM_RED_3	160			V		#d70000	
	XTERM_DEEP_PINK_5	161			V		#d7005f	**DeepPink3**
	XTERM_DEEP_PINK_3	162			V		#d70087	
	XTERM_MAGENTA_3	163			V		#d700af	
	XTERM_MAGENTA_5	164			V		#d700d7	**Magenta3**
	XTERM_MAGENTA_4	165			V		#d700ff	**Magenta2**
	XTERM_DARK_ORANGE_2	166			V		#d75f00	**DarkOrange3**
	XTERM_INDIAN_RED_3	167			V		#d75f5f	**IndianRed**
	XTERM_HOT_PINK_4	168			V		#d75f87	**HotPink3**
	XTERM_HOT_PINK_3	169			V		#d75faf	**HotPink2**
	XTERM_ORCHID_3	170			V		#d75fd7	**Orchid**
	XTERM_MEDIUM_ORCHID_2	171			V		#d75fff	**MediumOrchid1**
	XTERM_ORANGE_2	172			V		#d78700	**Orange3**
	XTERM_LIGHT_SALMON_2	173			V		#d7875f	**LightSalmon3**
	XTERM_LIGHT_PINK_2	174			V		#d78787	**LightPink3**
	XTERM_PINK_3	175			V		#d787af	
	XTERM_PLUM_3	176			V		#d787d7	
	XTERM_VIOLET	177			V		#d787ff	
	XTERM_GOLD_2	178			V		#d7af00	**Gold3**
	XTERM_LIGHT_GOLDENROD_5	179			V		#d7af5f	**LightGoldenrod3**
	XTERM_TAN	180			V		#d7af87	
	XTERM_MISTY_ROSE_3	181			V		#d7afaf	
	XTERM_THISTLE_3	182			V		#d7afd7	
	XTERM_PLUM_2	183			V		#d7afff	
	XTERM_YELLOW_3	184			V		#d7d700	
	XTERM_KHAKI_3	185			V		#d7d75f	
	XTERM_LIGHT_GOLDENROD_3	186			V		#d7d787	**LightGoldenrod2**
	XTERM_LIGHT_YELLOW_3	187			V		#d7d7af	
	XTERM_GREY_84	188			V		#d7d7d7	
	XTERM_LIGHT_STEEL_BLUE_1	189			V		#d7d7ff	
	XTERM_YELLOW_2	190			V		#d7ff00	
	XTERM_DARK_OLIVE_GREEN_2	191			V		#d7ff5f	**DarkOliveGreen1**
	XTERM_DARK_OLIVE_GREEN_1	192			V		#d7ff87	
	XTERM_DARK_SEA_GREEN_2	193			V		#d7ffaf	**DarkSeaGreen1**

Table 2 – continued from previous page

	Name	INT	SEQ	SPN	CLR	STY	RGB code	XTerm name
	XTERM_HONEYDEW_2	194			V		#d7ffd7	
	XTERM_LIGHT_CYAN_1	195			V		#d7ffff	
	XTERM_RED_1	196			V		#ff0000	
	XTERM_DEEP_PINK_4	197			V		#ff005f	**DeepPink2**
	XTERM_DEEP_PINK_2	198			V		#ff0087	**DeepPink1**
	XTERM_DEEP_PINK_1	199			V		#ff00af	
	XTERM_MAGENTA_2	200			V		#ff00d7	
	XTERM_MAGENTA_1	201			V		#ff00ff	
	XTERM_ORANGE_RED_1	202			V		#ff5f00	
	XTERM_INDIAN_RED_1	203			V		#ff5f5f	
	XTERM_INDIAN_RED_2	204			V		#ff5f87	**IndianRed1**
	XTERM_HOT_PINK_2	205			V		#ff5faf	**HotPink**
	XTERM_HOT_PINK	206			V		#ff5fd7	
	XTERM_MEDIUM_ORCHID_1	207			V		#ff5fff	
	XTERM_DARK_ORANGE	208			V		#ff8700	
	XTERM_SALMON_1	209			V		#ff875f	
	XTERM_LIGHT_CORAL	210			V		#ff8787	
	XTERM_PALE_VIOLET_RED_1	211			V		#ff87af	
	XTERM_ORCHID_2	212			V		#ff87d7	
	XTERM_ORCHID_1	213			V		#ff87ff	
	XTERM_ORANGE_1	214			V		#ffaf00	
	XTERM_SANDY_BROWN	215			V		#ffaf5f	
	XTERM_LIGHT_SALMON_1	216			V		#ffaf87	
	XTERM_LIGHT_PINK_1	217			V		#ffafaf	
	XTERM_PINK_1	218			V		#ffafd7	
	XTERM_PLUM_1	219			V		#ffafff	
	XTERM_GOLD_1	220			V		#ffd700	
	XTERM_LIGHT_GOLDENROD_4	221			V		#ffd75f	**LightGoldenrod2**
	XTERM_LIGHT_GOLDENROD_2	222			V		#ffd787	
	XTERM_NAVAJO_WHITE_1	223			V		#ffd7af	
	XTERM_MISTY_ROSE_1	224			V		#ffd7d7	
	XTERM_THISTLE_1	225			V		#ffd7ff	
	XTERM_YELLOW_1	226			V		#ffff00	
	XTERM_LIGHT_GOLDENROD_1	227			V		#ffff5f	
	XTERM_KHAKI_1	228			V		#ffff87	
	XTERM_WHEAT_1	229			V		#ffffaf	
	XTERM_CORNSILK_1	230			V		#ffffd7	
	XTERM_GREY_100	231			V		#ffffff	
	XTERM_GREY_3	232			V		#080808	
	XTERM_GREY_7	233			V		#121212	
	XTERM_GREY_11	234			V		#1c1c1c	
	XTERM_GREY_15	235			V		#262626	
	XTERM_GREY_19	236			V		#303030	
	XTERM_GREY_23	237			V		#3a3a3a	
	XTERM_GREY_27	238			V		#444444	
	XTERM_GREY_30	239			V		#4e4e4e	
	XTERM_GREY_35	240			V		#585858	
	XTERM_GREY_39	241			V		#626262	
	XTERM_GREY_42	242			V		#6c6c6c	

Table 2 – continued from previous page

	Name	INT	SEQ	SPN	CLR	STY	RGB code	XTerm name
■	XTERM_GREY_46	243			V		#767676	
■	XTERM_GREY_50	244			V		#808080	
■	XTERM_GREY_54	245			V		#8a8a8a	
■	XTERM_GREY_58	246			V		#949494	
■	XTERM_GREY_62	247			V		#9e9e9e	
■	XTERM_GREY_66	248			V		#a8a8a8	
■	XTERM_GREY_70	249			V		#b2b2b2	
■	XTERM_GREY_74	250			V		#bcbcbc	
■	XTERM_GREY_78	251			V		#c6c6c6	
■	XTERM_GREY_82	252			V		#d0d0d0	
■	XTERM_GREY_85	253			V		#dadada	
■	XTERM_GREY_89	254			V		#e4e4e4	
■	XTERM_GREY_93	255			V		#eeeeee	

Sources

1. https://en.wikipedia.org/wiki/ANSI_escape_code

2. https://www.ditig.com/256-colors-cheat-sheet

1.5 Color palette

Actual colors of *default* palette depend on user's terminal settings, i.e. the result color of `ColorDefault` is not guaranteed to exactly match the corresponding color listed below. What's more, note that *default* palette is actually a part of *indexed* one (first 16 colors of 256-color table).

Important: `@TODO` The approximation algomanrithm was explicitly made to ignore these colors because otherwise the results of transforming *RGB* values into *indexed* ones would be unpredictable, in addition to different results for different users, depending on their terminal emulator setup.

However, it doesn't mean that `ColorDefault` is useless. Just the opposite – it's ideal for situtations when you don't actually **have to** set exact values and it's easier to specify estimation of desired color. I.e. setting color to `'red'` is usually more than enough for displaying an error message – we don't really care of precise hue or brightness values for it.

Approximation algorithm is as simple as iterating through all colors in the *lookup table* (which contains all possible … @TODO finish

---

[3] First 16 colors are effectively the same as colors in *default* 16-color mode and share with them the same color values (and depend on terminal color scheme as well).

[4] XTerm name list contains duplicates; variable names for these were slightly modified (different numbers at the end) to avoid namespace conflicts. Every changed name is displayed with **bold** font.

000 #000000	001 #800000	002 #008000	003 #808000	004 #000080	005 #800080	006 #008080	007 #c0c0c0
008 #808080	009 #ff0000	010 #00ff00	011 #ffff00	012 #0000ff	013 #ff00ff	014 #00ffff	015 #ffffff

016 #000000	022 #005f00	028 #008700	034 #00af00	040 #00d700	046 #00ff00	082 #5fff00	076 #5fd700	070 #5faf00	064 #5f8700	058 #5f5f00	052 #5f0000
017 #00005f	023 #005f5f	029 #00875f	035 #00af5f	041 #00d75f	047 #00ff5f	083 #5fff5f	077 #5fd75f	071 #5faf5f	065 #5f875f	059 #5f5f5f	053 #5f005f
018 #000087	024 #005f87	030 #008787	036 #00af87	042 #00d787	048 #00ff87	084 #5fff87	078 #5fd787	072 #5faf87	066 #5f8787	060 #5f5f87	054 #5f0087
019 #0000af	025 #005faf	031 #0087af	037 #00afaf	043 #00d7af	049 #00ffaf	085 #5fffaf	079 #5fd7af	073 #5fafaf	067 #5f87af	061 #5f5faf	055 #5f00af
020 #0000d7	026 #005fd7	032 #0087d7	038 #00afd7	044 #00d7d7	050 #00ffd7	086 #5fffd7	080 #5fd7d7	074 #5fafd7	068 #5f87d7	062 #5f5fd7	056 #5f00d7
021 #0000ff	027 #005fff	033 #0087ff	039 #00afff	045 #00d7ff	051 #00ffff	087 #5fffff	081 #5fd7ff	075 #5fafff	069 #5f87ff	063 #5f5fff	057 #5f00ff
093 #8700ff	099 #875fff	105 #8787ff	111 #87afff	117 #87d7ff	123 #87ffff	159 #afffff	153 #afd7ff	147 #afafff	141 #af87ff	135 #af5fff	129 #af00ff
092 #8700d7	098 #875fd7	104 #8787d7	110 #87afd7	116 #87d7d7	122 #87ffd7	158 #afffd7	152 #afd7d7	146 #afafd7	140 #af87d7	134 #af5fd7	128 #af00d7
091 #8700af	097 #875faf	103 #8787af	109 #87afaf	115 #87d7af	121 #87ffaf	157 #afffaf	151 #afd7af	145 #afafaf	139 #af87af	133 #af5faf	127 #af00af
090 #870087	096 #875f87	102 #878787	108 #87af87	114 #87d787	120 #87ff87	156 #afff87	150 #afd787	144 #afaf87	138 #af8787	132 #af5f87	126 #af0087
089 #87005f	095 #875f5f	101 #87875f	107 #87af5f	113 #87d75f	119 #87ff5f	155 #afff5f	149 #afd75f	143 #afaf5f	137 #af875f	131 #af5f5f	125 #af005f
088 #870000	094 #875f00	100 #878700	106 #87af00	112 #87d700	118 #87ff00	154 #afff00	148 #afd700	142 #afaf00	136 #af8700	130 #af5f00	124 #af0000
160 #d70000	166 #d75f00	172 #d78700	178 #dfaf00	184 #dfdf00	190 #dfff00	226 #ffff00	220 #ffdf00	214 #ffaf00	208 #ff8700	202 #ff5f00	196 #ff0000
161 #d7005f	167 #d75f5f	173 #d7875f	179 #dfaf5f	185 #dfdf5f	191 #dfff5f	227 #ffff5f	221 #ffdf5f	215 #ffaf5f	209 #ff875f	203 #ff5f5f	197 #ff005f
162 #d70087	168 #d75f87	174 #d78787	180 #dfaf87	186 #dfdf87	192 #dfff87	228 #ffff87	222 #ffdf87	216 #ffaf87	210 #ff8787	204 #ff5f87	198 #ff0087
163 #d700af	169 #d75faf	175 #d787af	181 #dfafaf	187 #dfdfaf	193 #dfffaf	229 #ffffaf	223 #ffdfaf	217 #ffafaf	211 #ff87af	205 #ff5faf	199 #ff00af
164 #d700d7	170 #d75fd7	176 #d787d7	182 #dfafdf	188 #dfdfdf	194 #dfffdf	230 #ffffdf	224 #ffdfdf	218 #ffafdf	212 #ff87df	206 #ff5fdf	200 #ff00df
165 #d700ff	171 #d75fff	177 #d787ff	183 #dfafff	189 #dfdfff	195 #dfffff	231 #ffffff	225 #ffdfff	219 #ffafff	213 #ff87ff	207 #ff5fff	201 #ff00ff
232 #080808	233 #121212	234 #1c1c1c	235 #262626	236 #303030	237 #3a3a3a	238 #444444	239 #4e4e4e	240 #585858	241 #626262	242 #6c6c6c	243 #767676
244 #808080	245 #8a8a8a	246 #949494	247 #9e9e9e	248 #a8a8a8	249 #b2b2b2	250 #bcbcbc	251 #c6c6c6	252 #d0d0d0	253 #dadada	254 #e4e4e4	255 #eeeeee

Fig. 2: *Indexed* mode palette

Sources

1. https://www.tweaking4all.com/software/linux-software/xterm-color-cheat-sheet/

1.6 Formatters and Filters

The library contains @TODO

1.6.1 Auto-float formatter

1.6.2 Prefixed-unit formatter

1.6.3 Time delta formatter

```
from pytermor.render import RendererManager, SGRRenderer
from pytermor.util import time_delta

seconds_list = [2, 10, 60, 2700, 32340, 273600, 4752000, 864000000]
max_len_list = [3, 6, 10]


for max_len in max_len_list:
    formatter = time_delta.registry.find_matching(max_len)

RendererManager.set_up(SGRRenderer)
for seconds in seconds_list:
    for max_len in max_len_list:
        formatter = time_delta.registry.get_by_max_len(max_len)
        print(formatter.format(seconds, True), end=' ')
    print()
```
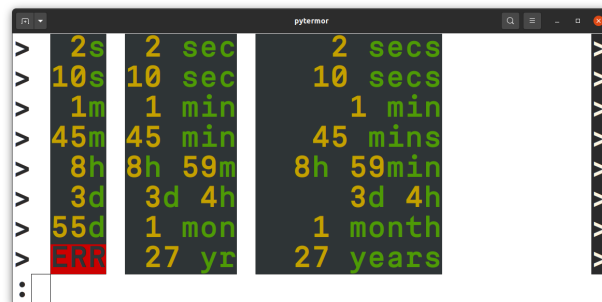
1.6.4 String filters

1.6.5 Standard Library extensions

@TODO

TWO

API REFERENCE

2.1 ansi

Module contains definitions for low-level ANSI escape sequences handling.

The key difference beetween `Spans` and `Sequences` is that sequence can *open* text style and also *close*, or terminate it. As for `Spans` – they always do both; typical use-case of *Span* is to wrap some text in opening SGR and closing one.

Each variable in *Seqs* and *Spans* below is a valid argument for *Span* and *SequenceSGR* default constructors; furthermore, it can be passed in a string form (case-insensitive):

```
>>> Span('BG_GREEN')
Span[SGR[42], SGR[49]]
```

```
>>> Span(Seqs.BG_GREEN, Seqs.UNDERLINED)
Span[SGR[42;4], SGR[49;24]]
```

class pytermor.ansi.**Sequence**

> Abstract ancestor of all escape sequences.
>
> **__init__**(*params: int*)
>
> abstract **assemble**() → str
>
> > Build up actual byte sequence and return as an ASCII-encoded string.
>
> **property params: List[int]**
>
> > Return internal params as array.

class pytermor.ansi.**SequenceCSI**

> Bases: *Sequence*
>
> Abstract class representing CSI-type ANSI escape sequence. All subtypes of this sequence start with e[.
>
> **__init__**(*params: int*)
>
> abstract **assemble**() → str
>
> > Build up actual byte sequence and return as an ASCII-encoded string.
>
> **property params: List[int]**
>
> > Return internal params as array.

class `pytermor.ansi.`**`SequenceSGR`**

> Bases: *SequenceCSI*
>
> Class representing SGR-type escape sequence with varying amount of parameters.
>
> *SequenceSGR* with zero params was specifically implemented to translate into empty string and not into `e[m`, which would have made sense, but also would be very entangling, as this sequence is equivalent of `e[0m` – hard reset sequence. The empty-string-sequence is predefined as *NOOP_SEQ*.
>
> It's possible to add of one SGR sequence to another:
>
> ```
> >>> SequenceSGR(31) + SequenceSGR(1) == SequenceSGR(31, 1)
> True
> ```
>
> **`__init__`**(**args: str | int |* SequenceSGR)
>
> > Create new *SequenceSGR* with specified `args` as params.
> >
> > Resulting sequence param order is same as an argument order.
> >
> > **Each sequence param can be specified as:**
> >
> > - string key (name of any constant defined in *IntCodes*, case-insensitive)
> >
> > - integer param value (`IntCodes` values)
> >
> > - existing `SequenceSGR` instance (params will be extracted).
> >
> > ```
> > >>> SequenceSGR('yellow', 'bold')
> > SGR[33;1]
> > >>> SequenceSGR(91, 7)
> > SGR[91;7]
> > >>> SequenceSGR(IntCodes.HI_CYAN, IntCodes.UNDERLINED)
> > SGR[96;4]
> > ```
>
> **classmethod** **`init_color_indexed`**(*idx: int*, *bg: bool = False*) → *SequenceSGR*
>
> > Wrapper for creation of *SequenceSGR* that sets foreground (or background) to one of 256-color pallete value.
> >
> > **Parameters**
> >
> > - **`idx`** – Index of the color in the pallete, 0 – 255.
> >
> > - **`bg`** – Set to *True* to change the background color (default is foreground).
> >
> > **Returns**
> > > *SequenceSGR* with required params.
>
> **classmethod** **`init_color_rgb`**(*r: int*, *g: int*, *b: int*, *bg: bool = False*) → *SequenceSGR*
>
> > Wrapper for creation of *SequenceSGR* operating in True Color mode (16M). Valid values for *r*, *g* and *b* are in range [0; 255]. This range linearly translates into [`0x00`; `0xFF`] for each channel. The result value is composed as #RRGGBB. For example, sequence with color of `#FF3300` can be created with:
> >
> > ```
> > SequenceSGR.init_color_rgb(255, 51, 0)
> > ```
> >
> > **Parameters**
> >
> > - **`r`** – Red channel value, 0 – 255.
> >
> > - **`g`** – Blue channel value, 0 – 255.
> >
> > - **`b`** – Green channel value, 0 – 255.

- **bg** – Set to *True* to change the background color (default is foreground).

Returns

SequenceSGR with required params.

assemble() → str

Build up actual byte sequence and return as an ASCII-encoded string.

property params: List[int]

Return internal params as array.

class pytermor.ansi.**Span**

Class consisting of two *SequenceSGR* instances – the first one, "opener", tells the terminal that's it should format subsequent characters as specified, and the second one, which reverses the effects of the first one.

__init__(**opening_params: str* | *int* | SequenceSGR)

Create a *Span* with specified control sequence(s) as an opening sequence and **automatically compose** second (closing) sequence that will terminate attributes defined in the first one while keeping the others (*soft* reset).

Resulting sequence param order is same as an argument order.

Each argument can be specified as:

- string key (name of any constant defined in *IntCodes*, case-insensitive)

- integer param value (IntCodes values)

- existing *SequenceSGR* instance (params will be extracted).

```
>>> Span('red', 'bold')
Span[SGR[31;1], SGR[39;22]]
>>> Span(IntCodes.GREEN)
Span[SGR[32], SGR[39]]
>>> Span(93, 4)
Span[SGR[93;4], SGR[39;24]]
>>> Span(Seqs.BG_BLACK + Seqs.RED)
Span[SGR[40;31], SGR[49;39]]
```

Parameters

opening_params – string keys, integer codes or existing SequenceSGR instances to build Span from.

classmethod init_explicit(*opening_seq: Optional[*SequenceSGR*] = None, closing_seq: Optional[*SequenceSGR*] = None, hard_reset_after: bool = False*) → *Span*

Create new *Span* with explicitly specified opening and closing sequences.

Note: *closing_seq* gets overwritten with *Seqs.RESET* if hard_reset_after is *True*.

Parameters

- **opening_seq** – Starter sequence, in general determening how *Span* will actually look like.

- **closing_seq** – Finisher SGR sequence.

- **hard_reset_after** – Terminate *all* formatting after this span.

wrap(*text: Optional[Any] = None*) → str

Wrap given `text` string with SGRs defined on initialization – `opening_seq` on the left, `closing_seq` on the right. `str(text)` will be invoked for all argument types with the exception of *None*, which will be replaced with an empty string.

> **Parameters**
>> **text** – String to wrap.
>
> **Returns**
>> `text` enclosed in instance's SGRs, if any.

property opening_str: str

Return opening SGR sequence assembled.

property opening_seq: *SequenceSGR*

Return opening SGR sequence instance.

property closing_str: str

Return closing SGR sequence assembled.

property closing_seq: *SequenceSGR*

Return closing SGR sequence instance.

__call__(*text: Optional[Any] = None*) → str

Can be used instead of *wrap()* method.

```
>>> Spans.RED('text') == Spans.RED.wrap('text')
True
```

pytermor.ansi.**NOOP_SEQ = SGR[~]**

Special sequence in case you *have to* provide one or another SGR, but do not want any control sequences to be actually included in the output. `NOOP_SEQ.assemble()` returns empty string, `NOOP_SEQ.params` returns empty list.

```
>>> NOOP_SEQ.assemble()
''
>>> NOOP_SEQ.params
[]
```

pytermor.ansi.**NOOP_SPAN = Span[SGR[~], SGR[~]]**

Special *Span* in cases where you *have to* select one or another *Span*, but do not want any control sequence to be actually included.

- NOOP_SPAN(string) or NOOP_SPAN.wrap(string) returns `string` without any modifications;

- NOOP_SPAN.opening_str and NOOP_SPAN.closing_str are empty strings;

- NOOP_SPAN.opening_seq and NOOP_SPAN.closing_seq both returns *NOOP_SEQ*.

```
>>> NOOP_SPAN('text')
'text'
>>> NOOP_SPAN.opening_str
''
>>> NOOP_SPAN.opening_seq
SGR[~]
```

class pytermor.ansi.**IntCodes**

    Bases: *Registry*[int]

    Complete or almost complete list of reliably working SGR param integer codes.

    Suitable for *Span* and *SequenceSGR* default constructors.

> **Attention:** Registry constants are omitted from API doc pages to improve readability and avoid duplication. Summary list of all presets can be found in *Preset list* section of the guide.

---

    classmethod resolve(*name: str*) → T

        Case-insensitive search through registry contents.

        Parameters

            name – name of the value to look up for.

        Returns

            value or KeyError if nothing found.

class pytermor.ansi.**Seqs**

    Bases: *Registry*[*SequenceSGR*]

    Registry of sequence presets.

> **Attention:** Registry constants are omitted from API doc pages to improve readability and avoid duplication. Summary list of all presets can be found in *Preset list* section of the guide.

    RESET = SGR[0]

        Hard reset sequence.

    classmethod resolve(*name: str*) → T

        Case-insensitive search through registry contents.

        Parameters

            name – name of the value to look up for.

        Returns

            value or KeyError if nothing found.

class pytermor.ansi.**Spans**

    Bases: *Registry*[*Span*]

    Registry of span presets.

> **Attention:** Registry constants are omitted from API doc pages to improve readability and avoid duplication. Summary list of all presets can be found in *Preset list* section of the guide.

---

    classmethod resolve(*name: str*) → T

        Case-insensitive search through registry contents.

        Parameters

            name – name of the value to look up for.

        Returns

            value or KeyError if nothing found.

2.2 color

@TODO

@TODO black/white text selection depending on bg

class pytermor.color.**Color**

> Abstract superclass for other `Colors`.
>
> **__init__**(*hex_value: Optional[int] = None*, *use_for_approximations: bool = True*)
>
> **static hex_value_to_hsv_channels**(*hex_value: int*) → Tuple[int, float, float]
>
> > Transforms `hex_value` in `0xffffff` format into tuple of three numbers corresponding to *hue*, *saturation* and *value* channel values respectively. *Hue* is within [0, 359] range, *saturation* and *value* are within [0; 1] range.
>
> **static hex_value_to_rgb_channels**(*hex_value: int*) → Tuple[int, int, int]
>
> > Transforms `hex_value` in `0xffffff` format into tuple of three integers corresponding to *red*, *blue* and *green* channel value respectively. Values are within [0; 255] range.
> >
> > ```
> > >>> Color.hex_value_to_rgb_channels(0x80ff80)
> > (128, 255, 128)
> > >>> Color.hex_value_to_rgb_channels(0x000001)
> > (0, 0, 1)
> > ```
>
> **abstract classmethod get_default**() → *Color*
>
> > **Returns**
> > > Fallback instance of *Color* inheritor (if registries are empty).
>
> **abstract classmethod find_closest**(*hex_value: int*) → *Color*
>
> > Wrapper for *Approximator.find_closest()*.
> >
> > **Parameters**
> > > **hex_value** – Integer color value in `0xffffff` format.
> >
> > **Returns**
> > > Nearest found color of specified type.

pytermor.color.**TypeColor**

> Any non-abstract *Color* type.
>
> alias of TypeVar('TypeColor', ColorDefault, ColorIndexed, ColorRGB)

class pytermor.color.**ColorDefault**

> Bases: *Color*
>
> **__init__**(*hex_value: int*, *code_fg: int*, *code_bg: int*)
>
> **classmethod get_default**() → *ColorDefault*
>
> > **Returns**
> > > Fallback instance of *Color* inheritor (if registries are empty).
>
> **classmethod find_closest**(*hex_value: int*) → *ColorDefault*
>
> > Wrapper for *Approximator.find_closest()*.

> **Attention:** Use this method only if you know what you are doing. *Default* mode colors may vary in a huge range depending on user terminal setup (colors even can have exactly the opposite value of what's listed in preset list). Much more reliable and predictable approach is to use `ColorIndexed.find_closest` instead.

> **Parameters**
>> **hex_value** – Integer color value in `0xffffff` format.
>
> **Returns**
>> Nearest found `ColorDefault` instance.

```
>>> ColorDefault.find_closest(0x660000)
ColorDefault[fg=31, bg=41, 0x800000]
```

> static **hex_value_to_hsv_channels**(*hex_value: int*) → Tuple[int, float, float]
>
>> Transforms `hex_value` in `0xffffff` format into tuple of three numbers corresponding to *hue*, *saturation* and *value* channel values respectively. *Hue* is within [0, 359] range, *saturation* and *value* are within [0; 1] range.
>
> static **hex_value_to_rgb_channels**(*hex_value: int*) → Tuple[int, int, int]
>
>> Transforms `hex_value` in `0xffffff` format into tuple of three integers corresponding to *red*, *blue* and *green* channel value respectively. Values are within [0; 255] range.

```
>>> Color.hex_value_to_rgb_channels(0x80ff80)
(128, 255, 128)
>>> Color.hex_value_to_rgb_channels(0x000001)
(0, 0, 1)
```

class pytermor.color.**ColorIndexed**

> Bases: *Color*
>
> **__init__**(*hex_value: int*, *code: int*, *use_for_approximations=True*)
>
> **classmethod get_default**() → *ColorIndexed*
>
>> **Returns**
>>> Fallback instance of *Color* inheritor (if registries are empty).
>
> **classmethod find_closest**(*hex_value: int*) → *ColorIndexed*
>
>> Wrapper for *Approximator.find_closest()*.
>
>> ---
>> **Note:** Approximation algorithm ignores colors 000-015 from the *indexed* palette and will return colors with int codes in 016-255 range only. The reason for this is the same as for discouraging the usage of `ColorDefault` method version – because aforementioned colors actually depend on end-user terminal settings and the final result can be differ drastically from what's the developer imagined.
>> ---
>
>> **Parameters**
>>> **hex_value** – Integer color value in `0xffffff` format.
>>
>> **Returns**
>>> Nearest found `ColorIndexed` instance.

```
>>> ColorIndexed.find_closest(0xd9dbdb)
ColorIndexed[code=253, 0xdadada]
```

static hex_value_to_hsv_channels(*hex_value: int*) → Tuple[int, float, float]

Transforms `hex_value` in `0xffffff` format into tuple of three numbers corresponding to *hue*, *saturation* and *value* channel values respectively. *Hue* is within [0, 359] range, *saturation* and *value* are within [0; 1] range.

static hex_value_to_rgb_channels(*hex_value: int*) → Tuple[int, int, int]

Transforms `hex_value` in `0xffffff` format into tuple of three integers corresponding to *red*, *blue* and *green* channel value respectively. Values are within [0; 255] range.

```
>>> Color.hex_value_to_rgb_channels(0x80ff80)
(128, 255, 128)
>>> Color.hex_value_to_rgb_channels(0x000001)
(0, 0, 1)
```

class pytermor.color.**ColorRGB**

Bases: *Color*

classmethod get_default() → *ColorRGB*

> **Returns**
>> Fallback instance of *Color* inheritor (if registries are empty).

classmethod find_closest(*hex_value: int*) → *ColorRGB*

In case of *ColorRGB* we suppose that user's terminal is not limited to a palette, therefore RGB-type color map works by simplified algorithm – it just checks if instance with same hex value was already created and returns it if that's the case, or returns a brand new instance with specified color value otherwise.

> **Parameters**
>> **hex_value** – Integer color value in `0xffffff` format.

> **Returns**
>> Existing *ColorRGB* instance or newly created one.

```
>>> existing_color1 = ColorRGB(0x660000)
>>> existing_color2 = ColorRGB(0x660000)
>>> existing_color1 == existing_color2
True
>>> existing_color1 is existing_color2  # different instances
False
>>> existing_color1 == ColorRGB.find_closest(0x660000)
True
>>> existing_color1 is ColorRGB.find_closest(0x660000)  # same instance
True
```

__init__(*hex_value: Optional[int] = None*, *use_for_approximations: bool = True*)

static hex_value_to_hsv_channels(*hex_value: int*) → Tuple[int, float, float]

Transforms `hex_value` in `0xffffff` format into tuple of three numbers corresponding to *hue*, *saturation* and *value* channel values respectively. *Hue* is within [0, 359] range, *saturation* and *value* are within [0; 1] range.

static **hex_value_to_rgb_channels**(*hex_value: int*) → Tuple[int, int, int]

> Transforms `hex_value` in `0xffffff` format into tuple of three integers corresponding to *red*, *blue* and *green* channel value respectively. Values are within [0; 255] range.

```
>>> Color.hex_value_to_rgb_channels(0x80ff80)
(128, 255, 128)
>>> Color.hex_value_to_rgb_channels(0x000001)
(0, 0, 1)
```

class pytermor.color.**Approximator**

> Bases: `Generic[`*TypeColor*`]`

Internal class containing a dictionary of registred *Colors* indexed by hex code along with cached nearest color search results to avoid unnecessary instance copies and search repeating.

> **__init__**(*parent_type: TypeColor*)
>
> > Called in *Color*-type class constructors. Each *Color* type should have class variable with instance of *Approximator* and create it by itself if it's not present.
> >
> > > **Parameters**
> > > > **parent_type** – Parent *Color* type.
>
> **add_to_map**(*color: TypeColor*)
>
> > Called in *Color*-type class constructors. Add a new element in color lookup table if it wasn't there, and then drop cached search results as they are most probably useless after registering a new color (i.e. now there will be better result for at least one cached value).
> >
> > > **Parameters**
> > > > **color** – *Color* instance being created.
>
> **get_exact**(*hex_value: int*) → Optional[TypeColor]
>
> > Public interface for searching exact values in the *lookup table*, or global registry of created instances of specified `Color` class.
> >
> > > **Parameters**
> > > > **hex_value** – Color value in RGB format.
> > >
> > > **Returns**
> > > > `Color` with specified value. Type is equal to type of the parent of selected color map.
>
> **find_closest**(*hex_value: int*) → TypeColor
>
> > Search for nearest to `hex_value` registered color. Is used by *SGRRenderer* to find supported color alternatives in case user's terminal is incapable of operating in better mode.
> >
> > > **Parameters**
> > > > **hex_value** – Color value in RGB format.
> > >
> > > **Returns**
> > > > Nearest to `hex_value` registered `Color`. Type is equal to type of the parent of selected color map. If no colors of required type were created (table and cache are empty), invokes *get_default()* `Color` method.
>
> **approximate**(*hex_value: int*, *max_results: int = 1*) → List[TypeColor]
>
> > Core color approximation method. Iterate the registred SGRs table, or *lookup table*, containing parents' instances, and compute the euclidean distance from argument to each color of the palette. Sort the results and return the first <max_results> of them.

> **Note:** It's not guaranteed that this method will **always** succeed in searching (the result list can be empty). Consider using *find_closest* instead, if you really want to be sure that at least some color will be returned. Another option is to use special "color" named *NOOP_COLOR*.

Parameters

- **hex_value** – Color RGB value.

- **max_results** – Maximum amount of values to return.

Returns

Closest *Color* instances found, sorted by color distance descending (i.e. 0th element is always the closest to the input value).

pytermor.color.NOOP_COLOR = ColorRGB[~]

Special instance of *Color* class always rendering into empty string.

class pytermor.color.Colors

Bases: *Registry*[*TypeColor*]

Registry of colors presets (*ColorDefault*, *ColorIndexed*, *ColorRGB*).

> **Attention:** Registry constants are omitted from API doc pages to improve readability and avoid duplication. Summary list of all presets can be found in *Preset list* section of the guide.

classmethod resolve(*name: str*) → T

Case-insensitive search through registry contents.

Parameters

name – name of the value to look up for.

Returns

value or KeyError if nothing found.

2.3 render

Module with output formatters. By default *SGRRenderer* is used. It also contains compatibility settings, see *SGRRenderer.set_up()*.

Working with non-default renderer can be achieved in two ways:

a. Method *RendererManager.set_up()* sets the default renderer globally.

b. Alternatively, you can use renderer's own class method *IRenderer.render()* directly and avoid calling *Style.render()* method whatsoever.

TL;DR

To unconditionally print formatted message to output terminal, do something like this:

```
>>> from pytermor import SGRRenderer, RendererManager, Styles
>>> RendererManager.set_up(SGRRenderer)    # can be omitted as SGR _is_ a default renderer
>>> SGRRenderer.set_up(force_styles=True)
>>> Styles.WARNING.render('Warning: AAA')   # print()
'\x1b[33mWarning: AAA\x1b[39m'
```

class pytermor.render.**Text**

>   Text

>   **__init__**(*text: Any = None*, *style:* Style | *str = None*)

>   **render**() → str

>   **append**(*text: str |* Text)

>   **prepend**(*text: str |* Text)

class pytermor.render.**Style**

>   Create a new Style().

>   Key difference between Styles and Spans or SGRs is that Styles describe colors in RGB format and therefore support output rendering in several different formats (see render).

>   Both fg and bg can be specified as:

>   1. *Color* instance or library preset;

>   2. key code – name of any of aforementioned presets, case-insensitive;

>   3. integer color value in hexademical RGB format.

>   4. None – the color will be unset.

>   **Parameters**

>   - **fg** – Foreground (i.e., text) color.

>   - **bg** – Background color.

>   - **inherit** – Parent instance to copy unset properties from.

>   - **blink** – Blinking effect; *supported by limited amount of Renderers*.

>   - **bold** – Bold or increased intensity.

>   - **crosslined** – Strikethrough.

>   - **dim** – Faint, decreased intensity.

>   - **double_underlined** – Faint, decreased intensity.

>   - **inversed** – Swap foreground and background colors.

>   - **italic** – Italic.

>   - **overlined** – Overline.

>   - **underlined** – Underline.

>   - **class_name** – Arbitary string used by some renderers, e.g. by HtmlRenderer.

```
>>> Style(fg='green', bold=True)
Style[fg=008000, no bg, bold]
>>> Style(bg=0x0000ff)
Style[no fg, bg=0000ff]
>>> Style(fg=Colors.XTERM_DEEP_SKY_BLUE_1, bg=Colors.XTERM_GREY_93)
Style[fg=00afff, bg=eeeeee]
```

__init__(*inherit:* Style *= None, fg:* Color *| int | str = None, bg:* Color *| int | str = None, blink: bool = None,*
        bold: bool = None, crosslined: bool = None, dim: bool = None, double_underlined: bool = None,
        inversed: bool = None, italic: bool = None, overlined: bool = None, underlined: bool = None,
        class_name: str = None)

render(*text: Optional[Any] = None*) → str

    Returns `text` with all attributes and colors applied.

    By default uses *SequenceSGR* renderer, that means that output will contain ANSI escape sequences.

autopick_fg() → *Color* | None

    Pick `fg_color` depending on `bg_color`. Set `fg_color` to either 4% gray (almost black) if background is bright, or to 96% gray (almost white) if it is dark, and after that return the applied `fg_color`. If `bg_color` is undefined, do nothing and return None.

        Returns

            Suitable foreground color or None.

property fg: *Color*

property bg: *Color*

pytermor.render.**NOOP_STYLE = Style[no fg, no bg]**

    Special style which passes the text furthrer without any modifications.

class pytermor.render.**RendererManager**

    classmethod set_up(*default_renderer: Type[*IRenderer*] | None = None*)

        Set up renderer preferences. Affects all renderer types.

        Parameters

            default_renderer – Default renderer to use globally. Passing None will result in library default setting restored (*SGRRenderer*).

```
>>> RendererManager.set_up(DebugRenderer)
>>> Style(fg='red').render('text')
'|31|text|39|'
```

```
>>> NoOpRenderer.render('text',Style(fg='red'))
'text'
```

    classmethod get_default() → Type[*IRenderer*]

        Get global default renderer type.

class pytermor.render.**IRenderer**

    Abstract ancestor of all renderers.

    abstract classmethod render(*text: Any*, *style:* Style) → str

        Apply colors and attributes described in `style` argument to `text` and return the result. Output format depends on renderer's class (which defines the implementation).

class pytermor.render.**SGRRenderer**

Bases: *IRenderer*

Default renderer that *Style.render()* invokes. Transforms *Color* instances defined in style into ANSI control sequence characters and merges them with input string.

Respects compatibility preferences (see *RendererManager.set_up()*) and maps RGB colors to closest *indexed* colors if terminal doesn't support RGB output. In case terminal doesn't support even 256 colors, falls back to *default* colors, searching for closest counterparts in 16-color table.

Type of output SequenceSGR depends on type of *Color* variables in style argument. Keeping all that in mind, let's summarize:

1. *ColorRGB* can be rendered as True Color sequence, indexed sequence or default (16-color) sequence depending on terminal capabilities.

2. *ColorIndexed* can be rendered as indexed sequence or default sequence.

3. *ColorDefault* can be rendered as default-color sequence.

4. Nothing of the above will happen and all Colors will be discarded completely if output is not a terminal emulator or if the developer explicitly set up the renderer to do so.

```
>>> SGRRenderer.render('text', Style(fg='red', bold=True))
'\x1b[1;31mtext\x1b[22;39m'
```

classmethod set_up(*force_styles: bool | None = False, compatibility_indexed: bool = False, compatibility_default: bool = False*)

Set up renderer preferences. Affects all renderer types.

> **Parameters**
>
> - **force_styles** –
>
>   – If set to *None*, all renderers will pass input text through themselves without any changes (i.e. no colors and attributes will be applied).
>
>   – If set to *True*, renderers will always apply the formatting regardless of other internal rules and algorithms.
>
>   – If set to *False* [default], the final decision will be made by every renderer independently, based on their own algorithms.
>
> - **compatibility_indexed** – Disable *RGB* (or True Color) output mode. 256-color (*indexed*) sequences will be printed out instead of disabled ones. Useful when combined with curses – that way you can check the terminal capabilities from the inside of that terminal and switch to different output mode at once.
>
> - **compatibility_default** – Disable *indexed* output mode and use *default* 16-color sequences instead. If this setting is set to *True*, the value of compatibility_indexed will be ignored completely. Useful when combined with curses – that way you can check the terminal capabilities from the inside of that terminal and switch to different output mode at once.

classmethod render(*text: Any, style:* Style)

Apply colors and attributes described in style argument to text and return the result. Output format depends on renderer's class (which defines the implementation).

class pytermor.render.**TmuxRenderer**

Bases: *IRenderer*

tmux

abstract classmethod render(*text: Any*, *style:* Style) → str

> Apply colors and attributes described in `style` argument to `text` and return the result. Output format depends on renderer's class (which defines the implementation).

class pytermor.render.`NoOpRenderer`

> Bases: *IRenderer*

Special renderer type that does nothing with the input string and just returns it as is. That's true only when it _is_ a str beforehand; otherwise argument will be casted to str and then returned.

```
>>> NoOpRenderer.render('text',Style(fg='red', bold=True))
'text'
```

classmethod render(*text: Any*, *style:* Style) → str

> Apply colors and attributes described in `style` argument to `text` and return the result. Output format depends on renderer's class (which defines the implementation).

class pytermor.render.`HtmlRenderer`

> Bases: *IRenderer*

html

```
>>> HtmlRenderer.render('text',Style(fg='red', bold=True))
'<span style="color: #800000; font-weight: 700">text</span>'
```

DEFAULT_ATTRS = ['color', 'background-color', 'font-weight', 'font-style',
'text-decoration', 'border', 'filter']

classmethod render(*text: Any*, *style:* Style) → str

> Apply colors and attributes described in `style` argument to `text` and return the result. Output format depends on renderer's class (which defines the implementation).

class pytermor.render.`DebugRenderer`

> Bases: *IRenderer*

DebugRenderer

```
>>> DebugRenderer.render('text',Style(fg='red', bold=True))
'|1;31|text|22;39|'
```

classmethod render(*text: Any*, *style:* Style) → str

> Apply colors and attributes described in `style` argument to `text` and return the result. Output format depends on renderer's class (which defines the implementation).

class pytermor.render.`Styles`

> Bases: *Registry*[*Style*]

Some ready-to-use styles. Can be used as examples.

This registry has unique keys in comparsion with other ones (*Seqs* / *Spans* / *IntCodes*), Therefore there is no risk of key/value duplication and all presets can be listed in the initial place – at API docs page directly.

WARNING = Style[fg=808000, no bg]

WARNING_LABEL = Style[fg=808000, no bg, bold]

WARNING_ACCENT = Style[fg=ffff00, no bg]

> ERROR = `Style[fg=800000, no bg]`
>
> ERROR_LABEL = `Style[fg=800000, no bg, bold]`
>
> **classmethod resolve**(*name: str*) → T
>
> > Case-insensitive search through registry contents.
> >
> > > **Parameters**
> > > > **name** – name of the value to look up for.
> > >
> > > **Returns**
> > > > value or KeyError if nothing found.
>
> ERROR_ACCENT = `Style[fg=ff0000, no bg]`
>
> CRITICAL = `Style[fg=ffffff, bg=ff0000]`
>
> CRITICAL_LABEL = `Style[fg=ffffff, bg=ff0000, bold]`
>
> CRITICAL_ACCENT = `Style[fg=ffffff, bg=ff0000, blink, bold]`

pytermor.render.**print_exception**(*e: Exception*, *file: ~typing.TextIO = <_io.TextIOWrapper name='<stderr>' mode='w' encoding='utf-8'>*, *with_trace: bool = True*)

> **Parameters**
>
> > - **e** –
> > - **file** –
> > - **with_trace** –
>
> **Returns**

pytermor.render.**distribute_padded**(*values: List[str | Text]*, *max_len: int*, *pad_before: bool = False*, *pad_after: bool = False*) → str

2.4 util

Package containing a set of formatters for prettier output, as well as utility classes for removing some of the boilerplate code when dealing with escape sequences.

pytermor.util.**format_thousand_sep**(*value: int | float*, *separator=' '*)

> Returns input `value` with integer part splitted into groups of three digits, joined then with `separator` string.

```
>>> format_thousand_sep(260341)
'260 341'
>>> format_thousand_sep(-9123123123.55, ',')
'-9,123,123,123.55'
```

2.4.1 auto_float

pytermor.util.auto_float.**format_auto_float**(*value: float*, *req_len: int*, *allow_exponent_notation: bool =*
True) → str

Dynamically adjust decimal digit amount and format to fill up the output string with as many significant digits as possible, and keep the output length strictly equal to *req_len* at the same time.

```
>>> format_auto_float(0.016789, 5)
'0.017'
>>> format_auto_float(0.167891, 5)
'0.168'
>>> format_auto_float(1.567891, 5)
'1.568'
>>> format_auto_float(12.56789, 5)
'12.57'
>>> format_auto_float(123.5678, 5)
'123.6'
>>> format_auto_float(1234.567, 5)
' 1235'
>>> format_auto_float(12345.67, 5)
'12346'
```

For cases when it's impossible to fit a number in the required length and rounding doesn't help (e.g. 12 500 000 and 5 chars) algorithm switches to scientific notation and the result looks like '1.2e7'.

When exponent form is disabled, there are two options for value that cannot fit into required length:

1) if absolute value is less than 1, zeros will be displayed ('0.0000');

2) in case of big numbers (like 10^9) ValueError will be raised instead.

> **Parameters**
>> • **value** – Value to format
>>
>> • **req_len** – Required output string length
>>
>> • **allow_exponent_notation** – Enable/disable exponent form.
>
> **Returns**
>> Formatted string of required length
>
> **Raises**
>> **ValueError** –

New in version 1.7.

2.4.2 prefixed_unit

pytermor.util.prefixed_unit.**format_si_metric**(*value: float*, *unit: str = 'm'*) → str

Format `value` as meters with SI-prefixes, max result length is *6* chars. Base is *1000*. Unit can be customized.

```
>>> format_si_metric(123.456)
'123 m'
>>> format_si_metric(0.331, 'g')
'331 mg'
```

```
>>> format_si_metric(45200, 'V')
'45.2 kV'
>>> format_si_metric(1.26e-9, 'm²')
'1.26 nm²'
```

> **Parameters**
>
> - **value** – Input value (unitless).
>
> - **unit** – Value unit, printed right after the prefix.
>
> **Returns**
> > Formatted string with SI-prefix if necessary.

New in version 2.0.

pytermor.util.prefixed_unit.**format_si_binary**(*value: float*, *unit: str = 'b'*) → str

> Format `value` as binary size (bytes, kbytes, Mbytes), max result length is *8* chars. Base is *1024*. Unit can be customized.

```
>>> format_si_binary(631)
'631 b'
>>> format_si_binary(1080)
'1.055 kb'
>>> format_si_binary(45200)
'44.14 kb'
>>> format_si_binary(1.258 * pow(10, 6), 'bps')
'1.200 Mbps'
```

> **Parameters**
>
> - **value** – Input value in bytes.
>
> - **unit** – Value unit, printed right after the prefix.
>
> **Returns**
> > Formatted string with SI-prefix if necessary.

New in version 2.0.

class pytermor.util.prefixed_unit.**PrefixedUnitFormatter**

> Formats `value` using settings passed to constructor. The main idea of this class is to fit into specified string length as much significant digits as it's theoretically possible by using multipliers and unit prefixes to indicate them.
>
> You can create your own formatters if you need fine tuning of the output and customization. If that's not the case, there are facade methods *format_si_metric()* and *format_si_binary()*, which will invoke predefined formatters and doesn't require setting up.
>
> @TODO params desc
>
> > **Parameters**
> > > **prefix_zero_idx** – Index of prefix which will be used as default, i.e. without multiplying coefficients.
>
> New in version 1.7.

__init__(*max_value_len: int, truncate_frac: bool = False, unit: str = None, unit_separator: str = None, mcoef: float = 1000.0, prefixes: List[str | None] = None, prefix_zero_idx: int = None*)

property max_len: int

> **Returns**
>> Maximum length of the result. Note that constructor argument is *max_value_len*, which is different parameter.

format(*value: float, unit: Optional[str] = None*) → str

> **Parameters**
>> • **value** – Input value
>>
>> • **unit** – Unit override
>
> **Returns**
>> Formatted value

pytermor.util.prefixed_unit.**PREFIXES_SI** = ['y', 'z', 'a', 'f', 'p', 'n', '', 'm', None, 'k', 'M', 'G', 'T', 'P', 'E', 'Z', 'Y']

> Prefix presets used by default module formatters. Can be useful if you are building your own formatter.

pytermor.util.prefixed_unit.**PREFIX_ZERO_SI** = 8

> Index of prefix which will be used as default, i.e. without multiplying coefficients.

2.4.3 time_delta

Module for time difference formatting (e.g. "4 days 15 hours", "8h 59m").

Supports several output lengths and can be customized even more.

pytermor.util.time_delta.**format_time_delta**(*seconds: float, max_len: Optional[int] = None*) → str

> Format time delta using suitable format (which depends on `max_len` argument). Key feature of this formatter is ability to combine two units and display them simultaneously, e.g. return "3h 48min" instead of "228 mins" or "3 hours",
>
> There are predefined formatters with output length of 3, 4, 6 and 10 characters. Therefore, you can pass in any value from 3 inclusive and it's guarenteed that result's length will be less or equal to required length. If *max_len* is omitted, longest registred formatter will be used.

```
>>> format_time_delta(10, 3)
'10s'
>>> format_time_delta(10, 6)
'10 sec'
>>> format_time_delta(15350, 4)
'4 h'
>>> format_time_delta(15350)
'4h 15min'
```

> **Parameters**
>> • **seconds** – Value to format
>>
>> • **max_len** – Maximum output string length (total)
>
> **Returns**
>> Formatted string

---

class pytermor.util.time_delta.**TimeDeltaFormatter**

> Formatter for time intervals. Key feature of this formatter is ability to combine two units and display them simultaneously, e.g. return "3h 48min" instead of "228 mins" or "3 hours", etc.
>
> You can create your own formatters if you need fine tuning of the output and customization. If that's not the case, there is a facade method *format_time_delta()* which will select appropriate formatter automatically.
>
> Example output:

```
"10 secs", "5 mins", "4h 15min", "5d 22h"
```

> __init__(*units: List[TimeUnit]*, *allow_negative: bool*, *unit_separator: Optional[str] = None*, *plural_suffix: Optional[str] = None*, *overflow_msg: str = 'OVERFLOW'*)
>
> **property max_len: int**
>
>> This property cannot be set manually, it is computed on initialization automatically.
>>
>> **Returns**
>>> Maximum possible output string length.
>
> **format**(*seconds: float*, *always_max_len: bool = False*) → str
>
>> Pretty-print difference between two moments in time.
>>
>> **Parameters**
>>> - **seconds** – Input value.
>>> - **always_max_len** – If result string is less than *max_len* it will be returned as is, unless this flag is set to *True*. In that case output string will be padded with spaces on the left side so that resulting length would be always equal to maximum length.
>>
>> **Returns**
>>> Formatted string.
>
> **format_raw**(*seconds: float*) → str | None
>
>> Pretty-print difference between two moments in time, do not replace the output with "OVERFLOW" warning message.
>>
>> **Parameters**
>>> **seconds** – Input value.
>>
>> **Returns**
>>> Formatted string or *None* on overflow (if input value is too big for the current formatter to handle).

class pytermor.util.time_delta.**TimeUnit**

> TimeUnit(name: 'str', in_next: 'int' = None, custom_short: 'str' = None, collapsible_after: 'int' = None, overflow_afer: 'int' = None)
>
> **name: str**
>
> **in_next: int = None**
>
> **custom_short: str = None**
>
> **collapsible_after: int = None**
>
> **overflow_afer: int = None**
>
> __init__(*name: str*, *in_next: Optional[int] = None*, *custom_short: Optional[str] = None*, *collapsible_after: Optional[int] = None*, *overflow_afer: Optional[int] = None*) → None

2.4.4 stdlib_ext

Some of the Python Standard Library methods rewritten for correct work with strings containing control sequences.

pytermor.util.stdlib_ext.**ljust_sgr**(*s: str*, *width: int*, *fillchar: str = ' '*) → str

> SGR-formatting-aware implementation of `str.ljust`.
>
> Return a left-justified string of length `width`. Padding is done using the specified fill character (default is a space).

pytermor.util.stdlib_ext.**rjust_sgr**(*s: str*, *width: int*, *fillchar: str = ' '*) → str

> SGR-formatting-aware implementation of `str.rjust`.
>
> Return a right-justified string of length `width`. Padding is done using the specified fill character (default is a space).

pytermor.util.stdlib_ext.**center_sgr**(*s: str*, *width: int*, *fillchar: str = ' '*) → str

> SGR-formatting-aware implementation of `str.center`.
>
> Return a centered string of length `width`. Padding is done using the specified fill character (default is a space).
>
> @ TODO   (.) #   –   f-

2.4.5 string_filter

String filtering module.

Main idea is to provide a common interface for string filtering, that can make possible working with filters like with objects rather than with functions/lambdas.

pytermor.util.string_filter.**apply_filters**(*s: AnyStr*, **args:* StringFilter*[AnyStr] |* Type*[*StringFilter*[AnyStr]]*) → AnyStr

> Method for applying dynamic filter list to a target string/bytes. Example (will replace all ESC control characters to `E` and thus make SGR params visible):

```
>>> apply_filters(Spans.RED('test'), ReplaceSGR(r'E\2\3\5'))
'E[31mtestE[39m'
```

> Note that type of `s` argument must be same as `StringFilter` parameterized type, i.e. *ReplaceNonAsciiBytes* is `StringFilter[bytes]` type, so you can apply it only to bytes-type strings.
>
> > **Parameters**
> >
> > * **s** (*AnyStr*) – String to filter.
> >
> > * **args** – *StringFilter* instance(s) or `StringFilter` class(es).
> >
> > **Returns**
> >   Filtered `s`.

class pytermor.util.string_filter.**StringFilter**

> Bases: `Generic`
>
> Common string modifier interface.
>
> **__init__**(*pattern: AnyStr*, *repl: AnyStr | Callable[[AnyStr | Match], AnyStr]*)
>
> **__call__**(*s: AnyStr*) → AnyStr
> > Can be used instead of *apply()*

apply(*s: AnyStr*) → AnyStr

> Apply filter to `s` string (or bytes).

static __new__(*cls*, **args*, ***kwds*)

class pytermor.util.string_filter.**VisualuzeWhitespace**

> Bases: *StringFilter*[str]
>
> Replace every invisible character with `repl` (default is ·), except newlines. Newlines are kept and get prepneded with same string.
>
> ```
> >>> VisualuzeWhitespace().apply('A  B  C')
> 'A··B··C'
> >>> apply_filters('1. D\n2. L ', VisualuzeWhitespace)
> '1.·D·\n2.·L·'
> ```
>
> **__init__**(*repl: AnyStr = '·'*)
>
> **__call__**(*s: AnyStr*) → AnyStr
>
> > Can be used instead of *apply()*
>
> **static __new__**(*cls*, **args*, ***kwds*)
>
> **apply**(*s: AnyStr*) → AnyStr
>
> > Apply filter to `s` string (or bytes).

class pytermor.util.string_filter.**ReplaceSGR**

> Bases: *StringFilter*[str]
>
> Find all SGR seqs (e.g. `ESC[1;4m`) and replace with given string. More specific version of *ReplaceCSI*.
>
> > **Parameters**
> >
> > > **repl** – Replacement, can contain regexp groups (see *apply_filters()*).
>
> **__init__**(*repl: AnyStr = ''*)
>
> **__call__**(*s: AnyStr*) → AnyStr
>
> > Can be used instead of *apply()*
>
> **static __new__**(*cls*, **args*, ***kwds*)
>
> **apply**(*s: AnyStr*) → AnyStr
>
> > Apply filter to `s` string (or bytes).

class pytermor.util.string_filter.**ReplaceCSI**

> Bases: *StringFilter*[str]
>
> Find all CSI seqs (i.e. `ESC[*`) and replace with given string. Less specific version of *ReplaceSGR*, as CSI consists of SGR and many other sequence subtypes.
>
> > **Parameters**
> >
> > > **repl** – Replacement, can contain regexp groups (see *apply_filters()*).
>
> **__init__**(*repl: AnyStr = ''*)
>
> **__call__**(*s: AnyStr*) → AnyStr
>
> > Can be used instead of *apply()*
>
> **static __new__**(*cls*, **args*, ***kwds*)

apply(*s: AnyStr*) → AnyStr

> Apply filter to `s` string (or bytes).

class pytermor.util.string_filter.**ReplaceNonAsciiBytes**

> Bases: *StringFilter*[bytes]
>
> Keep 7-bit ASCII bytes [`0x00` - `0x7f`], replace other to ?.
>
> > **Parameters**
> > **repl** – Replacement byte-string.
>
> **__init__**(*repl: AnyStr = b'?'*)
>
> **__call__**(*s: AnyStr*) → AnyStr
>
> > Can be used instead of *apply()*
>
> **static __new__**(*cls*, **args*, ***kwds*)
>
> **apply**(*s: AnyStr*) → AnyStr
>
> > Apply filter to `s` string (or bytes).

2.5 common

pytermor.common.**T**

> Any
>
> alias of TypeVar('T')

class pytermor.common.**Registry**

> Bases: `Generic[`*T*`]`
>
> Registry of elements of specified type.
>
> **classmethod resolve**(*name: str*) → T
>
> > Case-insensitive search through registry contents.
> >
> > > **Parameters**
> > > **name** – name of the value to look up for.
> > >
> > > **Returns**
> > > value or KeyError if nothing found.

pytermor.common.**get_terminal_width**() → int

> > **Returns**
> > terminal_width

exception pytermor.common.**LogicError**

> Bases: `Exception`
>
> **__init__**(**args*, ***kwargs*)
>
> **with_traceback**()
>
> > Exception.with_traceback(tb) – set self.__traceback__ to tb and return self.

CHANGELOG

3.1 v2.0.0

- Complete library rewrite.
- High-level abstractions *Color*, *Renderer* and *Style*.
- Unit tests for formatters and new modules.
- `pytest` and `coverage` integration.
- `sphinx` and `readthedocs` integraton.

3.2 v1.8.0

- `format_prefixed_unit` extended for working with decimal and binary metric prefixes.
- *format_time_delta* extended with new settings.
- Value rounding transferred from *format_auto_float* to `format_prefixed_unit`.
- Utility classes reorganization.
- Unit tests output formatting.
- `sequence.NOOP` SGR sequence and `span.NOOP` format.
- Max decimal points for *auto_float* extended from (2) to (max-2).

3.3 v1.7.4

- Added 3 formatters: `format_prefixed_unit`, *format_time_delta*, *format_auto_float*.

3.4 v1.7.3

- Added `span.BG_BLACK` format.

3.5 v1.7.2

- Added *ljust_sgr*, *rjust_sgr*, *center_sgr* util functions to align strings with SGRs correctly.

3.6 v1.7.1

- Print reset sequence as `\e[m` instead of `\e[0m`.

3.7 v1.7.0

- *Span* constructor can be called without arguments.
- Added SGR code lists.

3.8 v1.6.2

- Excluded `tests` dir from distribution package.

3.9 v1.6.1

- Ridded of `EmptyFormat` and `AbstractFormat` classes.
- Renamed `code` module to `sgr` because of conflicts in PyCharm debugger (`pydevd_console_integration.py`).

3.10 v1.5.0

- Removed excessive `EmptySequenceSGR` – default SGR class was specifically implemented to print out as empty string instead of `\e[m` if constructed without params.

3.11 v1.4.0

- *Span.wrap()* now accepts any type of argument, not only `str`.
- Rebuilt `Sequence` inheritance tree.
- Added equality methods for *SequenceSGR* and *Span* classes/subclasses.
- Added some tests for `fmt.*` and `seq.*` classes.

3.12 v1.3.2

- Added `span.GRAY` and `span.BG_GRAY` format presets.

3.13 v1.3.1

- Interface revisioning.

3.14 v1.2.1

- *opening_seq* and *closing_seq* properties for *Span* class.

3.15 v1.2.0

- `EmptySequenceSGR` and `EmptyFormat` classes.

3.16 v1.1.0

- Autoformat feature.

3.17 v1.0.0

- First public version.

This project uses Semantic Versioning – https://semver.org *(starting from 2.0.0)*

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```

PYTHON MODULE INDEX

p

INDEX