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:

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

CHAPTER

ONE

GUIDE

1.1 Getting started

1.1.1 Installation

```
pip install pytermor
```

1.1.2 Structure

A L	Module	Class(es)	Purpose
Hi	*text*	*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	*Color16* *Color256* *ColorRGB*	Abstractions for color operations in different color modes (default 16-color, 256-color, RGB). Tools for color approximation and transformations.
		pytermor	Color registry.
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 *SeqIndex*	Abstractions for manipulating ANSI control sequences and classes-factories, 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'))
```

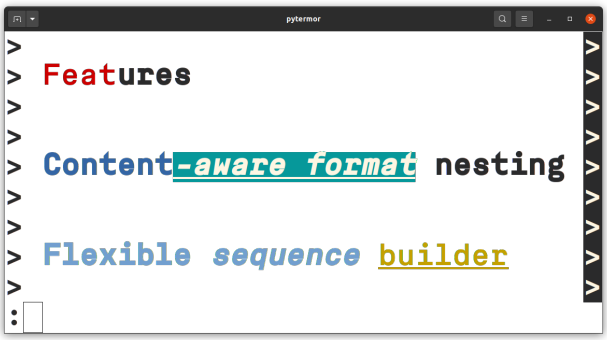
Content-aware format nesting

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 SeqIndex, SequenceSGR

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

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

```
from pytermor import SequenceSGR, SeqIndex

start_color = 41
for idx, c in enumerate(range(start_color, start_color+(36*6), 36)):
    print(f'{SequenceSGR.new_color_256(c)}{SeqIndex.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.new_color_rgb(r, g, b)}{SeqIndex.COLOR_OFF}', end='')
```

Customizable output formats

Todo: @TODOTODO

String and number formatters

Todo: @TODOTODO

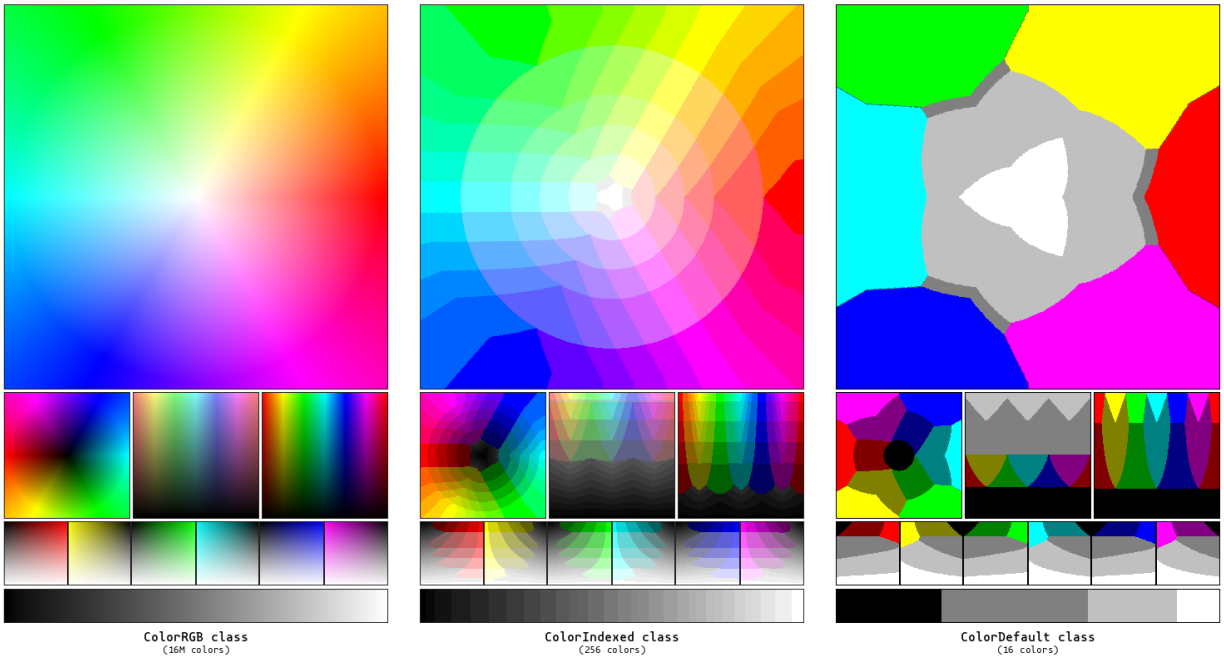


Fig. 1: Color approximations for indexed modes

1.2 High-level abstractions

1.2.1 ColorIndex and Styles

1.2.2 Output format control

1.2.3 Color mode fallbacks

1.2.4 Core API

@EXAMPLES

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 `ESC [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 `ESC [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:

```
from pytermor import Span, Spans, SeqIndex

# implicitly:
```

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```
span_warn = Span(93, 4)
# or explicitly:
span_warn = Span.init_explicit(
    SeqIndex.HI_YELLOW + SeqIndex.UNDERLINED,  # sequences can be summed up, remember?
    SeqIndex.COLOR_OFF + SeqIndex.UNDERLINED_OFF,  # "counteractive" sequences
    hard_reset_after=False
)

orig_text = Spans.BOLD(f'this is {SeqIndex.BG_GRAY}the original{SeqIndex.RESET} string')
updated_text = orig_text.replace('original', span_warn('updated'), 1)
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 `SeqIndex.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 *SeqIndex* 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 `ESC [m`, which would make sense, but also could be very entangling, as terminal emulators interpret that sequence as `ESC [0m`, which is *hard* reset sequence.

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

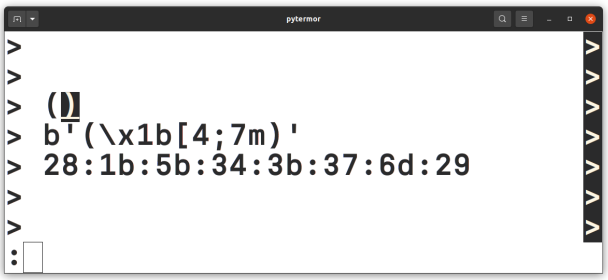
- *make_color_256()* will produce sequence operating in 256-colors mode (for a complete list see *Preset list*);
- *make_color_rgb()* will create a sequence capable of setting the colors in True Color 16M mode (however, some terminal emulators doesn't support it).

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

```
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 hexadecimal string representation.

1.3.4 SGR sequence structure

1. `ESC `` is escape *control character*, which opens a control sequence (can also be written as ``\x1b`, `\033` or `\e`).
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, SeqIndex

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

1.3.6 Core API

Todo:

- *SequenceSGR* constructor
- SequenceSGR.make_color_256()
- SequenceSGR.make_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 (*Color16*), and second one consisting of 256 colors (*Color256*). There is also True Color mode (referenced as *RGB* mode), but it is not palette-based.

Duplicate substitution definition name: “nbsp”.

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, resetters

	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* make_color_256 *and* make_color_rgb *instead*
	BG_COLOR_EXTENDED	48					Set background color [*indexed*/*RGB* mode]; *use* make_color_256 *and* make_color_rgb *instead*
	OVERLINED	53	V	V		V	Overline; *not widely supported*
Resetters							
	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 conecaling
	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

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	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

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	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	

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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

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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	

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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 `Color16` 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).

Todo: **(Verify)** 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 `Color16` 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.

Todo: Approximation algorithm is as simple as iterating through all colors in the *lookup table* (which contains all possible …

[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.

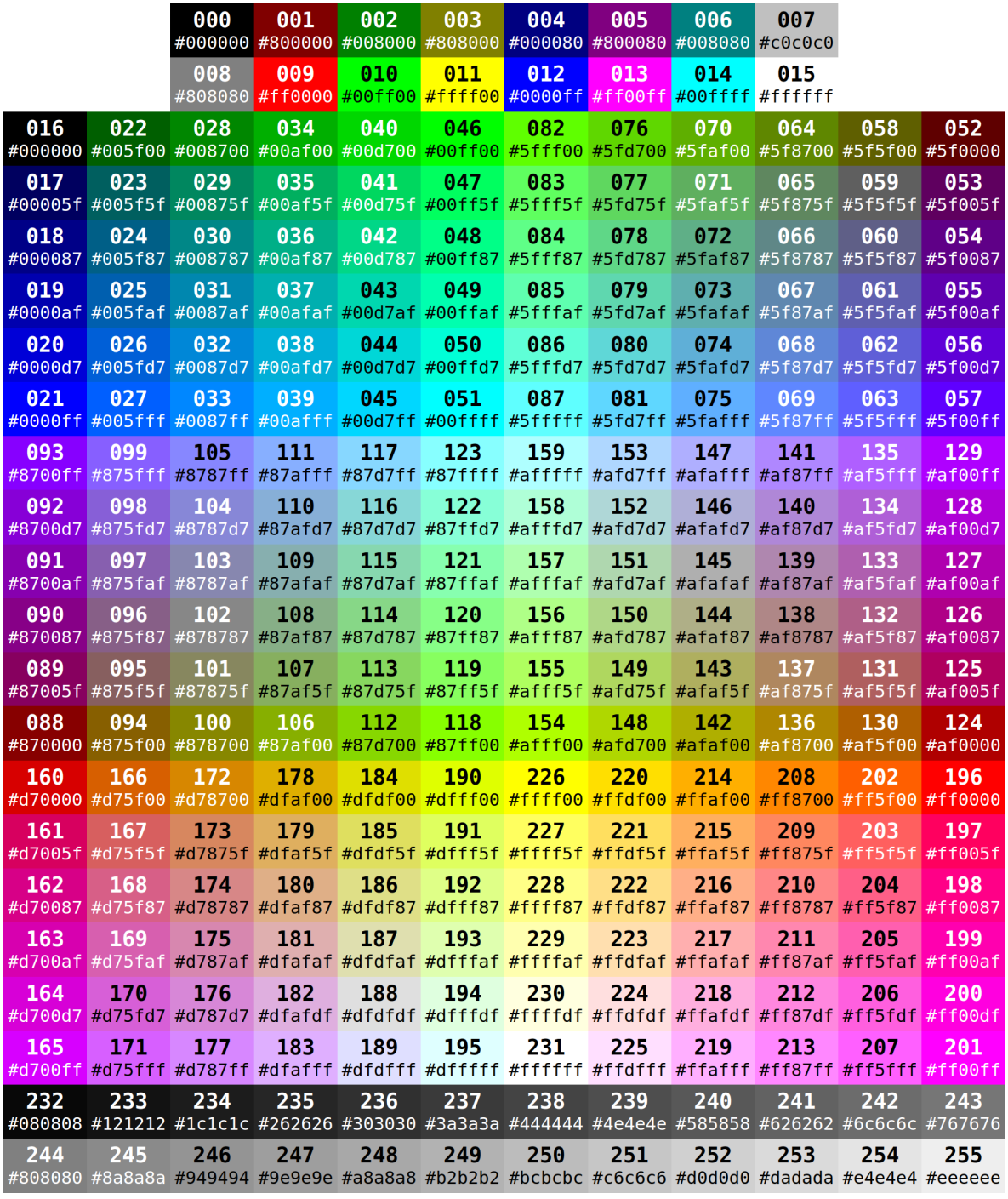

Fig. 2: *Indexed* mode palette

Sources

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

1.6 Formatters and Filters

Todo: The library contains @TODO

1.6.1 Auto-float formatter

1.6.2 Prefixed-unit formatter

1.6.3 Time delta formatter

```
import pytermor.utilnum
from pytermor 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 = pytermor.utilnum.registry.find_matching(max_len)

RendererManager.set_default(SgrRenderer)
for seconds in seconds_list:
    for max_len in max_len_list:
        formatter = pytermor.utilnum.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: @TODO

1.7 Documentation guidelines

(mostly as a reminder for myself)

- Basic types and built-in values should be surrounded with asterisks:

  `*True*` → *True*

  `*None*` → *None*

  `*int*` → *int*

- Library classes, methods, etc. should be enclosed in single backticks in order to become a hyperlinks:

  `` `SgrRenderer.render()` `` → *SgrRenderer.render()*

- Parameter names and string literals that include escape sequences or their fragments should be wrapped in double backticks:

  ``` ``param1`` ``` → `param1`

  ``` ``ESC [31m`` ``` → `ESC [31m`

  On the top of that, ASCII control chars should be padded with spaces for better readability. Also this will allow to apply custom styles to them.

CHAPTER

TWO

API REFERENCE

2.1 ansi

Module contains definitions for low-level ANSI escape sequences building. Can be used for creating a variety of sequences including:

- SGR sequences (text and background coloring, other text formatting and effects);
- CSI sequences (cursor management, selective screen cleraing);
- OSC (Operating System Command) sequences (varoius system commands).

Important: blah-blah-blah low-level @TODO

The module doesn't distinguish "single-instruction" sequences from several ones merged together, e.g. `Style(fg='red', bold=True)` produces only one opening SequenceSGR instance:

```
>>> SequenceSGR(IntCode.BOLD, IntCode.RED).assemble()
'\x1b[1;31m'
```

...although generally speaking it is two of them (`ESC [1m` and `ESC [31m`). However, the module can automatically match terminating sequences for any form of input SGRs and translate it to specified format.

XTerm Control Sequences
https://invisible-island.net/xterm/ctlseqs/ctlseqs.html

ECMA-48 specification
https://www.ecma-international.org/publications-and-standards/standards/ecma-48/

class pytermor.ansi.**Sequence**(**params*)

Bases: `Sized`, `ABC`

Abstract ancestor of all escape sequences.

assemble()

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

Return type
str

property params: t.List[int | str]

Return internal params as array.

class pytermor.ansi.**SequenceFe**(**params*)

Bases: *Sequence*, ABC

Wide range of sequence types that includes *CSI*, *OSC* and more.

All subtypes of this sequence start with ESC plus ASCII byte from 0x40 to 0x5F (@, [, \,], _, ^ and capital letters A-Z).

assemble()

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

Return type
str

property params: t.List[int | str]

Return internal params as array.

class pytermor.ansi.**SequenceST**(**params*)

Bases: *SequenceFe*

String Terminator sequence (ST). Terminates strings in other control sequences. Encoded as ESC \ (0x1B 0x5C).

assemble()

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

Return type
str

property params: t.List[int | str]

Return internal params as array.

class pytermor.ansi.**SequenceOSC**(**params*)

Bases: *SequenceFe*

OSC-type sequence. Starts a control string for the operating system to use. Encoded as ESC], plus params separated by ;, and terminated with *SequenceST*.

assemble()

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

Return type
str

property params: t.List[int | str]

Return internal params as array.

class pytermor.ansi.**SequenceCSI**(*terminator*, *short_name*, **params*)

Bases: *SequenceFe*

Class representing CSI-type ANSI escape sequence. All subtypes of this sequence start with ESC [.

Sequences of this type are used to control text formatting, change cursor position, erase screen and more.

```
>>> make_erase_in_line().assemble()
'\x1b[0K'
```

Parameters

- **terminator** –

- **short_name** –
- **params** –

assemble()

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

Return type
str

property params: t.List[int | str]

Return internal params as array.

class pytermor.ansi.**SequenceSGR**(**args*)

Bases: *SequenceCSI*

Class representing SGR-type escape sequence with varying amount of parameters. SGR sequences allow to change the color of text or/and terminal background (in 3 different color spaces) as well as set decorate text with italic style, underlining, overlining, cross-lining, making it bold or blinking etc.

When cast to *str*, as all other sequences, invokes *assemble()* method and transforms into encoded control sequence string. It is possible to add of one SGR sequence to another, resulting in a new one with merged params (see examples).

Note: *SequenceSGR* with zero params was specifically implemented to translate into empty string and not into `ESC [m`, which would have made sense, but also would be entangling, as this sequence is the equivalent of `ESC [0m` – hard reset sequence. The empty-string-sequence is predefined at module level as *NOOP_SEQ*.

```
>>> SequenceSGR(IntCode.HI_CYAN, 'underlined', 1)
<SGR[96,4,1]>
>>> SequenceSGR(31) + SequenceSGR(1) == SequenceSGR(31, 1)
True
```

Parameters

- **args** – Sequence params. Resulting param order is the same as an argument order. Each argument can be specified as:
  - *str* – any of *IntCode* names, case-insensitive
  - *int* – *IntCode* instance or plain integer
  - *SequenceSGR* instance (params will be extracted)
- **terminator** –
- **short_name** –
- **params** –

assemble()

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

Return type
str

property params: List[int]

Returns
Sequence params as integers or *IntCode* instances.

class pytermor.ansi.**CurlyUnderlinedSequenceSGR**

Bases: *SequenceSGR*

Registered as a separate class, because this is the one and only SGR in the package, which is identified by "4:3" string (in contrast with all the other sequences entirely made of digits and semicolon separators).

assemble()

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

Return type
str

pytermor.ansi.**NOOP_SEQ = <SGR[NOP]>**

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.

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

class pytermor.ansi.**IntCode**(*value*)

Bases: `IntEnum`

Complete or almost complete list of reliably working SGR param integer codes. Fully interchangeable with plain *int*. Suitable for *SequenceSGR* default constructor.

Note: *IntCode* predefined constants are omitted from documentation to avoid useless repeats and save space, as most of the time "next level" class *SeqIndex* is more appropriate, and on top of that, the constant names are literally the same for *SeqIndex* and *IntCode*.

---

classmethod resolve(*name*)

Parameters
name (*str*) –

Returns

Return type
IntCode

class pytermor.ansi.**SeqIndex**

Registry of static sequence presets.

RESET = <SGR[0]>

Hard reset sequence.

BOLD = <SGR[1]>

Bold or increased intensity.

DIM = <SGR[2]>

Faint, decreased intensity.

ITALIC = <SGR[3]>

Italic *(not widely supported)*.

UNDERLINED = <SGR[4]>

Underline.

BLINK_SLOW = <SGR[5]>

Set blinking to < 150 cpm.

BLINK_FAST = <SGR[6]>

Set blinking to 150+ cpm *(not widely supported)*.

INVERSED = <SGR[7]>

Swap foreground and background colors.

HIDDEN = <SGR[8]>

Conceal characters *(not widely supported)*.

CROSSLINED = <SGR[9]>

Strikethrough.

DOUBLE_UNDERLINED = <SGR[21]>

Double-underline. *On several terminals disables BOLD instead.*

OVERLINED = <SGR[53]>

Overline *(not widely supported)*.

BOLD_DIM_OFF = <SGR[22]>

Disable BOLD and DIM attributes.

Special aspects... It's impossible to reliably disable them on a separate basis.

ITALIC_OFF = <SGR[23]>

Disable italic.

UNDERLINED_OFF = <SGR[24]>

Disable underlining.

BLINK_OFF = <SGR[25]>

Disable blinking.

INVERSED_OFF = <SGR[27]>

Disable inversing.

HIDDEN_OFF = <SGR[28]>

Disable conecaling.

CROSSLINED_OFF = <SGR[29]>

Disable strikethrough.

OVERLINED_OFF = <SGR[55]>

Disable overlining.

BLACK = <SGR[30]>

Set text color to 0x000000.

RED = <SGR[31]>
Set text color to 0x800000.

GREEN = <SGR[32]>
Set text color to 0x008000.

YELLOW = <SGR[33]>
Set text color to 0x808000.

BLUE = <SGR[34]>
Set text color to 0x000080.

MAGENTA = <SGR[35]>
Set text color to 0x800080.

CYAN = <SGR[36]>
Set text color to 0x008080.

WHITE = <SGR[37]>
Set text color to 0xc0c0c0.

COLOR_OFF = <SGR[39]>
Reset foreground color.

BG_BLACK = <SGR[40]>
Set background color to 0x000000.

BG_RED = <SGR[41]>
Set background color to 0x800000.

BG_GREEN = <SGR[42]>
Set background color to 0x008000.

BG_YELLOW = <SGR[43]>
Set background color to 0x808000.

BG_BLUE = <SGR[44]>
Set background color to 0x000080.

BG_MAGENTA = <SGR[45]>
Set background color to 0x800080.

BG_CYAN = <SGR[46]>
Set background color to 0x008080.

BG_WHITE = <SGR[47]>
Set background color to 0xc0c0c0.

BG_COLOR_OFF = <SGR[49]>
Reset background color.

GRAY = <SGR[90]>
Set text color to 0x808080.

HI_RED = <SGR[91]>
Set text color to 0xff0000.

HI_GREEN = <SGR[92]>
Set text color to 0x00ff00.

HI_YELLOW = <SGR[93]>

Set text color to 0xffff00.

HI_BLUE = <SGR[94]>

Set text color to 0x0000ff.

HI_MAGENTA = <SGR[95]>

Set text color to 0xff00ff.

HI_CYAN = <SGR[96]>

Set text color to 0x00ffff.

HI_WHITE = <SGR[97]>

Set text color to 0xffffff.

BG_GRAY = <SGR[100]>

Set background color to 0x808080.

BG_HI_RED = <SGR[101]>

Set background color to 0xff0000.

BG_HI_GREEN = <SGR[102]>

Set background color to 0x00ff00.

BG_HI_YELLOW = <SGR[103]>

Set background color to 0xffff00.

BG_HI_BLUE = <SGR[104]>

Set background color to 0x0000ff.

BG_HI_MAGENTA = <SGR[105]>

Set background color to 0xff00ff.

BG_HI_CYAN = <SGR[106]>

Set background color to 0x00ffff.

BG_HI_WHITE = <SGR[107]>

Set background color to 0xffffff.

HYPERLINK = <OSC[8]>

Create a hyperlink in the text *(supported by limited amount of terminals)*. Note that for a working hyperlink you'll need two sequences, not just one.

See also:

make_hyperlink_part() and *assemble_hyperlink()*.

pytermor.ansi.**get_closing_seq**(*opening_seq*)

Parameters
opening_seq (SequenceSGR) –

Returns

Return type
SequenceSGR

pytermor.ansi.**enclose**(*opening_seq*, *string*)

Parameters

- **opening_seq** (SequenceSGR) –
- **string** (*str*) –

Returns

Return type
str

pytermor.ansi.**make_set_cursor_x_abs**(*x=1*)

Create CHA (Cursor Horizontal Absolute) sequence that sets cursor horizontal position, or column, to `x`.

Parameters
x (*int*) – New cursor horizontal position.

Example
`ESC [1G`

Return type
SequenceCSI

pytermor.ansi.**make_erase_in_line**(*mode=0*)

Create EL (Erase in Line) sequence that erases a part of the line or the entire line. Cursor position does not change.

Parameters
mode (*int*) – Sequence operating mode.

- If set to 0, clear from cursor to the end of the line.
- If set to 1, clear from cursor to beginning of the line.
- If set to 2, clear the entire line.

Example
`ESC [0K`

Return type
SequenceCSI

pytermor.ansi.**make_color_256**(*code*, *bg=False*)

Wrapper for creation of *SequenceSGR* that sets foreground (or background) to one of 256-color palette value.

Parameters

- **code** (*int*) – Index of the color in the palette, 0 – 255.
- **bg** (*bool*) – Set to *True* to change the background color (default is foreground).

Example
`ESC [38;5;141m`

Return type
SequenceSGR

pytermor.ansi.**make_color_rgb**(*r*, *g*, *b*, *bg=False*)

Wrapper for creation of *SequenceSGR* operating in True Color mode (16M). Valid values for `r`, `g` and `b` are in range of [0; 255]. This range linearly translates into [0x00; 0xFF] for each channel. The result value is composed as "0xRRGGBB". For example, sequence with color of 0xFF3300 can be created with:

```
make_color_rgb(255, 51, 0)
```

Parameters

- **r** (*int*) – Red channel value, 0 – 255.
- **g** (*int*) – Blue channel value, 0 – 255.
- **b** (*int*) – Green channel value, 0 – 255.
- **bg** (*bool*) – Set to *True* to change the background color (default is foreground).

Example
ESC [38;2;255;51;0m

Return type
SequenceSGR

pytermor.ansi.**make_hyperlink_part**(*url=None*)

Parameters
url (*Optional[str]*) –

Example
ESC]8;;http://localhost ESC \

Return type
SequenceOSC

pytermor.ansi.**assemble_hyperlink**(*url*, *label*)

Parameters

- **url** (*str*) –
- **label** (*str*) –

Example
ESC]8;;http://localhost ESC \Text ESC]8;; ESC \

Return type
str

2.2 color

pytermor.color.**ColorType**

alias of TypeVar('ColorType', Color16, Color256, ColorRGB)

class pytermor.color.**ApproximationResult**(*color*, *distance*)

Bases: Generic[*ColorType*]

Parameters

- **color** – *Color* instance.
- **distance** – Squared sRGB distance from this instance to the approximation target.

property distance_real: float

Actual distance from instance to target: Sqrt(distance).

class pytermor.color.Color(*args, **kwargs)

Abstract superclass for other Colors.

to_hsv()

Returns

Return type
Tuple[float, float, float]

to_rgb()

Returns

Return type
Tuple[int, int, int]

format_value(*prefix='0x'*)

Parameters
prefix (*str*) –

Returns

Return type
str

property hex_value: int

Returns

property name: str | None

Returns

property base: ColorType | None

Returns

property variations: Dict[str, ColorType]

Returns

abstract to_sgr(*bg*, *upper_bound=None*)

Parameters

- **bg** (*bool*) –
- **upper_bound** (*Optional[Type[Color]]*) –

Returns

Return type
SequenceSGR

abstract to_tmux(*bg*)

Parameters
bg (*bool*) –

Returns

Return type
str

`classmethod get_by_code(code)`

Parameters
code (*int*) –

Returns

Return type
ColorType

`classmethod resolve(name)`

Case-insensitive search through registry contents. Type of the result depends on invoked class:

- `Color16.resolve(..)` -> *Color16*
- `Color256.resolve(..)` -> *Color256*
- `ColorRGB.resolve(..)` -> *ColorRGB*

Note: Invoking the method of *Color* itself is a special case. The search will be first performed in the registry of *Color16* class, then – in *Color256*, and, if previous two were unsuccessful, in the largest *ColorRGB* registry.

Parameters
name (*str*) – name of the color to look up for.

Raises
LookupError – if no color with specified name is registered.

Returns
Color instance.

Return type
ColorType

`classmethod find_closest(hex_value)`

Search and return the nearset color to `hex_value`. Depending on the desired result type and current color mode you might use either of:

- `Color16.find_closest(..)` -> *Color16*
- `Color256.find_closest(..)` -> *Color256*
- `ColorRGB.find_closest(..)` -> *ColorRGB*

Note: Invoking the method of *Color* itself is equivalent to calling `Color256.find_closest()`.

Method is useful for finding applicable color alternatives if user's terminal is incapable of operating in more advanced mode.

This method caches the results, i.e., the same search query will from then onward result in the same return value without the necessity of iterating through the color index. If that's not applicable, use similar method *approximate()*, which is unaware of caching mechanism altogether.

Parameters
hex_value (*int*) – Target color RGB value.

Returns
Nearest to `hex_value` instance of *Color* found. Type will be the same as the class of called method.

Return type
ColorType

`classmethod approximate`(*hex_value*, *max_results=1*)

Search for nearest colors to `hex_value` and return the first `max_results` of them. This method is similar to the *find_closest()*, although they differ in some aspects:

- *approximate()* can return more than one result;
- *approximate()* returns not just *Color* instances, but also a number equal to squared distance to the target color for each of them;
- *find_closest()* caches the results, while *approximate()* ignores the cache completely.

The type of *Color* instances in the result will be the same as the *Color* class the called method is originating from (same as for method's sibling):

- `Color16.approximate(..)` -> [ApproximationResult[*Color16*], ...]
- `Color256.approximate(..)` -> [ApproximationResult[*Color256*], ...]
- `ColorRGB.approximate(..)` -> [ApproximationResult[*ColorRGB*], ...]

Note: Invoking the method of *Color* itself is equivalent to calling `Color256.find_closest()`.

Parameters

- **hex_value** (*int*) – Target color RGB value.
- **max_results** (*int*) – Return no more than `max_results` items.

Returns
Pairs of closest *Color* instance(s) found with their distances to the target color, sorted by distance descending, i.e., element at index 0 is the closest color found, paired with its distance to the target; element with index 1 is second-closest color (if any) and corresponding distance value, etc.

Return type
List[ApproximationResult[*ColorType*]]

`static hex_to_hsv`(*hex_value*)

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

Return type
Tuple[float, float, float]

`static hex_to_rgb`(*hex_value*)

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

Parameters
hex_value (*int*) – Color RGB value.

Return type
Tuple[int, int, int]

Usage:

```
>>> Color.hex_to_rgb(0x80ff80)
(128, 255, 128)
```

static rgb_to_hex(*r*, *g*, *b*)

Parameters

- **r** (*int*) –
- **g** (*int*) –
- **b** (*int*) –

Returns

Return type
int

class pytermor.color.**Color16**(**args*, ***kwargs*)

Bases: *Color*

Parameters

- **hex_value** –
- **code_fg** –
- **code_bg** –
- **name** –
- **aliases** –
- **variation_map** –
- **register** –
- **index** –

to_sgr(*bg*, *upper_bound=None*)

Parameters

- **bg** (*bool*) –
- **upper_bound** (*Optional[Type[Color]]*) –

Returns

Return type
SequenceSGR

to_tmux(*bg*)

Parameters
bg (*bool*) –

Returns

Return type
str

property code_fg: int

Returns

property code_bg: int

Returns

class pytermor.color.**Color256**(**args*, ***kwargs*)

Bases: *Color*

Parameters

- **hex_value** –
- **code** –
- **name** –
- **aliases** –
- **variation_map** –
- **color16_equiv** –
- **register** –
- **index** –

to_sgr(*bg*, *upper_bound=None*)

Parameters

- **bg** (*bool*) –
- **upper_bound** (*Optional[Type[Color]]*) –

Returns

Return type
SequenceSGR

to_tmux(*bg*)

Parameters
bg (*bool*) –

Returns

Return type
str

property code: int

Returns

class pytermor.color.**ColorRGB**(**args*, ***kwargs*)

Bases: *Color*

Parameters

- **hex_value** –
- **name** –
- **aliases** –
- **variation_map** –

- **register** –
- **index** –

to_sgr(*bg*, *upper_bound=None*)

Parameters

- **bg** (*bool*) –
- **upper_bound** (*Optional[Type[Color]]*) –

Returns

Return type
SequenceSGR

to_tmux(*bg*)

Parameters
bg (*bool*) –

Returns

Return type
str

pytermor.color.**NOOP_COLOR = <_NoopColor[NOP]>**

Special *Color* instance always rendering into empty string.

exception pytermor.color.**ColorNameConflictError**(*tokens*, *existing_color*, *new_color*)

Bases: Exception

exception pytermor.color.**ColorCodeConflictError**(*code*, *existing_color*, *new_color*)

Bases: Exception

2.3 common

pytermor.common.**T**

t.Any

alias of TypeVar('T')

pytermor.common.**StrType**

StrType in a method signature usually means that regular strings as well as *Renderable* implementations are supported, can be intermixed, and:

- return type will be *str* if and only if type of all arguments is *str*;
- otherwise return type will be *Renderable* – *str* arguments, if any, will be transformed into *Renderable* and concatenated.

alias of TypeVar('StrType', bound=Union[str, Renderable])

exception pytermor.common.**LogicError**

Bases: Exception

exception pytermor.common.**ConflictError**

Bases: Exception

exception pytermor.common.**ArgTypeError**(*actual_type*, *arg_name=None*, *fn=None*)

Bases: Exception

2.4 cval

Color preset list.

class pytermor.cval.**CValues**

BLACK = <Color16[#30,000000?,black]>

RED = <Color16[#31,800000?,red]>

GREEN = <Color16[#32,008000?,green]>

YELLOW = <Color16[#33,808000?,yellow]>

BLUE = <Color16[#34,000080?,blue]>

MAGENTA = <Color16[#35,800080?,magenta]>

CYAN = <Color16[#36,008080?,cyan]>

WHITE = <Color16[#37,C0C0C0?,white]>

GRAY = <Color16[#90,808080?,gray]>

HI_RED = <Color16[#91,FF0000?,hi-red]>

HI_GREEN = <Color16[#92,00FF00?,hi-green]>

HI_YELLOW = <Color16[#93,FFFF00?,hi-yellow]>

HI_BLUE = <Color16[#94,0000FF?,hi-blue]>

HI_MAGENTA = <Color16[#95,FF00FF?,hi-magenta]>

HI_CYAN = <Color16[#96,00FFFF?,hi-cyan]>

HI_WHITE = <Color16[#97,FFFFFF?,hi-white]>

AQUAMARINE_1 = <Color256[#122,87FFD7,aquamarine-1]>

AQUAMARINE_2 = <Color256[#86,5FFFD7,aquamarine-2]>

AQUAMARINE_3 = <Color256[#79,5FD7AF,aquamarine-3]>

BLUE_1 = <Color256[#21,0000FF,blue-1]>

BLUE_2 = <Color256[#20,0000D7,blue-2]>

BLUE_3 = <Color256[#19,0000AF,blue-3]>

BLUE_VIOLET = <Color256[#57,5F00FF,blue-violet]>

CADET_BLUE = <Color256[#73,5FAFAF,cadet-blue]>

CADET_BLUE_2 = <Color256[#72,5FAF87,cadet-blue-2]>

CHARTREUSE_1 = <Color256[#118,87FF00,chartreuse-1]>

CHARTREUSE_2 = <Color256[#82,5FFF00,chartreuse-2]>

CHARTREUSE_3 = <Color256[#112,87D700,chartreuse-3]>

CHARTREUSE_4 = <Color256[#76,5FD700,chartreuse-4]>

CHARTREUSE_5 = <Color256[#70,5FAF00,chartreuse-5]>

CHARTREUSE_6 = <Color256[#64,5F8700,chartreuse-6]>

CORNFLOWER_BLUE = <Color256[#69,5F87FF,cornflower-blue]>

CORNSILK_1 = <Color256[#230,FFFFD7,cornsilk-1]>

CYAN_1 = <Color256[#51,00FFFF,cyan-1]>

CYAN_2 = <Color256[#50,00FFD7,cyan-2]>

CYAN_3 = <Color256[#43,00D7AF,cyan-3]>

DARK_BLUE = <Color256[#18,000087,dark-blue]>

DARK_CYAN = <Color256[#36,00AF87,dark-cyan]>

DARK_GOLDENROD = <Color256[#136,AF8700,dark-goldenrod]>

DARK_GREEN = <Color256[#22,005F00,dark-green]>

DARK_KHAKI = <Color256[#143,AFAF5F,dark-khaki]>

DARK_MAGENTA = <Color256[#91,8700AF,dark-magenta]>

DARK_MAGENTA_2 = <Color256[#90,870087,dark-magenta-2]>

DARK_OLIVE_GREEN_1 = <Color256[#192,D7FF87,dark-olive-green-1]>

DARK_OLIVE_GREEN_2 = <Color256[#191,D7FF5F,dark-olive-green-2]>

DARK_OLIVE_GREEN_3 = <Color256[#155,AFFF5F,dark-olive-green-3]>

DARK_OLIVE_GREEN_4 = <Color256[#113,87D75F,dark-olive-green-4]>

DARK_OLIVE_GREEN_5 = <Color256[#149,AFD75F,dark-olive-green-5]>

DARK_OLIVE_GREEN_6 = <Color256[#107,87AF5F,dark-olive-green-6]>

DARK_ORANGE = <Color256[#208,FF8700,dark-orange]>

DARK_ORANGE_2 = <Color256[#166,D75F00,dark-orange-2]>

DARK_ORANGE_3 = <Color256[#130,AF5F00,dark-orange-3]>

DARK_RED = <Color256[#88,870000,dark-red]>

```
DARK_RED_2 = <Color256[#52,5F0000,dark-red-2]>
DARK_SEA_GREEN_1 = <Color256[#158,AFFFD7,dark-sea-green-1]>
DARK_SEA_GREEN_2 = <Color256[#193,D7FFAF,dark-sea-green-2]>
DARK_SEA_GREEN_3 = <Color256[#157,AFFFAF,dark-sea-green-3]>
DARK_SEA_GREEN_4 = <Color256[#151,AFD7AF,dark-sea-green-4]>
DARK_SEA_GREEN_5 = <Color256[#115,87D7AF,dark-sea-green-5]>
DARK_SEA_GREEN_6 = <Color256[#150,AFD787,dark-sea-green-6]>
DARK_SEA_GREEN_7 = <Color256[#108,87AF87,dark-sea-green-7]>
DARK_SEA_GREEN_8 = <Color256[#71,5FAF5F,dark-sea-green-8]>
DARK_SEA_GREEN_9 = <Color256[#65,5F875F,dark-sea-green-9]>
DARK_SLATE_GRAY_1 = <Color256[#123,87FFFF,dark-slate-gray-1]>
DARK_SLATE_GRAY_2 = <Color256[#87,5FFFFF,dark-slate-gray-2]>
DARK_SLATE_GRAY_3 = <Color256[#116,87D7D7,dark-slate-gray-3]>
DARK_TURQUOISE = <Color256[#44,00D7D7,dark-turquoise]>
DARK_VIOLET = <Color256[#128,AF00D7,dark-violet]>
DARK_VIOLET_2 = <Color256[#92,8700D7,dark-violet-2]>
DEEP_PINK_1 = <Color256[#199,FF00AF,deep-pink-1]>
DEEP_PINK_2 = <Color256[#198,FF0087,deep-pink-2]>
DEEP_PINK_3 = <Color256[#162,D70087,deep-pink-3]>
DEEP_PINK_4 = <Color256[#197,FF005F,deep-pink-4]>
DEEP_PINK_5 = <Color256[#161,D7005F,deep-pink-5]>
DEEP_PINK_6 = <Color256[#125,AF005F,deep-pink-6]>
DEEP_PINK_7 = <Color256[#89,87005F,deep-pink-7]>
DEEP_PINK_8 = <Color256[#53,5F005F,deep-pink-8]>
DEEP_SKY_BLUE_1 = <Color256[#39,00AFFF,deep-sky-blue-1]>
DEEP_SKY_BLUE_2 = <Color256[#38,00AFD7,deep-sky-blue-2]>
DEEP_SKY_BLUE_3 = <Color256[#32,0087D7,deep-sky-blue-3]>
DEEP_SKY_BLUE_4 = <Color256[#31,0087AF,deep-sky-blue-4]>
DEEP_SKY_BLUE_5 = <Color256[#25,005FAF,deep-sky-blue-5]>
DEEP_SKY_BLUE_6 = <Color256[#24,005F87,deep-sky-blue-6]>
DEEP_SKY_BLUE_7 = <Color256[#23,005F5F,deep-sky-blue-7]>
```

```
DODGER_BLUE_1 = <Color256[#33,0087FF,dodger-blue-1]>
DODGER_BLUE_2 = <Color256[#27,005FFF,dodger-blue-2]>
DODGER_BLUE_3 = <Color256[#26,005FD7,dodger-blue-3]>
GOLD_1 = <Color256[#220,FFD700,gold-1]>
GOLD_2 = <Color256[#178,D7AF00,gold-2]>
GOLD_3 = <Color256[#142,AFAF00,gold-3]>
GRAY_0 = <Color256[#16,000000,gray-0]>
GRAY_100 = <Color256[#231,FFFFFF,gray-100]>
GRAY_11 = <Color256[#234,1C1C1C,gray-11]>
GRAY_15 = <Color256[#235,262626,gray-15]>
GRAY_19 = <Color256[#236,303030,gray-19]>
GRAY_23 = <Color256[#237,3A3A3A,gray-23]>
GRAY_27 = <Color256[#238,444444,gray-27]>
GRAY_3 = <Color256[#232,080808,gray-3]>
GRAY_30 = <Color256[#239,4E4E4E,gray-30]>
GRAY_35 = <Color256[#240,585858,gray-35]>
GRAY_37 = <Color256[#59,5F5F5F,gray-37]>
GRAY_39 = <Color256[#241,626262,gray-39]>
GRAY_42 = <Color256[#242,6C6C6C,gray-42]>
GRAY_46 = <Color256[#243,767676,gray-46]>
GRAY_50 = <Color256[#244,808080,gray-50]>
GRAY_53 = <Color256[#102,878787,gray-53]>
GRAY_54 = <Color256[#245,8A8A8A,gray-54]>
GRAY_58 = <Color256[#246,949494,gray-58]>
GRAY_62 = <Color256[#247,9E9E9E,gray-62]>
GRAY_63 = <Color256[#139,AF87AF,gray-63]>
GRAY_66 = <Color256[#248,A8A8A8,gray-66]>
GRAY_69 = <Color256[#145,AFAFAF,gray-69]>
GRAY_7 = <Color256[#233,121212,gray-7]>
GRAY_70 = <Color256[#249,B2B2B2,gray-70]>
GRAY_74 = <Color256[#250,BCBCBC,gray-74]>
```

GRAY_78 = <Color256[#251,C6C6C6,gray-78]>

GRAY_82 = <Color256[#252,D0D0D0,gray-82]>

GRAY_84 = <Color256[#188,D7D7D7,gray-84]>

GRAY_85 = <Color256[#253,DADADA,gray-85]>

GRAY_89 = <Color256[#254,E4E4E4,gray-89]>

GRAY_93 = <Color256[#255,EEEEEE,gray-93]>

GREEN_2 = <Color256[#46,00FF00,green-2]>

GREEN_3 = <Color256[#40,00D700,green-3]>

GREEN_4 = <Color256[#34,00AF00,green-4]>

GREEN_5 = <Color256[#28,008700,green-5]>

GREEN_YELLOW = <Color256[#154,AFFF00,green-yellow]>

HONEYDEW_2 = <Color256[#194,D7FFD7,honeydew-2]>

HOT_PINK = <Color256[#206,FF5FD7,hot-pink]>

HOT_PINK_2 = <Color256[#205,FF5FAF,hot-pink-2]>

HOT_PINK_3 = <Color256[#169,D75FAF,hot-pink-3]>

HOT_PINK_4 = <Color256[#168,D75F87,hot-pink-4]>

HOT_PINK_5 = <Color256[#132,AF5F87,hot-pink-5]>

INDIAN_RED_1 = <Color256[#203,FF5F5F,indian-red-1]>

INDIAN_RED_2 = <Color256[#204,FF5F87,indian-red-2]>

INDIAN_RED_3 = <Color256[#167,D75F5F,indian-red-3]>

INDIAN_RED_4 = <Color256[#131,AF5F5F,indian-red-4]>

KHAKI_1 = <Color256[#228,FFFF87,khaki-1]>

KHAKI_3 = <Color256[#185,D7D75F,khaki-3]>

LIGHT_CORAL = <Color256[#210,FF8787,light-coral]>

LIGHT_CYAN_1 = <Color256[#195,D7FFFF,light-cyan-1]>

LIGHT_CYAN_3 = <Color256[#152,AFD7D7,light-cyan-3]>

LIGHT_GOLDENROD_1 = <Color256[#227,FFFF5F,light-goldenrod-1]>

LIGHT_GOLDENROD_2 = <Color256[#222,FFD787,light-goldenrod-2]>

LIGHT_GOLDENROD_3 = <Color256[#186,D7D787,light-goldenrod-3]>

LIGHT_GOLDENROD_4 = <Color256[#221,FFD75F,light-goldenrod-4]>

LIGHT_GOLDENROD_5 = <Color256[#179,D7AF5F,light-goldenrod-5]>

LIGHT_GREEN = <Color256[#120,87FF87,light-green]>

LIGHT_GREEN_2 = <Color256[#119,87FF5F,light-green-2]>

LIGHT_PINK_1 = <Color256[#217,FFAFAF,light-pink-1]>

LIGHT_PINK_2 = <Color256[#174,D78787,light-pink-2]>

LIGHT_PINK_3 = <Color256[#95,875F5F,light-pink-3]>

LIGHT_SALMON_1 = <Color256[#216,FFAF87,light-salmon-1]>

LIGHT_SALMON_2 = <Color256[#173,D7875F,light-salmon-2]>

LIGHT_SALMON_3 = <Color256[#137,AF875F,light-salmon-3]>

LIGHT_SEA_GREEN = <Color256[#37,00AFAF,light-sea-green]>

LIGHT_SKY_BLUE_1 = <Color256[#153,AFD7FF,light-sky-blue-1]>

LIGHT_SKY_BLUE_2 = <Color256[#110,87AFD7,light-sky-blue-2]>

LIGHT_SKY_BLUE_3 = <Color256[#109,87AFAF,light-sky-blue-3]>

LIGHT_SLATE_BLUE = <Color256[#105,8787FF,light-slate-blue]>

LIGHT_SLATE_GRAY = <Color256[#103,8787AF,light-slate-gray]>

LIGHT_STEEL_BLUE_1 = <Color256[#189,D7D7FF,light-steel-blue-1]>

LIGHT_STEEL_BLUE_2 = <Color256[#147,AFAFFF,light-steel-blue-2]>

LIGHT_STEEL_BLUE_3 = <Color256[#146,AFAFD7,light-steel-blue-3]>

LIGHT_YELLOW_3 = <Color256[#187,D7D7AF,light-yellow-3]>

MAGENTA_1 = <Color256[#201,FF00FF,magenta-1]>

MAGENTA_2 = <Color256[#200,FF00D7,magenta-2]>

MAGENTA_3 = <Color256[#163,D700AF,magenta-3]>

MAGENTA_4 = <Color256[#165,D700FF,magenta-4]>

MAGENTA_5 = <Color256[#164,D700D7,magenta-5]>

MAGENTA_6 = <Color256[#127,AF00AF,magenta-6]>

MEDIUM_ORCHID_1 = <Color256[#207,FF5FFF,medium-orchid-1]>

MEDIUM_ORCHID_2 = <Color256[#171,D75FFF,medium-orchid-2]>

MEDIUM_ORCHID_3 = <Color256[#134,AF5FD7,medium-orchid-3]>

MEDIUM_ORCHID_4 = <Color256[#133,AF5FAF,medium-orchid-4]>

MEDIUM_PURPLE_1 = <Color256[#141,AF87FF,medium-purple-1]>

MEDIUM_PURPLE_2 = <Color256[#135,AF5FFF,medium-purple-2]>

MEDIUM_PURPLE_3 = <Color256[#140,AF87D7,medium-purple-3]>

MEDIUM_PURPLE_4 = <Color256[#104,8787D7,medium-purple-4]>

MEDIUM_PURPLE_5 = <Color256[#98,875FD7,medium-purple-5]>

MEDIUM_PURPLE_6 = <Color256[#97,875FAF,medium-purple-6]>

MEDIUM_PURPLE_7 = <Color256[#60,5F5F87,medium-purple-7]>

MEDIUM_SPRING_GREEN = <Color256[#49,00FFAF,medium-spring-green]>

MEDIUM_TURQUOISE = <Color256[#80,5FD7D7,medium-turquoise]>

MEDIUM_VIOLET_RED = <Color256[#126,AF0087,medium-violet-red]>

MISTY_ROSE_1 = <Color256[#224,FFD7D7,misty-rose-1]>

MISTY_ROSE_3 = <Color256[#181,D7AFAF,misty-rose-3]>

NAVAJO_WHITE_1 = <Color256[#223,FFD7AF,navajo-white-1]>

NAVAJO_WHITE_3 = <Color256[#144,AFAF87,navajo-white-3]>

NAVY_BLUE = <Color256[#17,00005F,navy-blue]>

ORANGE_1 = <Color256[#214,FFAF00,orange-1]>

ORANGE_2 = <Color256[#172,D78700,orange-2]>

ORANGE_3 = <Color256[#94,875F00,orange-3]>

ORANGE_4 = <Color256[#58,5F5F00,orange-4]>

ORANGE_RED_1 = <Color256[#202,FF5F00,orange-red-1]>

ORCHID_1 = <Color256[#213,FF87FF,orchid-1]>

ORCHID_2 = <Color256[#212,FF87D7,orchid-2]>

ORCHID_3 = <Color256[#170,D75FD7,orchid-3]>

PALE_GREEN_1 = <Color256[#121,87FFAF,pale-green-1]>

PALE_GREEN_2 = <Color256[#156,AFFF87,pale-green-2]>

PALE_GREEN_3 = <Color256[#114,87D787,pale-green-3]>

PALE_GREEN_4 = <Color256[#77,5FD75F,pale-green-4]>

PALE_TURQUOISE_1 = <Color256[#159,AFFFFF,pale-turquoise-1]>

PALE_TURQUOISE_4 = <Color256[#66,5F8787,pale-turquoise-4]>

PALE_VIOLET_RED_1 = <Color256[#211,FF87AF,pale-violet-red-1]>

PINK_1 = <Color256[#218,FFAFD7,pink-1]>

PINK_3 = <Color256[#175,D787AF,pink-3]>

PLUM_1 = <Color256[#219,FFAFFF,plum-1]>

PLUM_2 = <Color256[#183,D7AFFF,plum-2]>

```
PLUM_3 = <Color256[#176,D787D7,plum-3]>
PLUM_4 = <Color256[#96,875F87,plum-4]>
PURPLE = <Color256[#129,AF00FF,purple]>
PURPLE_2 = <Color256[#93,8700FF,purple-2]>
PURPLE_3 = <Color256[#56,5F00D7,purple-3]>
PURPLE_4 = <Color256[#55,5F00AF,purple-4]>
PURPLE_6 = <Color256[#54,5F0087,purple-6]>
RED_1 = <Color256[#196,FF0000,red-1]>
RED_3 = <Color256[#160,D70000,red-3]>
RED_4 = <Color256[#124,AF0000,red-4]>
ROSY_BROWN = <Color256[#138,AF8787,rosy-brown]>
ROYAL_BLUE_1 = <Color256[#63,5F5FFF,royal-blue-1]>
SALMON_1 = <Color256[#209,FF875F,salmon-1]>
SANDY_BROWN = <Color256[#215,FFAF5F,sandy-brown]>
SEA_GREEN_1 = <Color256[#85,5FFFAF,sea-green-1]>
SEA_GREEN_2 = <Color256[#84,5FFF87,sea-green-2]>
SEA_GREEN_3 = <Color256[#78,5FD787,sea-green-3]>
SEA_GREEN_4 = <Color256[#83,5FFF5F,sea-green-4]>
SKY_BLUE_1 = <Color256[#117,87D7FF,sky-blue-1]>
SKY_BLUE_2 = <Color256[#111,87AFFF,sky-blue-2]>
SKY_BLUE_3 = <Color256[#74,5FAFD7,sky-blue-3]>
SLATE_BLUE_1 = <Color256[#99,875FFF,slate-blue-1]>
SLATE_BLUE_2 = <Color256[#62,5F5FD7,slate-blue-2]>
SLATE_BLUE_3 = <Color256[#61,5F5FAF,slate-blue-3]>
SPRING_GREEN_1 = <Color256[#48,00FF87,spring-green-1]>
SPRING_GREEN_2 = <Color256[#47,00FF5F,spring-green-2]>
SPRING_GREEN_3 = <Color256[#41,00D75F,spring-green-3]>
SPRING_GREEN_4 = <Color256[#29,00875F,spring-green-4]>
SPRING_GREEN_5 = <Color256[#35,00AF5F,spring-green-5]>
SPRING_GREEN_6 = <Color256[#42,00D787,spring-green-6]>
STEEL_BLUE = <Color256[#67,5F87AF,steel-blue]>
```

```
STEEL_BLUE_1 = <Color256[#81,5FD7FF,steel-blue-1]>

STEEL_BLUE_2 = <Color256[#75,5FAFFF,steel-blue-2]>

STEEL_BLUE_3 = <Color256[#68,5F87D7,steel-blue-3]>

TAN = <Color256[#180,D7AF87,tan]>

THISTLE_1 = <Color256[#225,FFD7FF,thistle-1]>

THISTLE_3 = <Color256[#182,D7AFD7,thistle-3]>

TURQUOISE_2 = <Color256[#45,00D7FF,turquoise-2]>

TURQUOISE_4 = <Color256[#30,008787,turquoise-4]>

VIOLET = <Color256[#177,D787FF,violet]>

WHEAT_1 = <Color256[#229,FFFFAF,wheat-1]>

WHEAT_4 = <Color256[#101,87875F,wheat-4]>

YELLOW_1 = <Color256[#226,FFFF00,yellow-1]>

YELLOW_2 = <Color256[#190,D7FF00,yellow-2]>

YELLOW_3 = <Color256[#184,D7D700,yellow-3]>

YELLOW_4 = <Color256[#106,87AF00,yellow-4]>

YELLOW_5 = <Color256[#148,AFD700,yellow-5]>

YELLOW_6 = <Color256[#100,878700,yellow-6]>
```

2.5 renderer

Module with output formatters. Default global renderer type is *SgrRenderer*.

Customizing of rendering mode can be accomplished in two ways:

a. Method `RendererManager.set_default()` sets the default renderer globally. After that calling *text.render()* will automatically invoke a said renderer and all formatting will be applied.

b. Alternatively, you can use renderer's own instance method `render()` directly and avoid messing up with the manager: *HtmlRenderer.render()*.

Generally speaking, if you need to invoke a custom renderer just once, it's convenient to use the second method for this case and use the global one in all the others.

On the contrary, if there is a necessity to use more than one renderer alternatingly, it's better to avoid using the global one at all, and just instantiate and invoke two _get_renderers independently.

TL;DR

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

```
>>> from pytermor import render, RendererManager, Styles
>>> RendererManager.set_default_to_force_formatting()
>>> render('Warning: AAAA', Styles.WARNING)
'\x1b[33mWarning: AAAA\x1b[39m'
```

class pytermor.renderer.**AbstractRenderer**

Renderer interface.

abstract property is_format_allowed: bool

Returns

abstract render(*string*, *fmt=<Style[NOP]>*)

Apply colors and attributes described in `fmt` argument to `string` and return the result. Output format depends on renderer's class, which defines the implementation.

Parameters

- **string** (*t.Any*) – String to format.
- **fmt** (*Color | Style*) – Style or color to apply. If `fmt` is a *Color* instance, it is assumed to be a foreground color.

Returns

String with formatting applied, or without it, depending on renderer settings.

Return type

str

class pytermor.renderer.**OutputMode**(*value*)

Bases: Enum

Determines what types of SGR sequences are allowed to use in the output.

NO_ANSI = 'no_ansi'

The renderer discards all color and format information completely.

XTERM_16 = 'xterm_16'

16-colors mode. Enforces the renderer to approximate all color types to *Color16* and render them as basic mode selection SGR sequences (`ESC [31m`, `ESC [42m` etc). See *Color.approximate()* for approximation algorithm details.

XTERM_256 = 'xterm_256'

256-colors mode. Allows the renderer to use either *Color16* or *Color256* (but RGB will be approximated to 256-color pallette).

TRUE_COLOR = 'true_color'

RGB color mode. Does not apply restrictions to color rendering.

AUTO = 'auto'

Lets the renderer select the most suitable mode by itself. See *SgrRenderer* constructor documentation for the details.

class pytermor.renderer.**SgrRenderer**(*output_mode=OutputMode.AUTO*)

Bases: *AbstractRenderer*

Todo: make render() protected (?)

Default renderer invoked by `Text.render()`. Transforms *Color* instances defined in `style` into ANSI control sequence bytes and merges them with input string. Type of resulting *SequenceSGR* depends on type of *Color* instances in `style` argument and current output mode of the renderer.

1. *ColorRGB* can be rendered as True Color sequence, 256-color sequence or 16-color sequence depending on specified *OutputMode*.
2. *Color256* can be rendered as 256-color sequence or 16-color sequence.
3. *Color16* will be rendered as 16-color sequence.
4. Nothing of the above will happen and all formatting will be discarded completely if output device is not a terminal emulator or if the developer explicitly set up the renderer to do so (*OutputMode.NO_ANSI*).

Renderer approximates RGB colors to closest **indexed** colors if terminal doesn't support RGB output. In case terminal doesn't support even 256 colors, it falls back to 16-color palette and picks closest samples again the same way. See *OutputMode* documentation for exact mappings.

```
>>> SgrRenderer(OutputMode.XTERM_256).render('text', Styles.WARNING_LABEL)
'\x1b[1;33mtext\x1b[22;39m'
>>> SgrRenderer(OutputMode.NO_ANSI).render('text', Styles.WARNING_LABEL)
'text'
```

Parameters

output_mode (`OutputMode`) – SGR output mode to use. Valid values are listed in *OutputMode* enum.

With *OutputMode.AUTO* the renderer will first check if the output device is a terminal emulator, and use *OutputMode.NO_ANSI* when it is not. Otherwise, the renderer will read `TERM` environment variable and follow these rules:

- *OutputMode.NO_ANSI* if `TERM` is set to `xterm`.
- *OutputMode.XTERM_16* if `TERM` is set to `xterm-color`.
- *OutputMode.XTERM_256* in all other cases.

Special case is when `TERM` equals to `xterm-256color` **and** `COLORTERM` is either `truecolor` or `24bit`, then *OutputMode.TRUE_COLOR* will be used.

property is_format_allowed: bool

Returns

render(*string*, *fmt=<Style[NOP]>*)

Apply colors and attributes described in `fmt` argument to `string` and return the result. Output format depends on renderer's class, which defines the implementation.

Parameters

- **string** (*t.Any*) – String to format.
- **fmt** (`Color | Style`) – Style or color to apply. If `fmt` is a *Color* instance, it is assumed to be a foreground color.

Returns
String with formatting applied, or without it, depending on renderer settings.

Return type
str

class pytermor.renderer.**TmuxRenderer**

Bases: *AbstractRenderer*

tmux

```
>>> TmuxRenderer().render('text',  Style(fg='blue', bold=True))
'#[fg=blue bold]text#[fg=default nobold]'
```

property is_format_allowed: bool

Returns

render(*string*, *fmt*=<*Style[NOP]*>)

Apply colors and attributes described in `fmt` argument to `string` and return the result. Output format depends on renderer's class, which defines the implementation.

Parameters

- **string** (*t.Any*) – String to format.
- **fmt** (*Color | Style*) – Style or color to apply. If `fmt` is a *Color* instance, it is assumed to be a foreground color.

Returns
String with formatting applied, or without it, depending on renderer settings.

Return type
str

class pytermor.renderer.**NoOpRenderer**

Bases: *AbstractRenderer*

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='green', bold=True))
'text'
```

property is_format_allowed: bool

Returns

render(*string*, *fmt*=<*Style[NOP]*>)

Apply colors and attributes described in `fmt` argument to `string` and return the result. Output format depends on renderer's class, which defines the implementation.

Parameters

- **string** (*t.Any*) – String to format.
- **fmt** (*Color | Style*) – Style or color to apply. If `fmt` is a *Color* instance, it is assumed to be a foreground color.

Returns
String with formatting applied, or without it, depending on renderer settings.

Return type
str

class pytermor.renderer.**HtmlRenderer**

Bases: *AbstractRenderer*

html

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

property is_format_allowed: bool

Returns

render(*string*, *fmt=<Style[NOP]>*)

Apply colors and attributes described in `fmt` argument to `string` and return the result. Output format depends on renderer's class, which defines the implementation.

Parameters

- **string** (*t.Any*) – String to format.
- **fmt** (*Color | Style*) – Style or color to apply. If `fmt` is a *Color* instance, it is assumed to be a foreground color.

Returns
String with formatting applied, or without it, depending on renderer settings.

Return type
str

class pytermor.renderer.**SgrRendererDebugger**(*output_mode=OutputMode.AUTO*)

Bases: *SgrRenderer*

```
>>> SgrRendererDebugger(OutputMode.XTERM_16).render('text', Style(fg='red',␣
↪bold=True))
'|1;31|text|22;39|'
```

property is_format_allowed: bool

Returns

render(*string*, *fmt=<Style[NOP]>*)

Apply colors and attributes described in `fmt` argument to `string` and return the result. Output format depends on renderer's class, which defines the implementation.

Parameters

- **string** (*t.Any*) – String to format.
- **fmt** (*Color | Style*) – Style or color to apply. If `fmt` is a *Color* instance, it is assumed to be a foreground color.

Returns
String with formatting applied, or without it, depending on renderer settings.

Return type
str

2.6 style

pytermor.style.**NOOP_STYLE = <Style[NOP]>**

Special style passing the text through without any modifications.

class pytermor.style.**Styles**

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

2.7 text

class pytermor.text.**Renderable**(**args*, ***kwds*)

Bases: Sized

Renderable abstract class. Can be inherited when the default style overlaps resolution mechanism implemented in *Text* is not good enough.

class pytermor.text.**Text**(*string=''*, *fmt=<Style[NOP]>*, *close_this=True*, *close_prev=False*)

Bases: *Renderable*

pytermor.text.**render**(*string*, *fmt=<Style[NOP]>*, *renderer=None*, *parse_template=False*)

Parameters

- **string** (*t.Any*) –
- **fmt** (*Color | Style*) –
- **renderer** (*AbstractRenderer*) –
- **parse_template** (*bool*) –

Returns

Return type
str | t.List[str]

pytermor.text.**echo**(*string=''*, *fmt=<Style[NOP]>*, *renderer=None*, *parse_template=False*, *nl=True*, *file=<_io.TextIOWrapper name='<stdout>' mode='w' encoding='utf-8'>*, *flush=True*, *wrap=False*, *indent_first=0*, *indent_subseq=0*)

Parameters

- **string** (*t.Any*) –
- **fmt** (*Color | Style*) –
- **renderer** (*AbstractRenderer*) –
- **parse_template** (*bool*) –
- **nl** (*bool*) –
- **file** (*t.IO*) –
- **flush** (*bool*) –
- **wrap** (*bool | int*) –
- **indent_first** (*int*) –
- **indent_subseq** (*int*) –

2.8 utilnum

pytermor.utilnum.**format_auto_float**(*value*, *req_len*, *allow_exponent_notation=True*)

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** (*float*) – Value to format
- **req_len** (*int*) – Required output string length
- **allow_exponent_notation** (*bool*) – Enable/disable exponent form.

Returns
Formatted string of required length

Raises
ValueError –

Return type
str

New in version 1.7.

pytermor.utilnum.**format_si_metric**(*value*, *unit='m'*, *join=True*)

Format `value` as meters with SI-prefixes, max result length is 7 chars: 4 for value plus 3 for default unit, prefix and separator. Base is 1000. Unit can be customized. Suitable for formatting any SI unit with values from approximately 10^-27 to 10^27.

```
>>> format_si_metric(1010, 'm²')
'1.01 km²'
>>> format_si_metric(0.0319, 'g')
```

(continues on next page)

(continued from previous page)

```
'31.9 mg'
>>> format_si_metric(1213531546, 'W')  # great scott
'1.21 GW'
>>> format_si_metric(1.26e-9, 'eV')
'1.26 neV'
```

Parameters

- **value** (*float*) – Input value (unitless).
- **unit** (*str*) – Value unit, printed right after the prefix.
- **join** (*bool*) – Return the result as a string if set to *True*, or as a (num, sep, unit) tuple otherwise.

Returns

Formatted string with SI-prefix if necessary.

Return type

str | Tuple[str, str, str]

New in version 2.0.

pytermor.utilnum.**format_si_binary**(*value*, *unit='b'*, *join=True*)

Format `value` as binary size (bytes, kbytes, Mbytes), max result length is 8 chars: 5 for value plus 3 for default unit, prefix and separator. Base is 1024. Unit can be customized.

```
>>> format_si_binary(1010)  # 1010 b < 1 kb
'1010 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** (*float*) – Input value in bytes.
- **unit** (*str*) – Value unit, printed right after the prefix.
- **join** (*bool*) – Return the result as a string if set to *True*, or as a (num, sep, unit) tuple otherwise.

Returns

Formatted string with SI-prefix if necessary.

Return type

str | Tuple[str, str, str]

New in version 2.0.

class pytermor.utilnum.**PrefixedUnitFormatter**(*max_value_len*, *truncate_frac=False*, *unit=None*, *unit_separator=None*, *mcoef=1000.0*, *prefixes=None*, *prefix_zero_idx=None*)

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.

Parameters

- **max_value_len** (*int*) –
- **truncate_frac** (*bool*) –
- **unit** (*str*) –
- **unit_separator** (*str*) –
- **mcoef** (*float*) –
- **prefixes** (*List[str | None]*) –
- **prefix_zero_idx** (*int*) – Index of prefix which will be used as default, i.e. without multiplying coefficients.

New in version 1.7.

property max_len: int

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

format(*value*, *unit=None*, *join=True*)

Parameters

- **value** (*float*) – Input value
- **unit** (*str*) – Unit override
- **join** (*bool*) – Return the result as a string if set to *True*, or as a (num, sep, unit) tuple otherwise.

Returns
Formatted value

Return type
str | Tuple[str, str, str]

pytermor.utilnum.**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.utilnum.**PREFIX_ZERO_SI = 8**

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

pytermor.utilnum.**_formatter_si_metric = PrefixedUnitFormatter**

Configuration example, used by *format_si_binary*.

`max_value_len` must be at least 4, because it's a minimum requirement for formatting values from 999 to -999. Next number to 999 is 1000, which will be formatted as "1k".

Total maximum length is `max_value_len + 3`, which is 7 (+3 is from separator, unit and prefix, assuming all of them have 1-char width). Without unit (default) it's 6.

pytermor.utilnum.**_formatter_si_binary = PrefixedUnitFormatter**

Configuration example, used by *format_si_metric*.

While being similar to *_formatter_si_metric*, this formatter differs in one aspect. Given a variable with default value = 995, formatting it's value results in "995 b". After increasing it by 20 we'll have 1015, but it's still not enough to become a kilobyte – so returned value will be "1015 b". Only after one more increase (at 1024 and more) the value will be in a form of "1.00 kb".

So, in this case `max_value_len` must be at least 5 (not 4), because it's a minimum requirement for formatting values from 1023 to -1023.

Total maximum length is `max_value_len + 3` = 8 (+3 is from separator, unit and prefix, assuming all of them have 1-char width).

pytermor.utilnum.**format_time_delta**(*seconds*, *max_len=None*)

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** (*float*) – Value to format
- **max_len** (*Optional[int]*) – Maximum output string length (total)

Returns
Formatted string

Return type
str

class pytermor.utilnum.**TimeDeltaFormatter**(*units*, *allow_negative*, *unit_separator=None*, *plural_suffix=None*, *overflow_msg='OVERFLOW'*)

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"
```

Parameters

- **units** (*List[TimeUnit]*) –
- **allow_negative** (*bool*) –
- **unit_separator** (*str*) –
- **plural_suffix** (*str*) –
- **overflow_msg** (*str*) –

property max_len: int

This property cannot be set manually, it is computed on initialization automatically.

Returns
Maximum possible output string length.

format(*seconds*, *always_max_len=False*)

Pretty-print difference between two moments in time.

Parameters

- **seconds** (*float*) – Input value.
- **always_max_len** (*bool*) – 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.

Return type
str

format_raw(*seconds*)

Pretty-print difference between two moments in time, do not replace the output with "OVERFLOW" warning message.

Parameters
seconds (*float*) – Input value.

Returns
Formatted string or *None* on overflow (if input value is too big for the current formatter to handle).

Return type
str | None

class pytermor.utilnum.**TimeUnit**(*name: 'str'*, *in_next: 'int' = None*, *custom_short: 'str' = None*, *collapsible_after: 'int' = None*, *overflow_afer: 'int' = None*)

2.9 utilstr

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.utilstr.**format_thousand_sep**(*value*, *separator=' '*)

Returns input `value` with integer part split 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'
```

Parameters

- **value** (*int | float*) –
- **separator** (*str*) –

Return type
str

pytermor.utilstr.**distribute_padded**(*values*, *max_len*, *pad_before=False*, *pad_after=False*)

Todo: todo

Parameters

- **values** (*List[StrType]*) –
- **max_len** (*int*) –
- **pad_before** (*bool*) –
- **pad_after** (*bool*) –

Returns

Return type
StrType

pytermor.utilstr.**ljust_sgr**(*s*, *width*, *fillchar=' '*, *actual_len=None*)

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).

Return type
str

pytermor.utilstr.**rjust_sgr**(*s*, *width*, *fillchar=' '*, *actual_len=None*)

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).

Return type
str

pytermor.utilstr.**center_sgr**(*s*, *width*, *fillchar=' '*, *actual_len=None*)

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-

Return type
str

pytermor.utilstr.**wrap_sgr**(*raw_input*, *width*, *indent_first=0*, *indent_subseq=0*)

A workaround to make standard library `textwrap.wrap()` more friendly to an SGR-formatted strings.

The main idea is

Parameters

- **raw_input** (*str | list[str]*) –
- **width** (*int*) –

Returns

Return type
str

class pytermor.utilstr.**OmniFilter**(**args*, ***kwds*)

Bases: `Generic[IT, OT]`

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.

__call__(*s*)

Can be used instead of *apply()*

Return type
OT

apply(*inp*)

Parameters
inp (*IT*) –

Returns

Return type
OT

class pytermor.utilstr.**NoopFilter**(**args*, ***kwds*)

Bases: *OmniFilter*[IT, OT]

apply(*inp*)

Parameters
inp (*IT*) –

Returns

Return type
OT

class pytermor.utilstr.**OmniDecoder**(**args*, ***kwds*)

Bases: *OmniFilter*[IT, str]

apply(*inp*)

Parameters
inp (*IT*) –

Returns

Return type
str

class pytermor.utilstr.**OmniEncoder**(**args*, ***kwds*)

Bases: *OmniFilter*[IT, bytes]

apply(*inp*)

Parameters
inp (*IT*) –

Returns

Return type
bytes

class pytermor.utilstr.**OmniReplacer**(*pattern*, *repl*)

Bases: *OmniFilter*[IT, OT]

.

apply(*inp*)

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

Return type
OT

class pytermor.utilstr.**StringReplacer**(*pattern*, *repl*)

Bases: *OmniReplacer*[str, str]

class pytermor.utilstr.**BytesReplacer**(*pattern*, *repl*)

Bases: *OmniReplacer*[bytes, bytes]

class pytermor.utilstr.**SgrStringReplacer**(*repl=''*)

Bases: *StringReplacer*

Find all SGR seqs (e.g. `ESC[1;4m`) and replace with given string. More specific version of `CsiReplacer`.

Parameters
repl – Replacement, can contain regexp groups (see *apply_filters()*).

class pytermor.utilstr.**CsiStringReplacer**(*repl=''*)

Bases: *StringReplacer*

Find all CSI seqs (i.e. starting with `ESC[`) and replace with given string. Less specific version of `SgrReplacer`, as CSI consists of SGR and many other sequence subtypes.

Parameters
repl – Replacement, can contain regexp groups (see *apply_filters()*).

class pytermor.utilstr.**WhitespacesStringReplacer**(*repl=''*, *keep_newlines=True*)

Bases: *StringReplacer*

Replace every invisible character with `repl` (default is `·`), except newlines. Newlines are kept and get prepneded with same string by default, but this behaviour can be disabled with `keep_newlines` = *False*.

```
>>> WhitespacesStringReplacer("·").apply('A  B  C')
'A··B··C'
>>> apply_filters('1. D\n2. L ', WhitespacesStringReplacer(keep_newlines=False))
'1.D2.L'
```

Parameters

- **repl** –
- **keep_newlines** –

class pytermor.utilstr.**ControlCharsStringReplacer**(*repl=''*)

Bases: *StringReplacer*

.

class pytermor.utilstr.**NonAsciiByteReplacer**(*repl=b''*)

Bases: *BytesReplacer*

Keep 7-bit ASCII bytes [0x00-0x7f], replace or remove (this is a default) others.

```
>>> inp = bytes((0x60, 0x70, 0x80, 0x90, 0x50))
>>> NonAsciiByteReplacer().apply(inp)
b'`pP'
>>> NonAsciiByteReplacer(lambda m: b'?'*len(m.group())).apply(inp)
b'`p??P'
>>> NonAsciiByteReplacer(lambda m: f'[{m.group().hex()}]'.encode()).apply(inp)
b'`p[8090]P'
```

Parameters

repl – Replacement byte-string.

class pytermor.utilstr.**OmniSanitizer**(*repl=b''*)

Bases: *OmniReplacer*[IT, bytes]

apply(*inp*)

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

Return type

bytes

pytermor.utilstr.**apply_filters**(*string*, **args*)

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(f'{SeqIndex.RED}test{SeqIndex.COLOR_OFF}', SgrStringReplacer(r'E\
↪2\3\4'))
'E[31mtestE[39m'
```

Note that type of `s` argument must be same as `StringFilter` parameterized type, i.e. `ReplaceNonAsciiBytes` is `StringFilter` type, so you can apply it only to bytes-type strings.

Parameters

- **string** (*IT*) – String to filter.
- **args** (*Union[OmniFilter[IT, OT], Type[OmniFilter[IT, OT]]]*) – *OmniFilter* instance(s) or `OmniFilter` type(s).

Returns
Filtered `s`.

Return type
OT

2.10 utilsys

`pytermor.utilsys.`**`get_terminal_width`**`(`*default=80*, *padding=2*`)`

Returns
terminal_width

Return type
int

`pytermor.utilsys.`**`wait_key`**`()`

Wait for a key press on the console and return it.

Return type
t.AnyStr | None

`pytermor.utilsys.`**`total_size`**`(`*o*, *handlers=None*, *verbose=False*`)`

Returns the approximate memory footprint an object and all of its contents.

Automatically finds the contents of the following builtin containers and their subclasses: tuple, list, deque, dict, set and frozenset. To search other containers, add handlers to iterate over their contents:

handlers = {SomeContainerClass: iter,
OtherContainerClass: OtherContainerClass.get_elements}

Return type
int

CHAPTER

THREE

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)*

CHAPTER

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PYTHON MODULE INDEX

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