MEANDER

User guide

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Page layout engine with image wrap-around and text threading.

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MEANDER implements a content layout algorithm that supports wrapping text around images of arbitrary shape. In practice, this makes MEANDER a temporary solution to issue #5181, and it will eventually become obsolete when Typst includes the feature natively. Though very different in its modeling, MEANDER can be seen as a Typst alternative to LaTeX's `wrapfig` and `parshape`.

Internally this is enabled by the following algorithms:
1. page tiling arranges containers around floating content,
2. text bisection recursively explores and splits `content`,
3. threading is the process of making text overflow to another box.

Contributions

If you have ideas or complaints, you're welcome to contribute to MEANDER by submitting a bug report, feature request, or pull request.

Versions

- `dev`
- `0.2.2` (`latest`)
- `0.2.1`
- `0.2.0`
- `0.1.0`

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Part I

Quick start

The main function provided by MEANDER is `#meander.reflow`, which takes as input a sequence of "containers", "obstacles", and "flowing content", created respectively by the functions `container(..)`, `placed(..)`, and `content(..)`. Obstacles are placed on the page with a fixed layout. After excluding the zones occupied by obstacles, the containers are segmented into boxes then filled by the flowing content.

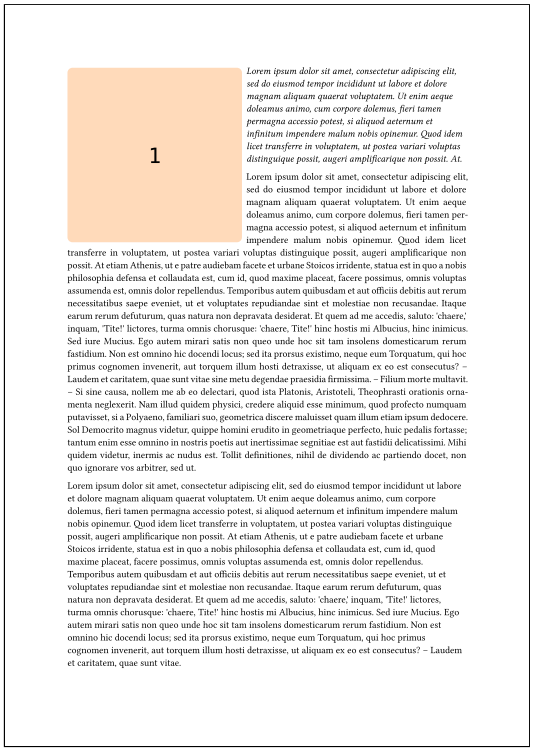
More details about MEANDER's model are given in Section II.

I.1 A simple example

Below is a single page whose layout is fully determined by MEANDER. The general pattern of `placed(..)` + `container(..)` + `content(..)` is almost universal.

Within a `#meander.reflow` block, use `placed(..)` (same parameters as the standard function `place(..)`) to position obstacles made of arbitrary content on the page, specify areas where text is allowed with `container(..)`, then give the actual content to be written there using `content(..)`.

```
#meander.reflow({
  import meander: *
  // Obstacle in the top left
  placed(top + left, my-img-1)

  // Full-page container
  container()

  // Flowing content
  content[
    _#lorem(60)_
    #[
      #set par(justify: true)
      #lorem(300)
    ]
    #lorem(200)
  ]
})
```



MEANDER is expected to automatically respect the majority of styling options, including headings, paragraph justification, bold and italics, etc. Notable exceptions that must be specified manually are detailed in Section IV.

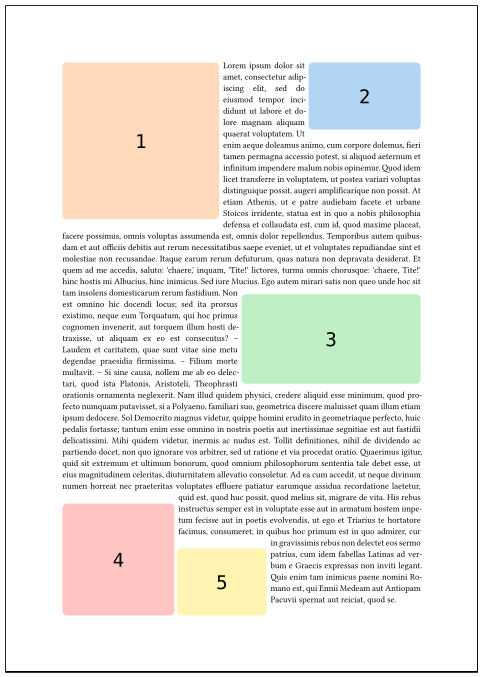
If you find a style discrepancy, make sure to file it as a bug report, if it is not already part of the known limitations.

I.2 Multiple obstacles

A single `#meander.reflow` invocation can contain multiple `placed(..)` objects. A possible limitation would be performance if the number of obstacles grows too large, but experiments have shown that up to ~100 obstacles is still workable.

In fact, this ability to handle arbitrarily many obstacles is what I consider MEANDER's main innovation compared to WRAP-IT, which also provides text wrapping but around at most two obstacles.

```
#meander.reflow({
  import meander: *
  // As many obstacles as you want
  placed(top + left, my-img-1)
  placed(top + right, my-img-2)
  placed(horizon + right, my-img-3)
  placed(bottom + left, my-img-4)
  placed(bottom + left, dx: 32%,
         my-img-5)

  // The container wraps around all
  container()
  content[
    #set par(justify: true)
    #lorem(430)
  ]
})
```

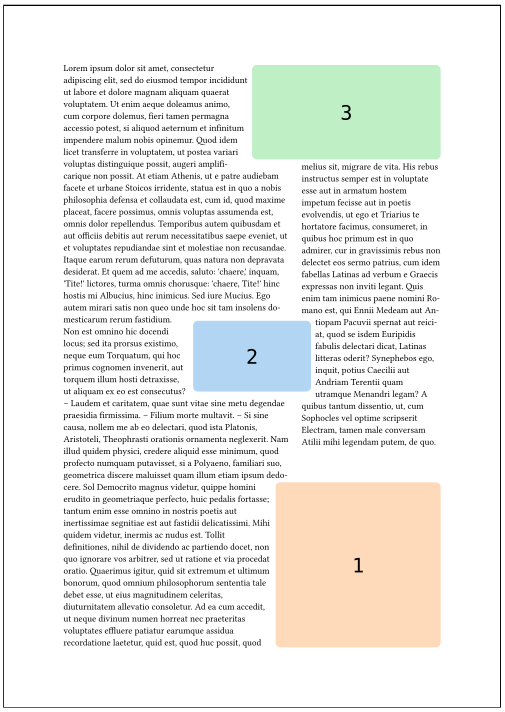


Technically, MEANDER can only handle rectangular obstacles. However, thanks to this ability to handle an arbitrary number of obstacles, we can approximate a non-rectangular obstacle using sereval rectangles. See concrete applications and techniques for defining these rectangular tilings in Section III.

I.3 Columns

Similarly, MEANDER can also handle multiple occurrences of `container(..)`. They will be filled in the order provided, leaving a (configurable) margin between one and the next. Among other things, this can allow producing a layout in columns, including columns of uneven width (a longstanding typst issue).

```
#meander.reflow({
  import meander: *
  placed(bottom + right, my-img-1)
  placed(center + horizon, my-img-2)
  placed(top + right, my-img-3)

  // With two containers we can
  // emulate two columns.

  // The first container takes 60%
  // of the page width
  container(width: 60%, margin: 5mm)
  // The second container automatically
  // fills the remaining space.
  container()

  content[#lorem(470)]
})
```



Part II

Understanding the algorithm

Although it can produce the same results as `parshape` in practice, MEANDER's model is fundamentally different. In order to better understand the limitations of what is feasible, know how to tweak an imperfect layout, and anticipate issues that may occur, it helps to have a basic understanding of MEANDER's algorithm(s).

Even if you don't plan to contribute to the implementation of MEANDER, I suggest you nevertheless briefly read this section to have an intuition of what happens behind the scenes.

II.1 Page tiling

When you write some layout such as the one below, MEANDER receives a sequence of elements that it splits into obstacles, containers, and content.

```
#meander.reflow({
  import meander: *
  placed(bottom + right, my-img-1)
  placed(center + horizon, my-img-2)
  placed(top + right, my-img-3)

  container(width: 60%)
  container(align: right, width: 35%)
  content[#lorem(470)]
})
```

First the `measure(..)` of each obstacle is computed, their positioning is inferred from the alignment parameter of `placed(..)`, and they are placed on the page. The regions they cover as marked as forbidden.

Then the same job is done for the containers, marking those regions as allowed. The two sets of computed regions are combined by subtracting the forbidden regions from the allowed ones, giving a rectangular subdivision of the usable areas.

You can have a visual representation of these regions by replacing `#meander.reflow` with `#meander.regions`, with the same inputs.

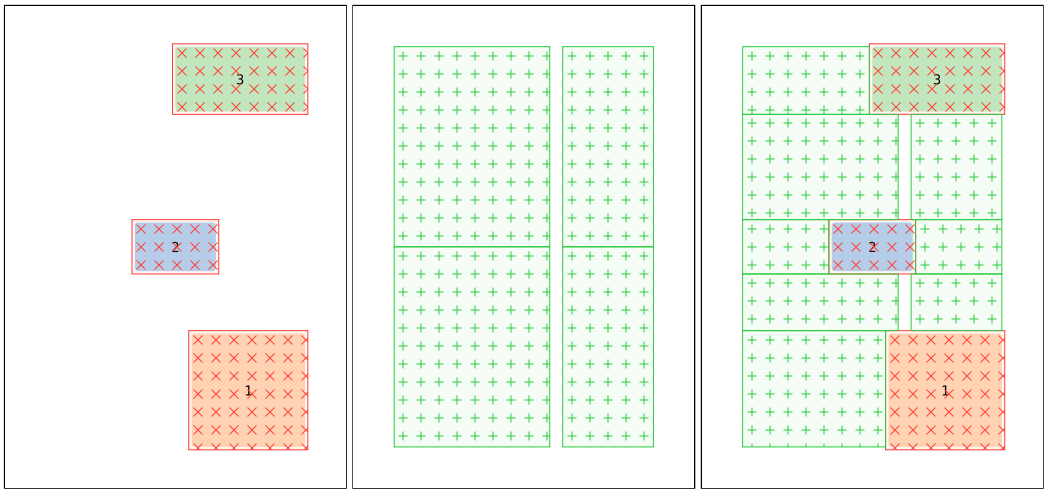


Figure 1: Left to right: the forbidden, allowed, and combined regions

II.2 Content bisection

The second building block of MEANDER is its algorithm to split content. The regions computed by the tiling algorithm must be filled in order, and text from one box might overflow to another. The content bisection rules are all MEANDER's heuristics to split text and take as much as fits in a box.

For example, consider the content `bold(lorem(20))` which does not fit in the container `box(width: 5cm, height: 5cm)`:

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magnam aliquam quaerat.

MEANDER will determine that

1. the content fits in the box until "eius-", and everything afterwards is overflow,
2. splitting `strong` text is equivalent to applying `strong(..)` to both halves,
3. therefore the content can be separated into
   - on the one hand, the text that fits `strong("Lorem ... eius-")`
   - on the other hand, the overflow `strong("mod ... quaerat.")`

If you find weird style artifacts near container boundaries, it is probably a case of faulty bisection heuristics, and deserves to be reported.

II.3 Threading

The threading process interactively invokes both the tiling and the bisection algorithms, establishing the following dialogue:

1. the tiling algorithm yields an available container
2. the bisection algorithm finds the maximum text that fits inside
3. the now full container becomes an obstacle and the tiling is updated
4. start over from step 1.

> The order in which the boxes are filled always follows the priority of
> - container order,
> - top → bottom,
> - left → right.
>
> In other words, MEANDER will not guess columns, you must always specify columns explicitly.

The exact boundaries of containers may be altered in the process for better spacing.

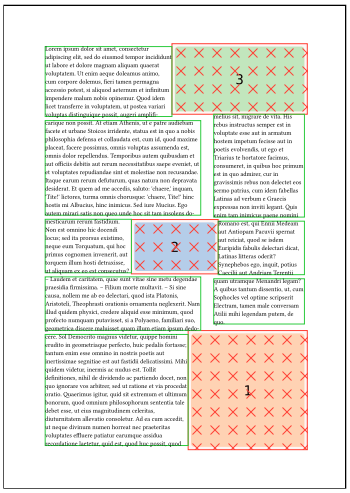


Figure 2: Debug view of the final output of `#meander.reflow`

> Every piece of content produced by `#meander.reflow` is placed, and therefore does not affect layout outside of `#meander.reflow`. See Section V.3 for solutions.

Part III

Contouring

I made earlier two seemingly contradictory claims:

1. MEANDER supports wrapping around images of arbitrary shape,
2. MEANDER only supports rectangular obstacles.

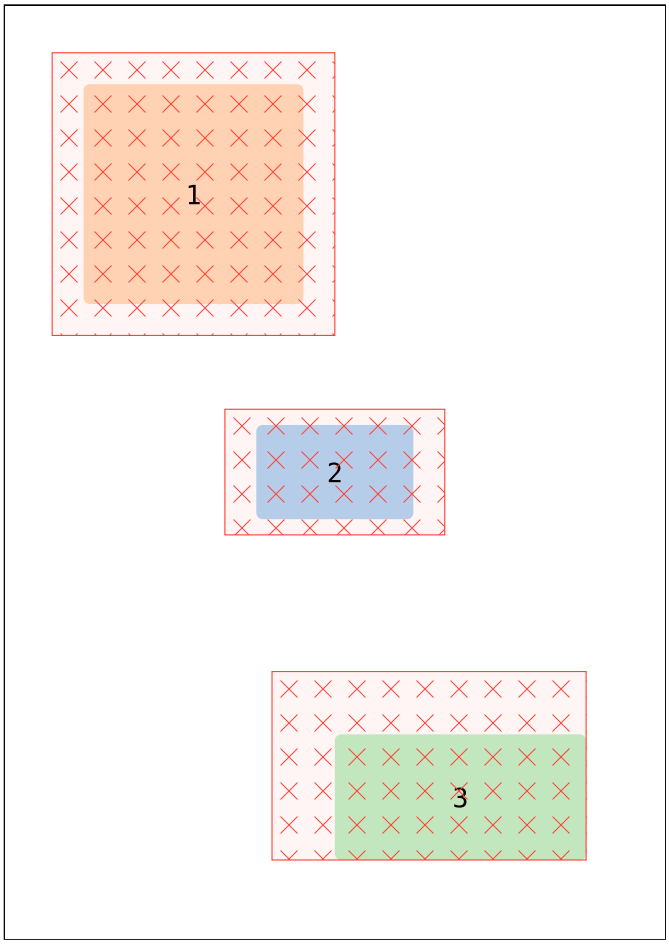
This is not a mistake. The reality is that these statements are only incompatible if we assume that 1 image = 1 obstacle. We call "contouring functions" the utilities that allow splitting one image into multiple obstacles to approximate an arbitrary shape.

All contouring utilities live in the `contour` module.

III.1 Margins

The simplest form of contouring is adjusting the margins. The default is a uniform `5pt` gap, but you can adjust it for each obstacle and each direction.

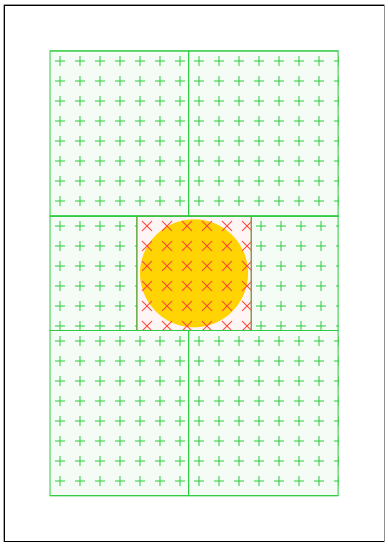
```
#meander.regions({
  import meander: *
  placed(
    top + left,
    boundary:
      contour.margin(1cm),
    my-img-1,
  )
  placed(
    center + horizon,
    boundary:
      contour.margin(
        5mm,
        x: 1cm,
      ),
    my-img-2,
  )
  placed(
    bottom + right,
    boundary:
      contour.margin(
        top: 2cm,
        left: 2cm,
      ),
    my-img-3,
  )
})
```



III.2 Boundaries as equations

For more complex shapes, one method offered is to describe as equations the desired shape. Consider the following starting point: a simple double-column page with a cutout in the middle for an image.

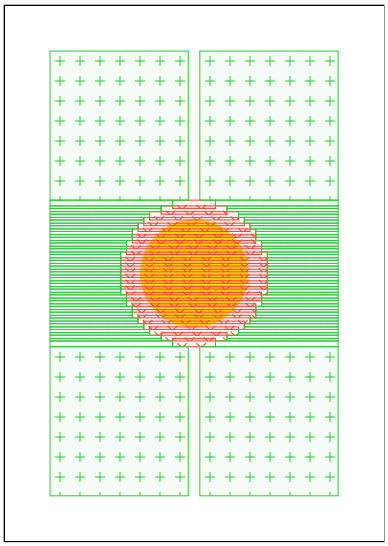
```
#meander.reflow({
  import meander: *
  placed(center + horizon)[
    #circle(radius: 3cm, fill: yellow)
  ]

  container(width: 50% - 3mm, margin: 6mm)
  container()

  content[
    #set par(justify: true)
    #lorem(590)
  ]
})
```



MEANDER sees all obstacles as rectangular, so the circle leaves a big ugly square hole in the page. Fortunately the desired circular shape is easy to describe in equations, and we can do so using the function `contour.grid(..)`, which takes as input a 2D formula normalized to $[0, 1]$, i.e. a function from $[0, 1] \times [0, 1]$ to `bool`.

```
#meander.reflow({
  import meander: *
  placed(
    center + horizon,
    boundary:
      // Override the default margin
      contour.margin(1cm) +
      // Then redraw the shape as a grid
      contour.grid(
        // 25 vertical and horizontal subdivisions.
        // Just pick a number that looks good.
        // A good rule of thumb is to start with obstacles
        // about as high as one line of text.
        div: 25,
        // Equation for a circle of center (0.5, 0.5) and radius 0.5
        (x, y) => calc.pow(2 * x - 1, 2) + calc.pow(2 * y - 1, 2) <= 1
      ),
    // Underlying object
    circle(radius: 3cm, fill: yellow),
  )
  // ...
})
```

This results in the new subdivisions of containers below.



This enables in theory drawing arbitrary paragraph shapes. In practice not all shapes are convenient to express in this way, so the next sections propose other methods.

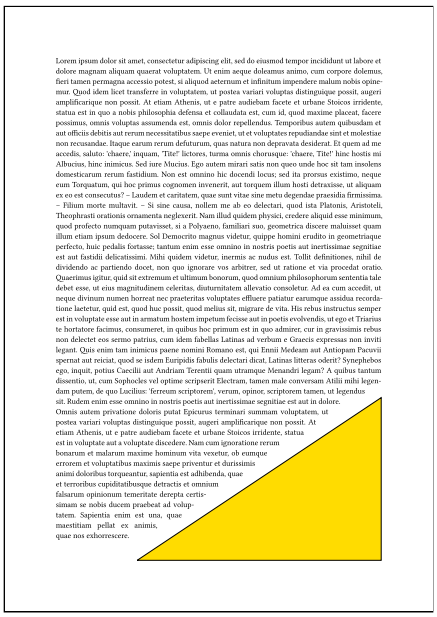
> Watch out for the density of obstacles. Too many obstacles too close together can impact performance.

III.3 Boundaries as layers

If your shape is not convenient to express through a grid function, but has some horizontal or vertical regularity, here are some other suggestions. As before, they are all normalized between 0 and 1.

III.3.1 Horizontal rectangles

`contour.horiz(..)` and `contour.width(..)` produce horizontal layers of varying width. `contour.horiz(..)` works on a `(left, right)` basis (the parameterizing function should return the two extremities of the obstacle), while `contour.width(..)` works on an `(anchor, width)` basis.




```
#meander.reflow({
  import meander: *
  placed(right + bottom,
    boundary:
      // The right aligned edge makes
      // this easy to specify using
      // `horiz`
      contour.horiz(
        div: 20,
        // (left, right)
        y => (1 - y, 1),
      ) +
      // Add a post-segmentation margin
      contour.margin(5mm)
  )[...]
  // ...
})
```

The interpretation of `flush` for `contour.width(..)` is as follows:

- if `flush = left`, the `anchor` point will be the left of the obstacle;
- if `flush = center`, the `anchor` point will be the middle of the obstacle;
- if `flush = right`, the `anchor` point will be the right of the obstacle.

```
#meander.reflow({
  import meander: *
  placed(center + bottom,
    boundary:
      // This time the vertical symetry
      // makes `width` a good match.
      contour.width(
        div: 20,
        flush: center,
        // Centered in 0.5, of width y
        y => (0.5, y),
      ) +
      contour.margin(5mm)
  )[...]
  // ...
})
```

III.3.2 Vertical rectangles

`contour.vert(..)` and `contour.height(..)` produce vertical layers of varying height.

```
#meander.reflow({
  import meander: *
  placed(top,
    boundary:
      contour.vert(
        div: 25,
        x => if x <= 0.5 {
          (0, 2 * (0.5 - x))
        } else {
          (0, 2 * (x - 0.5))
        },
      ) +
      contour.margin(5mm)
  )[...]
  // ...
})
```

The interpretation of `flush` for `contour.height(..)` is as follows:

- if `flush = top`, the `anchor` point will be the top of the obstacle;

- if `flush = horizon`, the `anchor` point will be the middle of the obstacle;
- if `flush = bottom`, the `anchor` point will be the bottom of the obstacle.

```
#meander.reflow({
  import meander: *
  placed(left + horizon,
    boundary:
      contour.height(
        div: 20,
        flush: horizon,
        x => (0.5, 1 - x),
      ) +
      contour.margin(5mm)
  )[...]
  // ...
})
```

III.4 Autocontouring

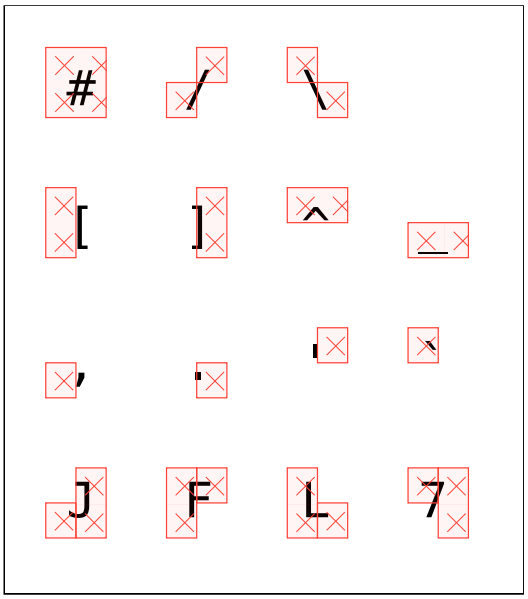
The contouring function `contour.ascii-art(..)` takes as input a string or raw code and uses it to draw the shape of the image. The characters that can occur are:

```
#meander.reflow(debug: true, {
  import meander: *
  placed(top + left,
    boundary: contour.margin(6mm) +
      contour.ascii-art(
        ```
        # / \

        [ ] ^ _

        , . ' `

        J F L 7
        ```
      )
  )[#image]
})
```



If you have ImageMagick and Python 3 installed, you may use the auxiliary tool `autocontour` to produce a first draft. This small Python script will read an image, pixelate it, apply a customizable threshold function, and produce a `*.contour` file that can be given as input to `contour.ascii-art(..)`.

```
# Install the script
$ pip install autocontour

# Run on `image.png` down to 15 by 10 pixels, with an 80% threshold.
$ autocontour image.png 15x10 80%
```

```
#meander.reflow({
  import meander: *
  placed(top + left,
    boundary: contour.ascii-art(read("image.png.contour")),
    image("image.png"),
  )
  // ...
})
```

> You can read more about `autocontour` on the dedicated `README.md`

> `autocontour` is still very experimental.

> The output of `autocontour` is unlikely to be perfect, and it is not meant to be. The format is simple on purpose so that it can be tweaked by hand afterwards.

III.5 More to come

If you find that the shape of your image is not convenient to express through any of those means, you're free to submit suggestions as a feature request.

Part IV
Styling

MEANDER respects most styling options through a dedicated content segmentation algorithm, as briefly explained in Section II. Bold, italic, underlined, stroked, highlighted, colored, etc. text is preserved through threading, and easily so because those styling options do not affect layout much.

There are however styling parameters that have a consequence on layout, and some of them require special handling. Some of these restrictions may be relaxed or entirely lifted by future updates.

IV.1 Paragraph justification

In order to properly justify text across boxes, MEANDER needs to have contextual access to `#par.justify`, which is only updated via a `#set` rule.

As such **do not** use `#par(justify: true)[...]`.

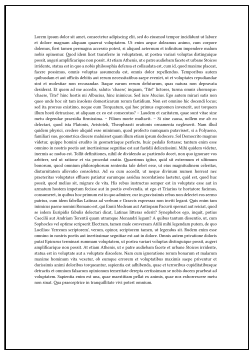
Instead prefer `#[#set par(justify: true); ...]`, or put the `#set` rule outside of the invocation of `#meander.reflow` altogether.

Wrong

```
#meander.reflow({
  // ...
  content[
    #par(justify: true)[
      #lorem(600)
    ]
  ]
})
```

Correct

```
#meander.reflow({
  // ...
  content[
    #set par(justify: true)
    #lorem(600)
  ]

})
```



Correct

```
#set par(justify: true)
#meander.reflow({
  // ...
  content[

    #lorem(600)
  ]

})
```

IV.2 Font size and `par` leading

The font size indirectly affects layout because it determines the spacing between lines. When a linebreak occurs between containers, MEANDER needs to manually insert the appropriate spacing there. Since the spacing is affected by font size, make sure to update the font size outside of the `#meander.reflow` invocation if you want the correct line spacing. Alternatively, `size` can be passed as a parameter of `content` and it will be interpreted as the text size.

Analogously, if you wish to change the spacing between lines, use either a `#set par(leading: 1em)` outside of `#meander.reflow`, or pass `leading: 1em` as a parameter to `content`.

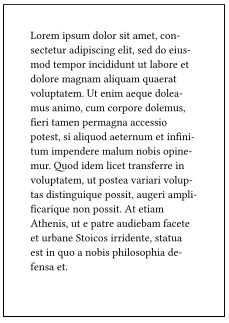
Wrong

```
#meander.reflow({
  // ...
  content[
    #set text(size: 30pt)
    #lorem(80)
  ]
})
```

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magnam aliquam quaerat voluptatem. Ut enim aeque doleamus animo, cum corpore dolemus, fieri tamen permagna accessio potest, si aliquod aeternum et infinitum impendere malum nobis opinemur. Quod idem licet transferre in voluptatem, ut postea variari voluptas distinguique possit, augeri amplificarique non possit. At etiam Athenis, ut e patre audiebam facete et urbane Stoicos irridente, statua est in quo a nobis philosophia defensa et.

Correct

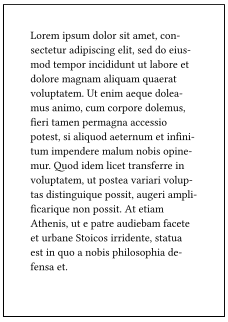
```
#set text(size: 30pt)
#meander.reflow({
  // ...
  content[

    #lorem(80)
  ]
})
```



Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magnam aliquam quaerat voluptatem. Ut enim aeque doleamus animo, cum corpore dolemus, fieri tamen permagna accessio potest, si aliquod aeternum et infinitum impendere malum nobis opinemur. Quod idem licet transferre in voluptatem, ut postea variari voluptas distinguique possit, augeri amplificarique non possit. At etiam Athenis, ut e patre audiebam facete et urbane Stoicos irridente, statua est in quo a nobis philosophia defensa et.

Correct

```
#meander.reflow({
  // ...
  content(size: 30pt)[

    #lorem(80)
  ]
})
```

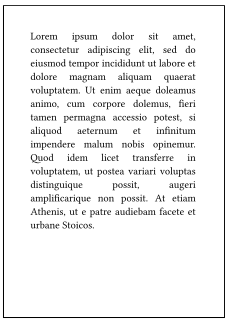


IV.3 Hyphenation and language

Hyphenation can only be fetched contextually, and highly influences how text is split between boxes. Language indirectly influences layout because it determines hyphenation rules. To control the hyphenation and language, use the same approach as for the text size: either `#set` them outside of `#meander.reflow`, or pass them as parameters to `content`.

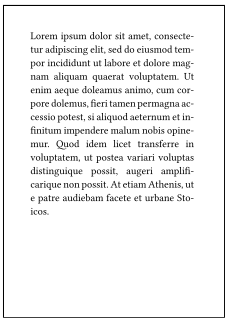
Wrong

```
#meander.reflow({
  // ...
  content[
    #set text(hyphenate: true)
    #lorem(70)
  ]
})
```



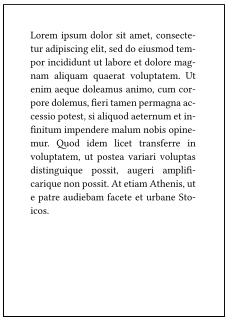
Correct

```
#set text(hyphenate: true)
#meander.reflow({
  // ...
  content[

    #lorem(70)
  ]
})
```



Correct

```
#meander.reflow({
  // ...
  content(hyphenate: true)[

    #lorem(70)
  ]
})
```



IV.3.1 Styling containers

`container(..)` accepts a `style` dictionary that may contain the following keys:

- `text-fill`: the color of the text in this container,
- `align`: the left/center/right alignment of content,
- and more to come.

These options have in common that they do not affect layout so they can be applied post-threading to the entire box. Future updates may lift this restriction.

```
#meander.reflow({
  import meander: *
  container(width: 25%,
    style: (align: right, text-fill: blue))
  container(width: 75%,
    style: (align: center))
  container(
    style: (text-fill: red))
  content[#lorem(590)]
})
```

Part V
Multi-page setups

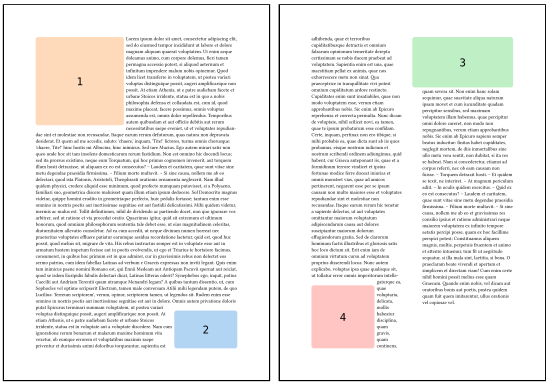
V.1 Pagebreak

MEANDER can deal with text that spans multiple pages, you just need to place `pagebreak()`s appropriately. Note that `pagebreak()` only affects the obstacles and containers, while `content(..)` blocks ignore them entirely.

The layout below spans two pages:

- obstacles and containers before the `pagebreak()` go to the first page,
- obstacles and containers after the `pagebreak()` go to the second page,
- `content(..)` is page-agnostic and will naturally overflow to the second page when all containers from the first page are full.

```
#meander.reflow({
  import meander: *

  placed(top + left, my-img-1)
  placed(bottom + right, my-img-2)
  container()

  pagebreak()

  placed(top + right, my-img-3)
  placed(bottom + left, my-img-4)
  container(width: 45%)
  container(align: right, width: 45%)

  content[#lorem(1000)]
})
```

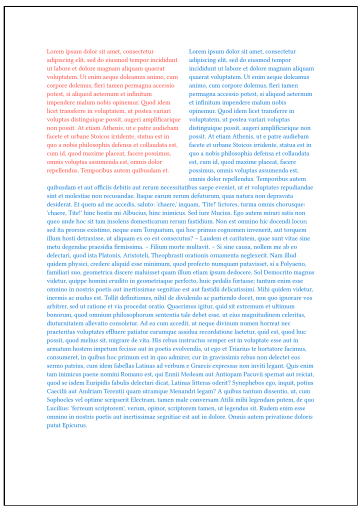


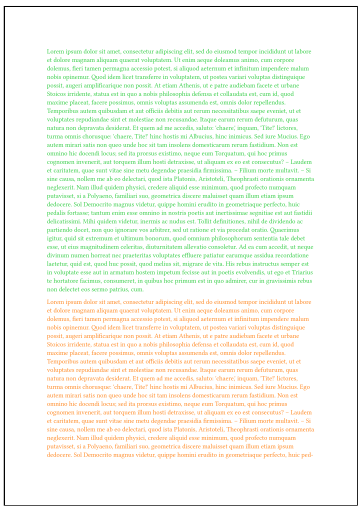
Notice: text from a 1-column layout overflows into a 2-column layout.

V.2 Colbreak

Analogously, `colbreak()` breaks to the next container. Note that `pagebreak()` is a *container* separator while `colbreak()` is a *content* separator. The next container may be on the next page, so the right way to create an entirely new page for both containers and content is a `pagebreak()` **and** a `colbreak()`… or you could just end the `#meander.reflow` and start a new one.

```
#meander.reflow({
  import meander: *

  container(width: 50%, style: (text-fill: red))
  container(style: (text-fill: blue))
  content[#lorem(100)]
  colbreak()
  content[#lorem(500)]

  pagebreak()
  colbreak()

  container(style: (text-fill: green))
  container(style: (text-fill: orange))
  content[#lorem(400)]
  colbreak()
  content[#lorem(400)]
  colbreak() // Note: the colbreak applies only after the overflow is handled.

  pagebreak()

  container(align: center, dy: 25%, width: 50%, style: (text-fill: fuchsia))
  container(width: 50% - 3mm, margin: 6mm, style: (text-fill: teal))
  container(style: (text-fill: purple))
  content[#lorem(400)]

})
```





V.3 Placement

Placement options control how a `#meander.reflow` invocation is visible by and sees other content. This is important because MEANDER places all its contents, so it is by default invisible to the native layout.

V.3.1 `page`

The default, and least opinionated, mode is `placement: page`.

- suitable for: one or more pages that `meander` has full control over.
- advantages: supports `pagebreaks`, several invocations can be superimposed, flexible.
- drawbacks: superimposed with content that follows.

V.3.2 `box`

The option `placement: box` will emit non-`placed` boxes to simulate the actual space taken by the MEANDER-controlled layout.

- suitable for: an invocation that is part of a larger page.
- advantages: supports `pagebreak()`, content that follows is automatically placed after.
- drawbacks: cannot superimpose multiple invocations.

V.3.3 `float`

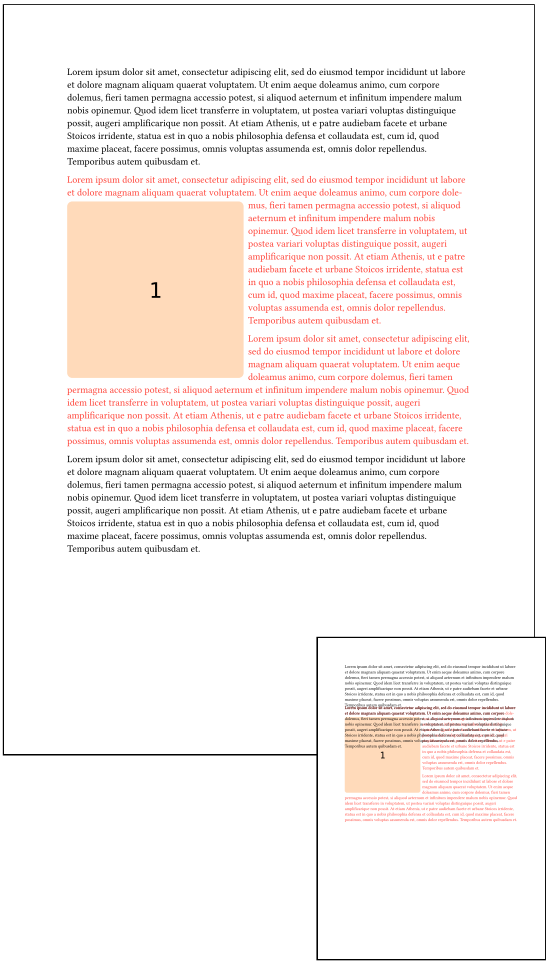
Finally, `placement: float` produces a layout that spans at most a page, but in exchange it can take the whole page even if some content has already been placed.

- suitable for: single page layouts.
- advantages: gets the whole page even if some content has already been written.
- drawbacks: does not support `pagebreaks`, does not consider other content.

V.3.4 Use-case

Below is a layout that is not (as easily) achievable in `page` as it is in `box`. Only text in red is actually controlled by MEANDER, the rest is naturally placed before and after. This makes it possible to hand over to MEANDER only a few paragraphs where a complex layout is required, then fall back to the native Typst layout engine.

```
#lorem(100)

#meander.reflow(placement: box, {
  import meander: *
  placed(top + left, dy: 1cm,
         my-img-1)
  container()
  content[
    #set text(fill: red)
    #lorem(100)

    #lorem(100)
  ]
})

#lorem(100)
```



For reference, to the right is the same page if we omit `placement: box`, where we can see a glitchy superimposition of text.

V.4 Overflow

By default, if the content provided overflows the available containers, it will show a warning. This behavior is configurable.

V.4.1 No overflow

The default behavior is `overflow: false` because it avoids panics while still alerting that something is wrong. The red warning box suggests adding more containers or a pagebreak to fit the remaining text. Setting `overflow: true` will silently ignore the overflow, while `overflow: panic` will immediately abort compilation.

`overflow: false`

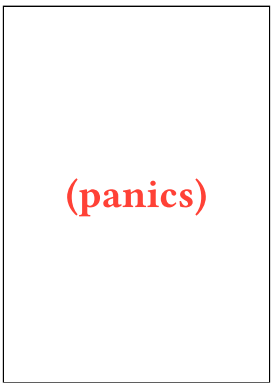
```
#meander.reflow(
  overflow: false, {
  import meander: *
  container()
  content[#lorem(1000)]
})
```

`overflow: true`

```
#meander.reflow(
  overflow: true, {
  import meander: *
  container()
  content[#lorem(1000)]
})
```

`overflow: panic`

```
#meander.reflow(
  overflow: panic, {
  import meander: *
  container()
  content[#lorem(1000)]
})
```

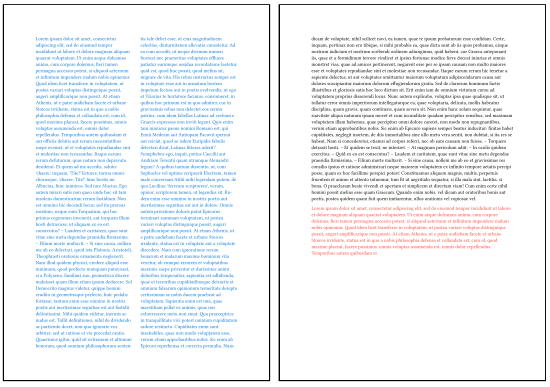


V.4.2 Predefined layouts

The above options are more useful if you absolutely want the content to fit in the defined layout. A commonly desired behavior is for the overflow to simply integrate with the layout as gracefully as possible. That is the purpose of the two options that follow.

With `overflow: pagebreak`, any content that overflows is placed on the next page. This is typically most useful in conjunction with `placement: page`, and is outright incompatible with `placement: float` (because it does not support pagebreaks; see Section V.3).

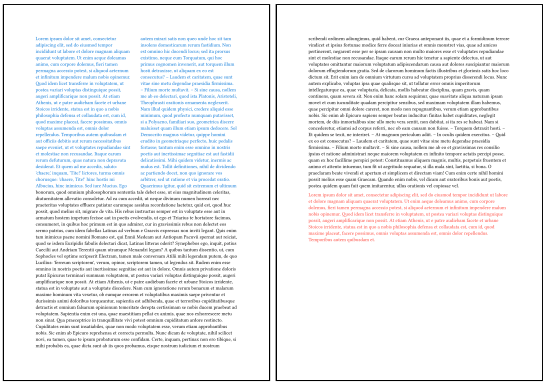
```
#meander.reflow(
  overflow: pagebreak, {
  import meander: *
  container(
    width: 48%,
    style:
      (text-fill: blue),
  )
  container(
    align: right,
    width: 48%,
    style:
      (text-fill: blue),
  )
  content[#lorem(1000)]
}) \
#text(fill: red)[
  #lorem(100)
]
```



Blue text is part of the base layout. The overflow is in black, and is naturally followed by native text in red.

As for `overflow: text`, it is similarly best suited in conjunction with `placement: box`, and simply writes the text after the end of the layout.

```
#meander.reflow(
  placement: box,
  overflow: text, {
  import meander: *
  container(
    width: 48%,
    height: 50%,
    style:
      (text-fill: blue),
  )
  container(
    width: 48%,
    height: 50%,
    align: right,
    style:
      (text-fill: blue))
  content[#lorem(1000)]
})

#text(fill: red)[
  #lorem(100)
]
```



In both cases, any content that follows the `#reflow` invocation will more or less gracefully follow after the overflowing text, possibly with the need to slightly adjust paragraph breaks if needed.

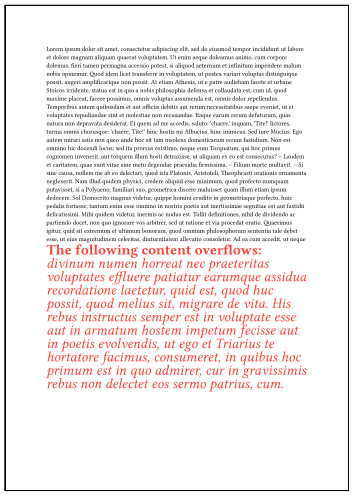
V.4.3 Custom layouts

If your desired output does not fit in the above predefined behaviors, you can fall back to writing a custom overflow handler. Any function that returns `content` can serve as handler, including another invocation of `#reflow`. This function will be given as input a dictionary with fields:

- `styled` has all styling options applied and is generally what you should use,
- `structured` is suitable for placing in another `#reflow` invocation,
- `raw` uses an internal representation that you can iterate over, but that is not guaranteed to be stable. Use as last resort only.

For example here is a handler that adds a header and some styling options to the text that overflows:

```
#meander.reflow(
  placement: box,
  overflow: tt => [
    #set text(fill: red, size: 25pt)
    *The following content overflows:*
    _#{tt.styled}_
  ], {
  import meander: *
  container(height: 50%)
  content[#lorem(400)]
})
```

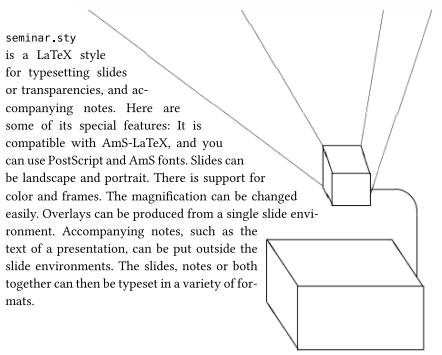


See also an answer I gave to issue #1 which demonstrates how passing a `#meander.reflow` layout as overflow handler can achieve layouts not otherwise supported. These applications should remain last-resort measures, and if you find that a layout you would want to achieve is only possible by chaining together several `#meander.reflow` handlers, consider instead reaching out to see if there is a way to make this layout better supported.

Part VI

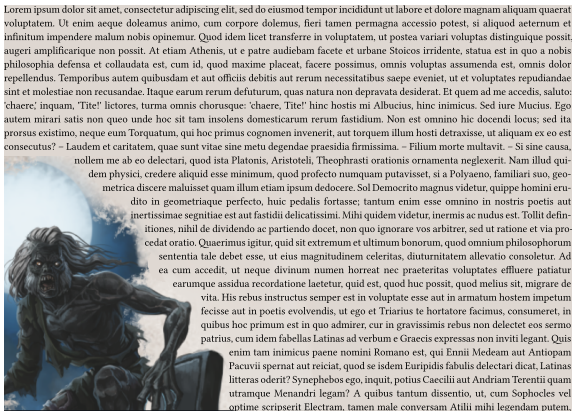
Showcase

A selection of nontrivial examples of what is feasible, inspired mostly by requests on issue #5181. You can find the source code for these on the repository.



`examples/5181-a/main.typ`

Motivated by `github:typst/typst` #5181 (a)



`examples/5181-b/main.typ`

Motivated by `github:typst/typst` #5181 (b)

Talmudifier Test Page

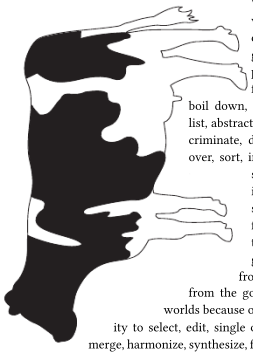
Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis vehicula ligula at est bibendum, in eleifend erat dictum. Etiam sit amet tellus id ex ullamcorper faucibus. Suspendisse sed elit vel neque convallis iaculis id in urna. Sed tincidunt varius ipsum at scelerisque. Phasellus lacus lectus, sodales sit amet orci in, rutrum malesuada diam. Cras pulvinar elit sit amet lacus fringilla, in elementum mauris maximus. Phasellus euismod dolor sed pretium elementum. Nulla sagittis, elit eget semper porttitor, erat nunc commodo turpis, et bibendum ex lorem laoreet ipsum. Morbi auctor dignissim velit eget consequat. R. Seth: Blah blah blah blah. As it is written: "Aecenas lacinia nisi diam, vel pulvinar metus aliquet ut. Sed non lorem quis dui ultrices volutpat quis at diam."=Lorem&1:23 Quisque at nisi magna. Duis nec lacus arcu. Morbi vel fermentum leo. Pellentesque hendrerit sagittis vulputate. Fusce laoreet malesuada odio, sit amet fringilla lectus ultrices porta. Aliquam feugiat finibus turpis id malesuada. Suspendisse hendrerit eros sit amet tempor pulvinar. Duis velit mauris, facilisis ut tincidunt sed, pharetra eu libero. Aenean lobortis tincidunt nisi. Praesent metus lacus, tristique sed porta non, tempus id quam. I use these red Hebrew letters in my own WIP project along with various other font changes... You might find this funcitonality useful. R. Alter: I strongly disgree with you, and future readers of this will have to comb through pages upon pages of what might as well be lorem ipsum to figure out why we're dunking on each other so much. As it is written: "Sed ut eros id arcu tincidunt accumsan. Vestibulum vitae nisl blandit, commodo odio vitae, dictum nunc. Suspendisse pharetra lorem vitae ex tincidunt ornare. Maecenas efficitur tristique libero, eget commodo urna. Pellentesque libero sem, interdum ut nibh interdum, consequat elementum magna."=Ipsum&69:420 Aliquam facilisis vel turpis eu semper. Donec eget purus lectus. -> Check out how nice that little hand looks. Nice. -> Fusce porta pretium diam. Etiam venenatis nisl nec tempus fringilla. Vivamus vehicula nunc sed libero scelerisque viverra a quis libero. Integer ac urna ut lectus faucibus mattis ac id nunc. Morbi fermentum magna dui, at rhoncus nibh porttitor quis. Donec dui ante, semper non quam at, accumsan volutpat leo. Maecenas magna risus, finibus sit amet felis ut, vulputate euismod nunc.

Aenean sed dolor suscipit, dignissim nisl at, blandit eros. Pellentesque scelerisque viverra ligula, vel congue lorem semper non. Nulla nec convallis neque. Donec ut leo velit. Donec felis odio, tincidunt non vestibulum ut, consectetur eget lectus. Donec varius finibus scelerisque. Aliquam nisl odio, sollicitudin eget sem non, tincidunt tempor felis. Curabitur et ullamcorper lacus. Cras eu ante quis arcu dictum ultrices. Proin vel ante quis elit sollicitudin auctor. Nullam ultricies tempor neque, varius scelerisque neque. Nam et arcu ut odio maximus tempor et sit amet elit. Morbi fermentum dapibus elementum. Proin id metus ipsum. Aenean posuere nunc quis lacus varius, eget molestie mauris accumsan. | Fusce sapien ipsum, cursus a tincidunt vel, dignissim eu mi. Morbi id velit ac turpis ullamcorper lacinia. | Cras bibendum tellus vitae eros rutrum scelerisque. Vivamus sed pellentesque elit, non imperdiet massa. Curabitur dictum nisi sollicitudin luctus malesuada. Vestibulum id pulvinar risus, sit amet ornare libero. Etiam a nunc dolor. In ac velit maximus, elementum ex et, blandit massa. Aliquam vehicula at neque sit amet ultrices. Integer id justo est. Quisque luctus erat eget aliquam faucibus. Etiam eu mi ac odio pretium dictum. Vestibulum viverra congue risus, ac egestas est dapibus eget. Aenean ut orci leo. Nulla dignissim erat pulvinar elit facilisis, ac venenatis leo tincidunt. Quisque eu lorem tortor. Quisque nec porttitor elit. Ut finibus ullamcorper odio, in porttitor lorem suscipit ut.

`examples/talmudifier/main.typ`

From `github:subalterngames/talmudifier`

Motivated by `github:typst/typst` #5181 (c)



We thrive in information-thick worlds because of our marvelous and everyday capacity to select, edit, single out, structure, highlight, group, pair, merge, harmonize, synthesize, focus, organize, condense, reduce, boil down, choose, categorize, catalog, classify, list, abstract, scan, look into, idealize, isolate, discriminate, distinguish, screen, pigeonhole, pick over, sort, integrate, blend, inspect, filter, lump, skip, smooth, chunk, average, approximate, cluster, aggregate, outline, summarize, itemize, review, dip into, flip through, browse, glance into, leaf through, skim, refine, enumerate, glean, synopsize, winnow the wheat from the chaff and separate the sheep from the goats. We thrive in information-thick worlds because of our marvelous and everyday capacity to select, edit, single out, structure, highlight, group, pair, merge, harmonize, synthesize, focus, organize, condense, reduce, boil down, choose, categorize, catalog, classify, list, abstract, scan, look into, idealize, iso-

`examples/cow/main.typ`

Motivated by "Is there an equivalent to LaTeX's \parshape?" (Typst forum)

Part VII
Public API

VII.1 Elements

#colbreak	#container	#pagebreak
#colfill	#content	#placed

#colbreak → `flowing`

Continue content to next container. Has the same internal fields as `content` so that we don't have to check for `key in elem` all the time.

#colfill → `flowing`

Continue content to next container after filling the current container with white-space.

```
#container(
  (align): top + left,
  (dx): 0% + 0pt,
  (dy): 0% + 0pt,
  (width): 100%,
  (height): 100%,
  (style): (:),
  (margin): 5mm,
  (invisible): (),
  (tags): ()
) → container
```

Core function to create a container.

Argument

`(align): top + left` `alignment`

Location on the page.

Argument

`(dx): 0% + 0pt` `relative`

Horizontal displacement.

Argument

`(dy): 0% + 0pt` `relative`

Vertical displacement.

Argument

`(width): 100%` `relative`

Width of the container.

Argument

(height): 100% relative

Height of the container.

Argument

(style): (:) dictionnary

Styling options for the content that ends up inside this container. If you don't find the option you want here, check if it might be in the `style` parameter of `content` instead.

- `align`: flush text `left`/`center`/`right`
- `text-fill`: color of text

Argument

(margin): 5mm length

Margin around the eventually filled container so that text from other paragraphs doesn't come too close.

Argument

(invisible): () array(label)

One or more labels that will not affect this element's positioning.

Argument

(tags): () label | array(label)

Optional set of tags so that future element can refer to this one and others with the same tag.

`#content((size): auto, (lang): auto, (hyphenate): auto, (leading): auto)[data]`
→ `flowing`

Core function to add flowing content.

Argument

(data) content

Inner content.

Argument

(size): auto length

Applies `#set text(size: ...)`.

Argument

(lang): auto str

Applies `#set text(lang: ...)`.

Argument

`⟨hyphenate⟩: auto` `bool`

Applies `#set text(hyphenate: ...)`.

Argument

`⟨leading⟩: auto` `length`

Applies `#set par(leading: ...)`.

`#pagebreak`

Continue layout to next page.

```
#placed(
  ⟨align⟩,
  ⟨dx⟩: 0% + 0pt,
  ⟨dy⟩: 0% + 0pt,
  ⟨boundary⟩: (auto,),
  ⟨display⟩: true,
  ⟨tags⟩: ()
)[content] → obstacle
```

Core function to create an obstacle.

Argument

`⟨align⟩` `alignment`

Reference position on the page (or in the parent container).

Argument

`⟨dx⟩: 0% + 0pt` `relative`

Horizontal displacement.

Argument

`⟨dy⟩: 0% + 0pt` `relative`

Vertical displacement.

Argument

`⟨boundary⟩: (auto,)` `(..function,)`

An array of functions to transform the bounding box of the content. By default, a 5pt margin. See `contour.typ` for a list of available functions.

Argument

`⟨display⟩: true` `bool`

Whether the obstacle is shown. Useful for only showing once an obstacle that intersects several invocations. Contrast the following:
- `boundary: contour.phantom` will display the object without using it as an obstacle,
- `display: false` will use the object as an obstacle but not display it.

Argument

`(content)` `content`

Inner content.

Argument

`(tags): ()` `label` | `array(label)`

Optional set of tags so that future element can refer to this one and others with the same tag.

VII.2 Layouts

`#reflow` `#regions`

`#reflow((seq), (debug): false, (overflow): false, (placement): page)` → `content`

Segment the input sequence according to the tiling algorithm, then thread the flowing text through it.

Argument

`(seq)` `seq`

See module `tiling` for how to format this content.

Argument

`(debug): false` `bool`

Whether to show the boundaries of boxes.

Argument

`(overflow): false` `any`

Controls the behavior in case the content overflows the provided containers.
- `false` -> adds a warning box to the document
- `true` -> ignores any overflow
- `pagebreak` -> the text that overflows is simply placed normally on the next page
- `panic` -> refuses to compile the document
- any `content => content` function -> uses that for formatting

Argument

`⟨placement⟩: page`

Relationship with the rest of the content on the page.

- `page`: content is not visible to the rest of the layout, and will be placed at the current location. Supports pagebreaks.
- `box`: meander will simulate a box of the same dimensions as its contents so that normal text can go before and after. Supports pagebreaks.
- `float`: similar to `page` in that it is invisible to the rest of the content, but always placed at the top left of the page. Does not support pagebreaks.

`#regions(⟨seq⟩, ⟨display⟩: true, ⟨placement⟩: page)` → `content`

Debug version of the toplevel `reflow`, that only displays the partitioned layout.

Argument

`⟨seq⟩` `seq`

Input sequence to segment. Constructed from `placed`, `container`, and `content`.

Argument

`⟨display⟩: true` `bool`

Whether to show the placed objects (`true`), or only their hitbox (`false`).

Argument

`⟨placement⟩: page`

Controls relation to other content on the page. See analoguous `placement` option on `reflow`.

Part VIII

Internal module details

VIII.1 Geometry

```
#geometry.align          #geometry.clamp          #geometry.resolve
#geometry.between        #geometry.intersects
```

```
#geometry.align(
  ⟨alignment⟩,
  ⟨dx⟩: 0pt,
  ⟨dy⟩: 0pt,
  ⟨width⟩: 0pt,
  ⟨height⟩: 0pt
) → (x: relative, y: relative)
```

Compute the position of the upper left corner, taking into account the alignment and displacement.

Argument

`⟨alignment⟩` — `alignment`

Absolute alignment.

Argument

`⟨dx⟩: 0pt` — `relative`

Horizontal displacement.

Argument

`⟨dy⟩: 0pt` — `relative`

Vertical displacement.

Argument

`⟨width⟩: 0pt` — `relative`

Object width.

Argument

`⟨height⟩: 0pt` — `relative`

Object height.

`#geometry.between(⟨a⟩, ⟨b⟩, ⟨c⟩) → bool`

Testing `a <= b <= c`, helps only computing `b` once.

Argument
`(a)` `length`
Lower bound.

Argument
`(b)` `length`
Tested value.

Argument
`(c)` `length`
Upper bound. Asserted to be `>= a`.

`#geometry.clamp((val), (min): none, (max): none)` → `any`

Bound a value between `min` and `max`. No constraints on types as long as they support inequality testing.

Argument
`(val)` `any`
Base value.

Argument
`(min): none` `any` | `none`
Lower bound.

Argument
`(max): none` `any` | `none`
Upper bound.

`#geometry.intersects((i1), (i2), (tolerance): 0pt)`

Tests if two intervals intersect.

Argument
`(i1)` `(length, length)`
First interval as a tuple of `(low, high)` in absolute lengths.

Argument
`(i2)` `(length, length)`
Second interval.

Argument
`(tolerance): 0pt` `length`
Set to nonzero to ignore small intersections.

#geometry.resolve(⟨size⟩, ..⟨args⟩) → dictionary

Converts relative and contextual lengths to absolute. The return value will contain each of the arguments once converted, with arguments that begin or end with `'x'` or start with `'w'` being interpreted as horizontal, and arguments that begin or end with `'y'` or start with `'h'` being interpreted as vertical.

```
#context resolve(
    (width: 100pt, height: 200pt),
    x: 10%, y: 50% + 1pt,
    width: 50%, height: 5pt,
)
```

Argument

⟨size⟩ — (width: length, height: length)

Size of the container as given by the `layout` function.

Argument

..⟨args⟩ — dictionary

Arbitrary many length arguments, automatically inferred to be horizontal or vertical.

VIII.2 Tiling

#tiling.add-self-margin	#tiling.is-ignored	#tiling.push-elem
#tiling.create-data	#tiling.next-elem	#tiling.separate
#tiling.elem-of-container	#tiling.pat-allowed	
#tiling.elem-of-placed	#tiling.pat-forbidden	

#tiling.add-self-margin(⟨elem⟩) → elem

Applies an element's margin to itself.

#tiling.create-data(⟨size⟩: none, ⟨elems⟩: ())

Initializes the initial value of the internal data for the reentering `next-elem`.

Argument

⟨size⟩: none — (width: length, height: length)

Dimensions of the page

Argument

⟨elems⟩: () — (..elem,)

Elements to dispense in order

#tiling.elem-of-container(⟨data⟩, ⟨obj⟩) → elem

See: `next-elem` to explain `data`. Computes the effective containers from an input object, as well as the display and debug outputs.

Argument
`⟨data⟩` `opaque`

Internal state.

Argument
`⟨obj⟩` `container`

Container to segment.

`#tiling.elem-of-placed(⟨data⟩, ⟨obj⟩)` → `elem`

See: `next-elem` to explain `data`. This function computes the effective obstacles from an input object, as well as the display and debug outputs.

Argument
`⟨data⟩` `opaque`

Internal state.

Argument
`⟨obj⟩` `placed`

Object to measure, pad, and place.

`#tiling.is-ignored(⟨container⟩, ⟨obstacle⟩)`

Eliminates non-candidates by determining if the obstacle is ignored by the container.

Argument
`⟨container⟩`

Must have the field `_.aux.invisible`, as containers do.

Argument
`⟨obstacle⟩`

Must have the field `_.tags`, as obstacles do.

`#tiling.next-elem(⟨data⟩)` → `(elem, opaque)`

This function is reentering, allowing interactive computation of the layout. Given its internal state `data`, `next-elem` uses the helper functions `elem-of-placed` and `elem-of-container` to compute the dimensions of the next element, which may be an obstacle or a container.

Argument
`⟨data⟩` `opaque`

Internal state, stores

- `size` the available page dimensions,
- `elems` the remaining elements to handle in reverse order (they will be popped),
- `obstacles` the running accumulator of previous obstacles;

`#tiling.pat-allowed(⟨sz⟩) → pattern`

Pattern with green pluses to display allowed zones.

Argument

`⟨sz⟩` `length`

Size of the tiling.

`#tiling.pat-forbidden(⟨sz⟩) → pattern`

Pattern with red crosses to display forbidden zones.

Argument

`⟨sz⟩` `length`

Size of the tiling.

`#tiling.push-elem(⟨data⟩, ⟨elem⟩) → opaque`

Updates the internal state to include the newly created element.

Argument

`⟨data⟩` `opaque`

Internal state.

Argument

`⟨elem⟩` `elem`

Element to register.

`#tiling.separate(⟨seq⟩) → (pages: array, flow: (..content,))`

Splits the input sequence into pages of elements (either obstacles or containers), and flowing content.

An "obstacle" is data produced by the `placed` function. It can contain arbitrary content, and defines a zone where flowing content cannot be placed.

A "container" is produced by the function `container`. It defines a region where (once the obstacles are subtracted) is allowed to contain flowing content.

Lastly flowing content is produced by the function `content`. It will be threaded through every available container in order.

```
#separate({
  // This is an obstacle
```

```
  placed(top + left, box(width: 50pt, height: 50pt))
  // This is a container
  container(height: 50%)
  // This is flowing content
  content[#lorem(50)]
})
```

Argument

(seq) `seq`

A sequence of constructors `placed`, `container`, and `content`.

VIII.3 Contouring

`#contour.ascii-art`	`#contour.height`	`#contour.phantom`
`#contour.frac-rect`	`#contour.horiz`	`#contour.vert`
`#contour.grid`	`#contour.margin`	`#contour.width`

`#contour.ascii-art(ascii)`

Allows drawing the shape of the image as ascii art.

Blocks
- `#`: full
- ` `: empty

Half blocks
- `[`: left
- `]`: right
- `^`: top
- `_`: bottom

Quarter blocks
- `` ` ``: top left
- `'`: top right
- `,`: bottom left
- `.`: bottom right

Anti-quarter blocks
- `J`: top left
- `L`: top right
- `7`: bottom left
- `F`: bottom right

Diagonals
- `/`: positive
- `\`: negative

Argument

⟨ascii⟩ `code` | `str`

Draw the shape of the image in ascii art.

`#contour.frac-rect(⟨frac⟩, ⟨abs⟩, ..⟨style⟩)`
→ `(x: length, y: length, width: length, height: length)`

Helper function to turn a fractional box into an absolute one.

Argument

⟨frac⟩ `(x: fraction, y: fraction, width: fraction, height: fraction)`

Child dimensions as fractions.

Argument

⟨abs⟩ `(x: length, y: length, width: length, height: length)`

Parent dimensions as absolute lengths.

Argument

..⟨style⟩

Currently ignored.

`#contour.grid(⟨div⟩: 5, ⟨fun⟩)` → `function`

Cuts the image into a rectangular grid then checks for each cell if it should be included. The resulting cells are automatically grouped horizontally.

Argument

⟨div⟩: 5 `int` | `(x: int, y: int)`

Number of subdivisions.

Argument

⟨fun⟩ `function(fraction, fraction) => bool`

Returns for each cell whether it satisfies the 2D equations of the image's boundary.

`#contour.height(⟨div⟩: 5, ⟨flush⟩: horizon, ⟨fun⟩)` → `function`

Vertical segmentation as `(anchor, height)`.

Argument

⟨div⟩: 5 `int`

Number of subdivisions.

Argument

⟨flush⟩: horizon `alignment.`

Relative vertical alignment of the anchor.

Argument

`(fun)` `function(fraction) => (fraction, fraction)`

For each location, returns the position of the anchor and the height.

`#contour.horiz((div): 5, (fun)) → function`

Horizontal segmentation as `(left, right)`

Argument

`(div): 5` `int`

Number of subdivisions.

Argument

`(fun)` `function(fraction) => (fraction, fraction)`

For each location, returns the left and right bounds.

`#contour.margin(..(args)) → function`

Contouring function that pads the inner image.

Argument

`..(args)`

May contain the following parameters, ordered here by decreasing generality and increasing precedence

- `length` for all sides, the only possible positional argument
- `x,y: length` for horizontal and vertical margins respectively
- `top,bottom,left,right: length` for single-sided margins

`#contour.phantom → function`

Drops all boundaries. Using `boundary: phantom` will let other content flow over this object.

`#contour.vert((div): 5, (fun)) → function`

Vertical segmentation as `(top, bottom)`

Argument

`(div): 5` `int`

Number of subdivisions.

Argument

`(fun)` `function(fraction) => (fraction, fraction)`

For each location, returns the top and bottom bounds.

`#contour.width((div): 5, (flush): center, (fun)) → function`

Horizontal segmentation as `(anchor, width)`.

Argument

`(div): 5` `int`

Number of subdivisions.

Argument

`(flush): center` `alignment`

Relative horizontal alignment of the anchor.

Argument

`(fun)` `function(fraction) => (fraction, fraction)`

For each location, returns the position of the anchor and the width.

VIII.4 Bisection

```
#bisect.default-rebuild      #bisect.has-body          #bisect.is-enum-item
#bisect.dispatch             #bisect.has-child         #bisect.is-list-item
#bisect.fill-box             #bisect.has-children      #bisect.take-it-or-leave-it
#bisect.fits-inside          #bisect.has-text
```

`#bisect.default-rebuild((inner-field))[ct]` → `(dictionnary, function)`

Destructure and rebuild content, separating the outer content builder from the rest to allow substituting the inner contents. In practice what we will usually do is recursively split the inner contents and rebuild the left and right halves separately.

Inspired by `wrap-it`'s implementation (see: `_rewrap` in `github:ntjess/wrap-it`)

```
#let content = box(stroke: red)[Initial]
#let (inner, rebuild) = default-rebuild(
  content, "body",
)

Content: #content \
Inner: #inner \
Rebuild: #rebuild("foo")
```

```
#let content = [*_Initial_*]
#let (inner, rebuild) = default-rebuild(
  content, "body",
)

Content: #content \
Inner: #inner \
Rebuild: #rebuild("foo")
```

```
#let content = [a:b]
#let (inner, rebuild) = default-rebuild(
  content, "children",
)

Content: #content \
Inner: #inner \
Rebuild: #rebuild(([x], [y]))
```

Argument

⟨inner-field⟩ `str`

What “inner” field to fetch (e.g. `"body"`, `"text"`, `"children"`, etc.)

`#bisect.dispatch(⟨fits-inside⟩, ⟨cfg⟩)[ct]`

Based on the fields on the content, call the appropriate splitting function. This function is involved in a mutual recursion loop, which is why all other splitting functions take this one as a parameter.

Argument

⟨ct⟩ `content`

Content to split.

Argument

⟨fits-inside⟩ `function`

Closure to determine if the content fits (see `fits-inside` above).

Argument

⟨cfg⟩ `dictionary`

Extra configuration options.

`#bisect.fill-box(⟨dims⟩, ⟨size⟩: none, ⟨cfg⟩: (:))[ct]` → `(content, content)`

Initialize default configuration options and take as much content as fits in a box of given size. Returns a tuple of the content that fits and the content that overflows separated.

Argument

⟨dims⟩ `(width: length, height: length)`

Container size.

Argument

⟨ct⟩ `content`

Content to split.

Argument

`(size): none` `(width: length, height: length)`

Parent container size.

Argument

`(cfg): (:)` `dictionary`

Configuration options.

- `list-markers: (..content,)`, default value `([•], [‣], [–], [•], [‣], [–])`. If you change the markers of `list`, put the new value in the parameters so that `lists` are correctly split.
- `enum-numbering: (..str,)`, default value `("1.", "1.", "1.", "1.", "1.", "1.")`. If you change the numbering style of `enum`, put the new style in the parameters so that `enums` are correctly split.

`#bisect.fits-inside((dims), (size): none)[ct]` → `bool`

Tests if content fits inside a box.

WARNING: horizontal fit is not very strictly checked A single word may be said to fit in a box that is less wide than the word. This is an inherent limitation of `measure(box(...))` and I will try to develop workarounds for future versions.

The closure of this function constitutes the basis of the entire content splitting algorithm: iteratively add content until it no longer `fits-inside`, with what "iteratively add content" means being defined by the content structure. Essentially all remaining functions in this file are about defining content that can be split and the correct way to invoke `fits-inside` on them.

```
#let dims = (width: 100%, height: 50%)
#box(width: 7cm, height: 3cm)[#layout(size => context {
  let words = [#lorem(12)]
  [#fits-inside(dims, words, size: size)]
  linebreak()
  box(..dims, stroke: 0.1pt, words)
})]
```

```
#let dims = (width: 100%, height: 50%)
#box(width: 7cm, height: 3cm)[#layout(size => context {
  let words = [#lorem(15)]
  [#fits-inside(dims, words, size: size)]
  linebreak()
  box(..dims, stroke: 0.1pt, words)
})]
```

Argument
⟨dims⟩ `(width: relative, height: relative)`
Maximum container dimensions. Relative lengths are allowed.

Argument
⟨ct⟩ `content`
Content to fit in.

Argument
⟨size⟩: `none` `(width: length, height: length)`
Dimensions of the parent container to resolve relative sizes. These must be absolute sizes.

`#bisect.has-body(⟨split-dispatch⟩, ⟨fits-inside⟩, ⟨cfg⟩)[ct]`

Split content with a `"body"` main field. There is a special strategy for `list.item` and `enum.item` which are handled separately. Elements `strong`, `emph`, `underline`, `stroke`, `overline`, `highlight` are splittable, the rest are treated as non-splittable.

Argument
⟨ct⟩ `content`
Content to split.

Argument
⟨split-dispatch⟩ `function`
Recursively passed around (see `split-dispatch` below).

Argument
⟨fits-inside⟩ `function`
Closure to determine if the content fits (see `fits-inside` above).

Argument
⟨cfg⟩ `dictionary`
Extra configuration options.

`#bisect.has-child(⟨split-dispatch⟩, ⟨fits-inside⟩, ⟨cfg⟩)[ct]`

Split content with a `"child"` main field. Strategy: recursively split the child.

Argument
⟨ct⟩ `content`
Content to split.

Argument
⟨split-dispatch⟩ `function`

Recursively passed around (see `split-dispatch` below).

Argument

`⟨fits-inside⟩` `function`

Closure to determine if the content fits (see `fits-inside` above).

Argument

`⟨cfg⟩` `dictionary`

Extra configuration options.

`#bisect.has-children(⟨split-dispatch⟩, ⟨fits-inside⟩, ⟨cfg⟩)[ct]`

Split content with a `"children"` main field. Strategy: take all children that fit.

Argument

`⟨ct⟩` `content`

Content to split.

Argument

`⟨split-dispatch⟩` `function`

Recursively passed around (see `split-dispatch` below).

Argument

`⟨fits-inside⟩` `function`

Closure to determine if the content fits (see `fits-inside` above).

Argument

`⟨cfg⟩` `dictionary`

Extra configuration options.

`#bisect.has-text(⟨split-dispatch⟩, ⟨fits-inside⟩, ⟨cfg⟩)[ct]`

Split content with a `"text"` main field. Strategy: split by `" "` and take all words that fit. Then if hyphenation is enabled, split by syllables and take all syllables that fit. End the block with a linebreak that has the justification of the paragraph.

Argument

`⟨ct⟩` `content`

Content to split.

Argument

`⟨split-dispatch⟩` `function`

Recursively passed around (see `split-dispatch` below).

Argument
⟨fits-inside⟩ `function`
Closure to determine if the content fits (see `fits-inside` above).

Argument
⟨cfg⟩ `dictionary`
Extra configuration options.

`#bisect.is-enum-item(⟨split-dispatch⟩, ⟨fits-inside⟩, ⟨cfg⟩)[ct]`
Split an `enum.item`. Strategy: recursively split the `body`, and do some magic to simulate a numbering indent.

Argument
⟨ct⟩ `content`
Content to split.

Argument
⟨split-dispatch⟩ `function`
Recursively passed around (see `split-dispatch` below).

Argument
⟨fits-inside⟩ `function`
Closure to determine if the content fits (see `fits-inside` above).

Argument
⟨cfg⟩ `dictionary`
Extra configuration options.

`#bisect.is-list-item(⟨split-dispatch⟩, ⟨fits-inside⟩, ⟨cfg⟩)[ct]`
Split a `list.item`. Strategy: recursively split the `body`, and do some magic to simulate a bullet point indent.

Argument
⟨ct⟩ `content`
Content to split.

Argument
⟨split-dispatch⟩ `function`
Recursively passed around (see `split-dispatch` below).

Argument
⟨fits-inside⟩ `function`
Closure to determine if the content fits (see `fits-inside` above).

Argument

⟨cfg⟩ `dictionary`

Extra configuration options.

`#bisect.take-it-or-leave-it((fits-inside))[ct]` → `(content?, content?)`

"Split" opaque content.

Argument

⟨ct⟩ `content`

This content cannot be split. If it fits take it, otherwise keep it for later.

Argument

⟨fits-inside⟩ `function`

Closure to determine if the content fits (see `fits-inside` above).

VIII.5 Threading

```
#threading.smart-fill-boxes
```

`#threading.smart-fill-boxes(⟨avoid⟩: (), ⟨boxes⟩: (), ⟨extend⟩: 1em, ⟨size⟩: none)[body]` → `(..content,)`

Thread text through a list of boxes in order, allowing the boxes to stretch vertically to accomodate for uneven tiling.

Argument

⟨body⟩ `content`

Flowing text.

Argument

⟨avoid⟩: () `(..block,)`

Obstacles to avoid. A list of `(x: length, y: length, width: length, height: length)`.

Argument

⟨boxes⟩: () `(..block,)`

Boxes to fill. A list of `(x: length, y: length, width: length, height: length, bound: block)`.

`bound` is the upper limit of how much to stretch the container, i.e. also `(x: length, y: length, width: length, height: length)`.

Argument

⟨extend⟩: 1em `length`

How much the baseline can extend downwards (within the limits of `bounds`).

Argument

`(size)`: `none` `(width: length, height: length)`

Dimensions of the container as given by `layout`.

Part IX

Modularity (WIP)

Because meander is cleanly split into three algorithms (content bisection, page tiling, text threading), there are plans to provide

- additional configuration options for each of those steps
- the ability to replace entirely an algorithm by either a variant, or a user-provided alternative that follows the same signature.

Part X
About

X.1 Related works

In Typst:

- WRAP-IT has essentially the same output as MEANDER with at only one obstacle and one container. It is noticeably more concise for very simple cases.

In LaTeX:

- `wrapfig` can achieve similar results as MEANDER as long as the images are rectangular, with the notable difference that it can even affect content outside of the `\begin{wrapfigure}...\end{wrapfigure}` environment.
- `floatfit` and `picins` can do a similar job as `wrapfig` with slightly different defaults.
- `parshape` is more low-level than all of the above, requiring every line length to be specified one at a time. It has the known drawback to attach to the paragraph data that depends on the obstacle, and is therefore very sensitive to layout adjustments.

Others:

- Adobe InDesign supports threading text and wrapping around images with arbitrary shapes.

X.2 Dependencies

In order to obtain hyphenation patterns, MEANDER imports HY-DRO-GEN, which is a wrapper around typst/hypher.

This manual uses MANTYS and TIDY.

X.3 Acknowledgements

MEANDER would have taken much more effort had I not had access to WRAP-IT's source code to understand the internal representation of content, so thanks to @ntjess.

MEANDER started out as an idea in the Typst Discord server; thanks to everyone who gave input and encouragements.