Problem Chosen	2025 MCM/ICM Summary Sheet	Team Control Number
ABCDEF		1111111

A Simple Example for MCM/ICM Typst Template

Summary

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 collaudata est, cum id, quod maxime placeat, facere possimus, omnis voluptas assumenda est, omnis dolor repellendus. Temporibus autem quibusdam et.

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Keywords: MCM; ICM; Mathematical; template

Contents

1 Introduction

Create a new file and start with following lines.

```
#import "@preview/mcm-scaffold:0.1.0": *

#show: mcm.with(
  title: "A Simple Example for MCM/ICM Typst Template",
  problem-chosen: "ABCDEF",
  team-control-number: "1111111",
  year: "2025",
  summary: [
  ],
  keywords: [MCM; ICM; Mathemetical; template],
  magic-leading: 0.65em,
)

//////////////////////Body//////////////////////////
= Introduction
```

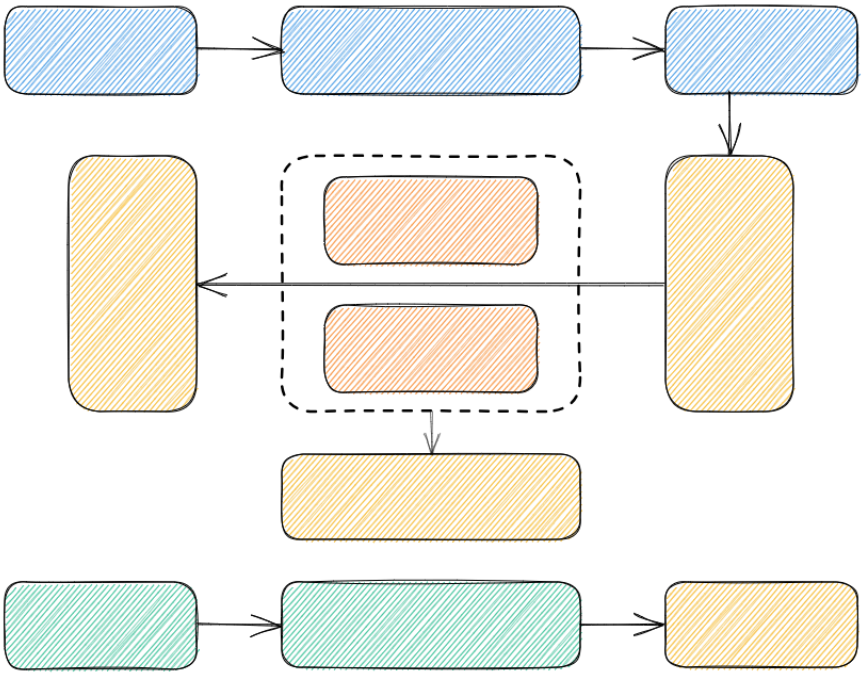
2 Images

2.1 Single Image

```
#img-single(path: str, width: 70%, caption: none, placement: none)
```

2.1.1 An image with default width and no caption

```
#img-single(path: "template/figures/image1.png")
```



2.1.2 An image with caption

```
#img-single(path: "template/figures/image1.png", caption:[workflow])
```

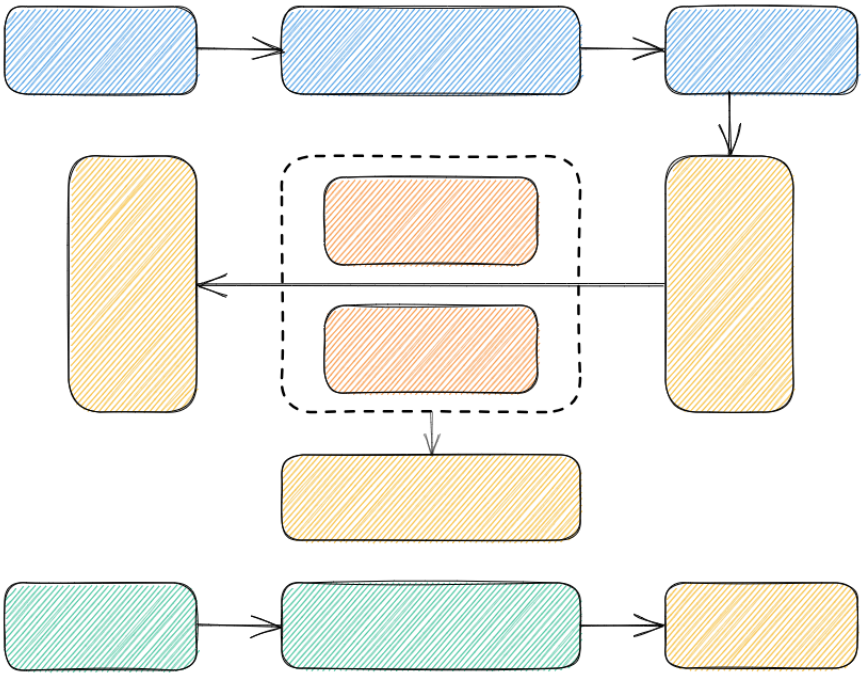


Figure 2: workflow

2.1.3 Adjust width

```
#img-single(
  path: "template/figures/image1.png",
  width: 50%,
  caption:[image of 50% width (default 70%).]
)
```

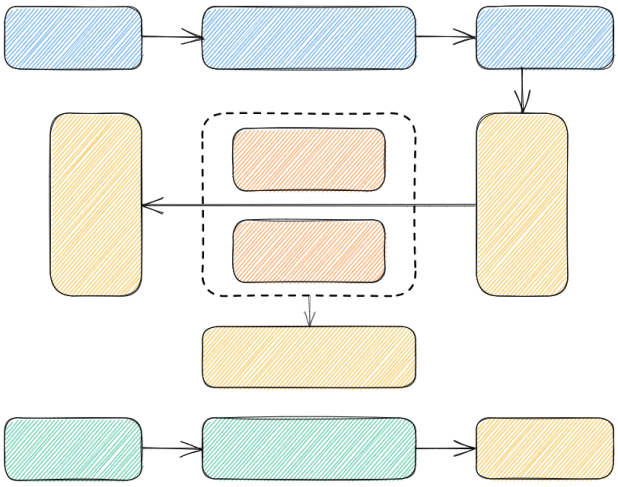


Figure 3: image of 50% width (default 70%).

2.1.4 Specify image placement

```
placement: none(default)/auto/top/buttom
```

I put 3 images right below the code.

```
#img-single(
  path: "template/figures/image1.png",
  caption:[placement: top (default none).],
  placement: top
)

#img-single(
  path: "template/figures/image1.png",
  caption:[placement: auto (default none).],
  placement: auto
)

#img-single(
  path: "template/figures/image1.png",
  caption:[placement: bottom (default none).],
```

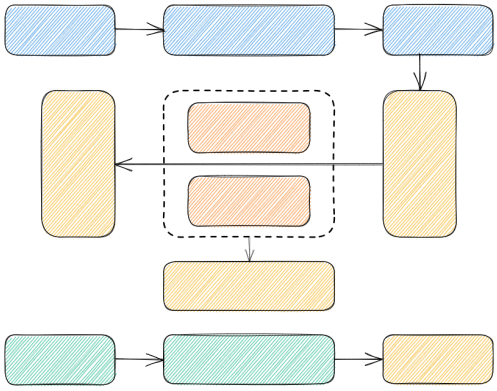


Figure 4: placement: top (default none).

```
  placement: bottom
)
```

See where the images are gone:

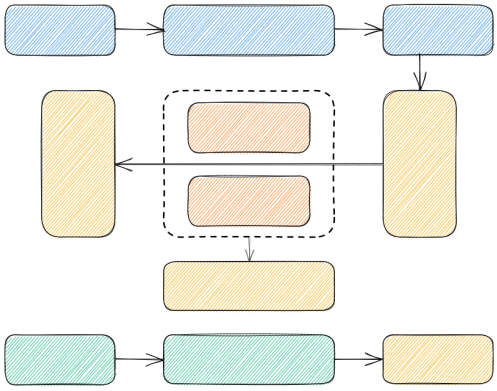


Figure 5: placement: auto (default none).

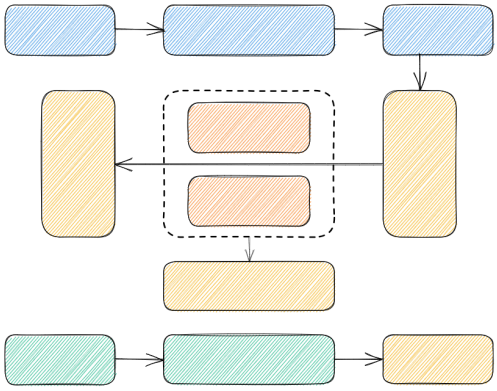


Figure 6: placement: bottom (default none).

2.2 Multiple Images

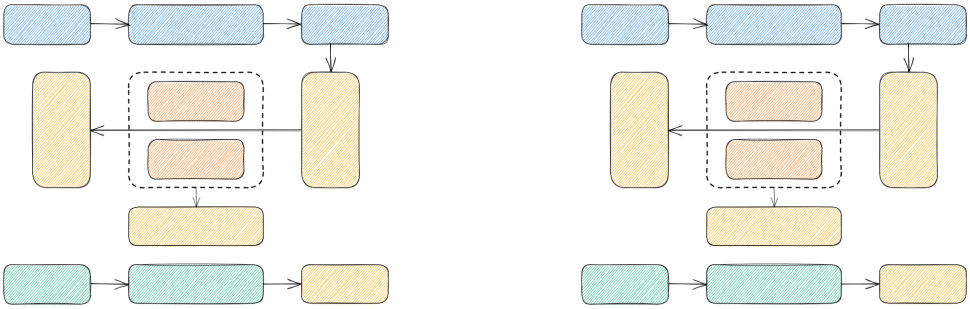
If you want to show multiple images in one figure, try this.

```
#img-grid(
  cols: 2,
  rows: 1,
  imgs: array,
  subcaps: (),
  caption: none,
  placement: none
)
```

2.2.1 Two images in default

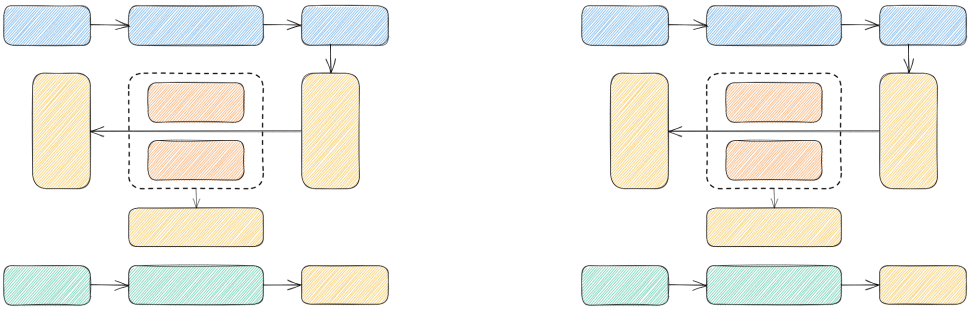
If not specified cloumns and rows, 1×2 grid is in default.

```
#img-grid(
  imgs: ("template/figures/image1.png", "template/figures/image1.png")
)
```



2.2.2 Subcaptions

```
#img-grid(
  imgs: ("template/figures/image1.png", "template/figures/image1.png"),
  subcaps: ([(a)], [(b)]),
  caption: [Two images with subcaptions.]
)
```



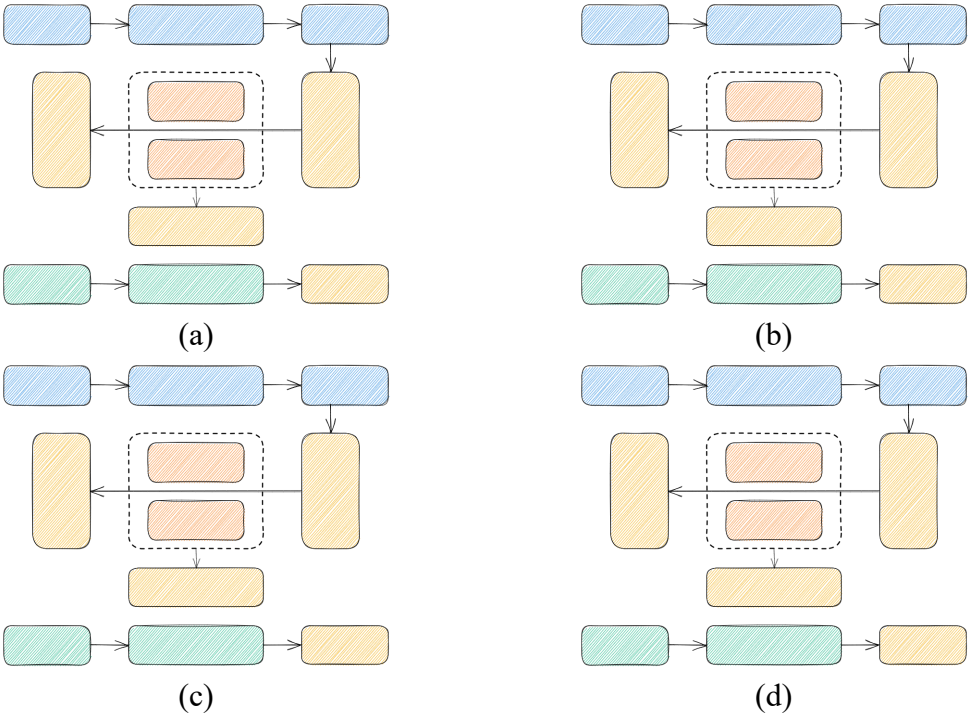
(a) (b)

Figure 8: Two images with subcaptions.

2.2.3 More images to show!

You can specify the columns and rows to put more images as you like.

```
#img-grid(
  cols: 2, rows: 2,
  imgs: ("template/figures/image1.png",) * 4,
  subcaps: ([(a)], [(b)], [(c)], [(d)]),
  caption: [Four images with subcaptions.]
)
```



(a) (b)

(c) (d)

Figure 9: Four images with subcaptions.

```
#img-grid(
  cols: 3, rows: 2,
  imgs: ("template/figures/image1.png",) * 6,
  subcaps: ([(a)], [(b)], [(c)], [(d)], [(e)], [(f)]),
  caption: [Six images with subcaptions.]
)
```

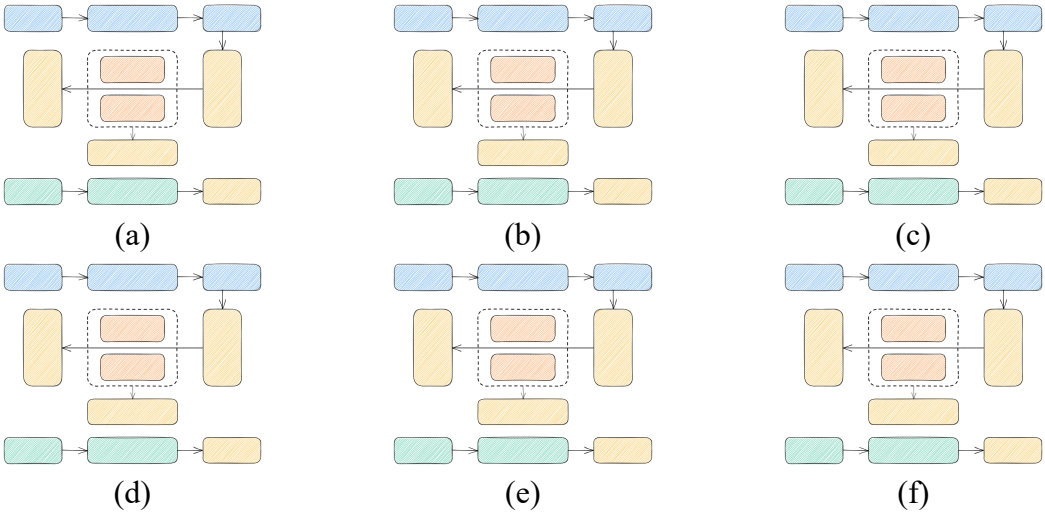


Figure 10: Six images with subcaptions.

```
#img-grid(
  cols: 4, rows: 3,
  imgs: ("template/figures/image1.png",) * 12,
  subcaps: (
    [(a)], [(b)], [(c)], [(d)], [(e)], [(f)],
    [(g)], [(h)], [(i)], [(j)], [(k)], [(l)],
  ),
  caption: [Twelve images with subcaptions.]
)
```

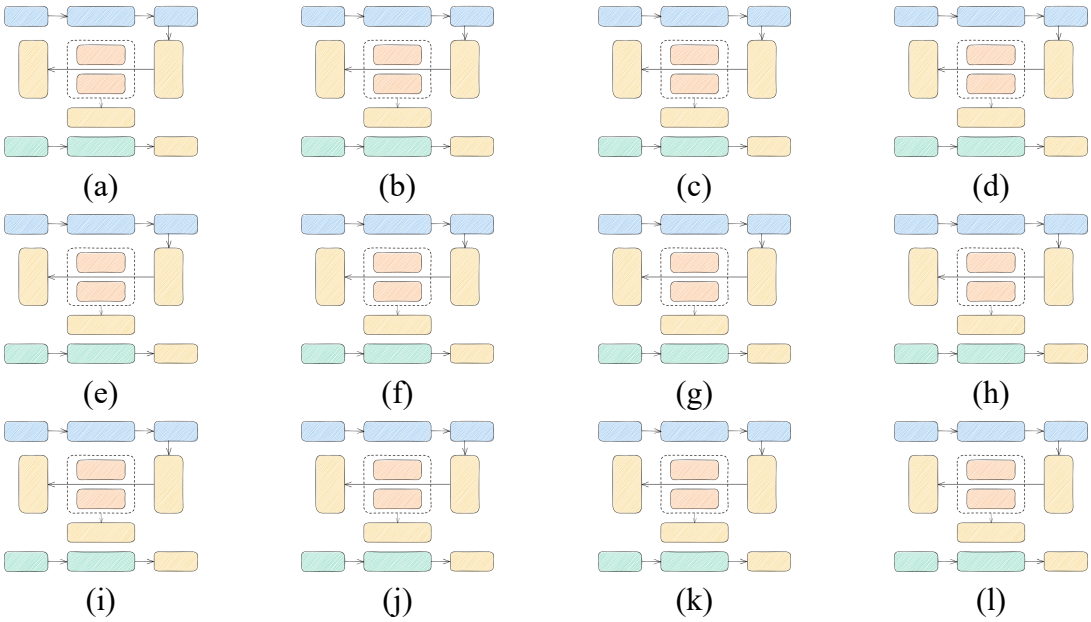


Figure 11: Twelve images with subcaptions.

3 Table

```
#threee-line-table(
  columns: array,
  align: auto,
  headers: array,
  bodies: array,
  caption: content
)
```

3.1 Simple three-line-table

ex: Symbols and notations are listed in the Table 1

```
Symbols and notations are listed in the @SymbolDescription

#threee-line-table(
  columns: (25%, 60%),  // Set colum width(auto/10%/1ft/1pt)
  headers: ([Symbol], [Explain]),
  bodies: (
    [$S_t$], [state of submersible],
    [$f_m$], [standard equation of motion],
    [$P_k^(\(t\))$], [probability of appearance],
    [$R$], [usability score],
    [$T_S$], [search mission point set],
    [$S_M$], [submersible set],
```

```
    [$T_D$], [assigned but uncompleted search mission point set],
    [$T_U$], [mission point set that violates the assignment]
  ),
  caption: "Symbol Description",
) <SymbolDescription>  //ref label
```

Table 1: Symbol Description

Symbol	Explain
S_t	state of submersible
f_m	standard equation of motion
$P_k^{(t)}$	probability of appearance
R	usability score
T_S	search mission point set
S_M	submersible set
T_D	assigned but uncompleted search mission point set
T_U	mission point set that violates the assignment

3.2 Width and alignment

```
Symbols and notations are listed in the @SymbolDescription

#threee-line-table(
  columns: (auto, 60%),
  align: (right, center),  // right/center/left
  headers: ([Symbol], [Explain]),
  bodies: (
    [$S_t$], [state of submersible],
    [$f_m$], [standard equation of motion],
    [$P_k^(\(t\))$], [probability of appearance],
    [$R$], [usability score],
    [$T_S$], [search mission point set],
    [$S_M$], [submersible set],
    [$T_D$], [assigned but uncompleted search mission point set],
    [$T_U$], [mission point set that violates the assignment]
  ),
  caption: "Symbol Description",
) <SymbolDescription>  //ref label
```

Table 2: Symbol Description

Symbol	Explain
S_t	state of submersible
f_m	standard equation of motion
$P_k^{(t)}$	probability of appearance
R	usability score
T_S	search mission point set
S_M	submersible set
T_D	assigned but uncompleted search mission point set
T_U	mission point set that violates the assignment

4 Enum

```
#let enum-default = { set enum(numbering: "1.") }

#let enum-paren(content) = {
  set enum(numbering: "1)")
  content
  enum-default
}
```

4.1 Tight and loose list

A tight enum would like this:

```
+ item1
+ item2
+ item3
```

1. item1
2. item2
3. item3

To make it loose, add a blank line after the first line:

```
+ #lorem(30)

+ #lorem(30)

+ #lorem(30)
```

1. 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.
2. 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.
3. 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.

4.2 Change numbering

```
#enum-paren()[
  + #lorem(20)
  + #lorem(20)
  + #lorem(20)
]
```

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

5 References

5.1 bib

Put `references.bib` in your project file. and use `@<tag>` to ref them. [1]

```
For, emample. @2018YOLOv3
```

For, emample. [2]

5.2 plain text(by yml)

If you want to use plaintext reference directory, there is a trick: Edit references.yml and replace publisher by reference text.

```
ref1:
    type: Article
```

```
    publisher: "ZygOS: Achieving Low Tail Latency for Microse"

ref2:
    type: Article
    publisher: "article title here"
```

6 Appendix

```
#heading("Appendix A ", numbering: none, outlined: false)

`` `py
import ...
`` `
```

7 Handful tools

7.1 Paragraph with no indent

Paragraphs after figure, table or maths will be automatically with indent. Sometimes we don't need the indent.

```
#no-indent()
content below
```

For example, after a math block,

$$y = x^2 \tag{1}$$

The aragraph after the block is with indent.

```
$ y = x^2 $

#no-indent
Paragraph with no indent.
```

$$y = x^2 \tag{2}$$

Paragraph with no indent.

7.2 Math without numbering

```
```

Table 3: A simpel table

a	u	v	w	p	q	r
30	10	−8	−2	0.01	0.004	0.001

```
#math-no-number(
$ y = sqrt(x) $
)
```

$$y = \sqrt{x}$$

7.3 Figures fly away? Place here!

Sometimes, images or tables will fly away and left a huge blank place. Use `#place-here()` to catch them back!

```
#place-here()[
#threee-line-table(
  columns: 7 * (10%, ),
  headers: ([a], [u], [v], [w], [p], [q], [r]),
  bodies: ([30], [10], [-8], [-2], [0.01], [0.004], [0.001]),
  caption: [A simpel table]
)
]
```

7.4 Latex math eqaution

Support Mitex, `#mitext('')`

```
#mitext(`
\begin{equation}
SSIM(x,y)=\frac{\left(2\mu_x\mu_y+c1\right)\left(\sigma_{xy}+c2\right)}
{\left(\mu_x^2+\mu_y^2+c1\right)\left(\sigma_x^2+\sigma_y^2+c2\right)}
\end{equation}

Where $\mu_x$ is the average of x, $\mu_y$ is the average of y, $\sigma_x^2$
is the variance of x, $\sigma_y^2$ is the variance of y, and $\sigma_{xy}$ is
the covariance of x and y. C1=(k1L)2, C1=(k1L)2, is a constant used to maintain
stability. L is the dynamic range of the pixel value. K1 = 0.01, k2 = 0.03. The
structural similarity ranges from 0 to 1. When the two images are identical,
the value of SSIM is equal to one.
`)
```

$$SSIM(x,y) = \frac{(2\mu_x\mu_y + c1)(\sigma_{xy} + c2)}{(\mu_x^2 + \mu_y^2 + c1)(\sigma_x^2 + \sigma_y^2 + c2)} \tag{3}$$

Where μ_x is the average of x, μ_y is the average of y, σ_x^2 is the variance of x, σ_y^2 is the variance of y, and σ_{xy} is the covariance of x and y. C1=(k1L)2, C1=(k1L)2, is a constant used to maintain stability. L is the dynamic range of the pixel value. K1 = 0.01, k2 = 0.03. The structural similarity ranges from 0 to 1. When the two images are identical, the value of SSIM is equal to one.

References

[1] J. Redmon and A. Farhadi, "YOLO9000: Better, Faster, Stronger," in *IEEE Conference on Computer Vision & Pattern Recognition*, 2017, pp. 6517–6525.

[2] J. Redmon and A. Farhadi, "YOLOv3: An Incremental Improvement," *arXiv e-prints*, 2018.

Appendix A

```
import cv2
import numpy as np
import matplotlib.pyplot as plt
from skimage import exposure
from skimage.exposure import match_histograms


def plot(img):
    plt.subplot(121)
    plt.imshow(img, 'gray')
    plt.subplot(122)
    plt.hist(img.ravel(), 256, [0, 256])
    plt.show()


if __name__ == '__main__':
    img = cv2.imread('img1.png', cv2.IMREAD_GRAYSCALE)
    hist = cv2.calcHist([img], [0], None, [256], [0, 256])
    plot(img)

    equ = cv2.equalizeHist(img)
    plot(equ)

    target = cv2.imread('mask.png', cv2.IMREAD_GRAYSCALE)
    target_hist = cv2.calcHist([target], [0], None, [256], [0, 256])
    plot(target)

    matched = match_histograms(img, target)
    plot(matched)
```