Eye-Tracking

Kaden Kornaus

Project Description

1. Research metrics and visualizations for analyzing eye-tracking data.

2. Develop an application that allow a user to choose all images that meet specific criteria. (For example, click on all images of dogs … or better … given a photo of person/dog/object identify which images are of the same person/dog/object …)

3. Determine file format and store all eye-tracking data in files for reuse.

4. Application should be able to replay the eye-tracking data stored in the file to

   (i) show the search pattern of the user, and

   (ii) produce a heatmap of where the user was looking.

Project Description

Interesting and engaging way to collect gaze data from a subject.

Find a file format to store the gaze data.

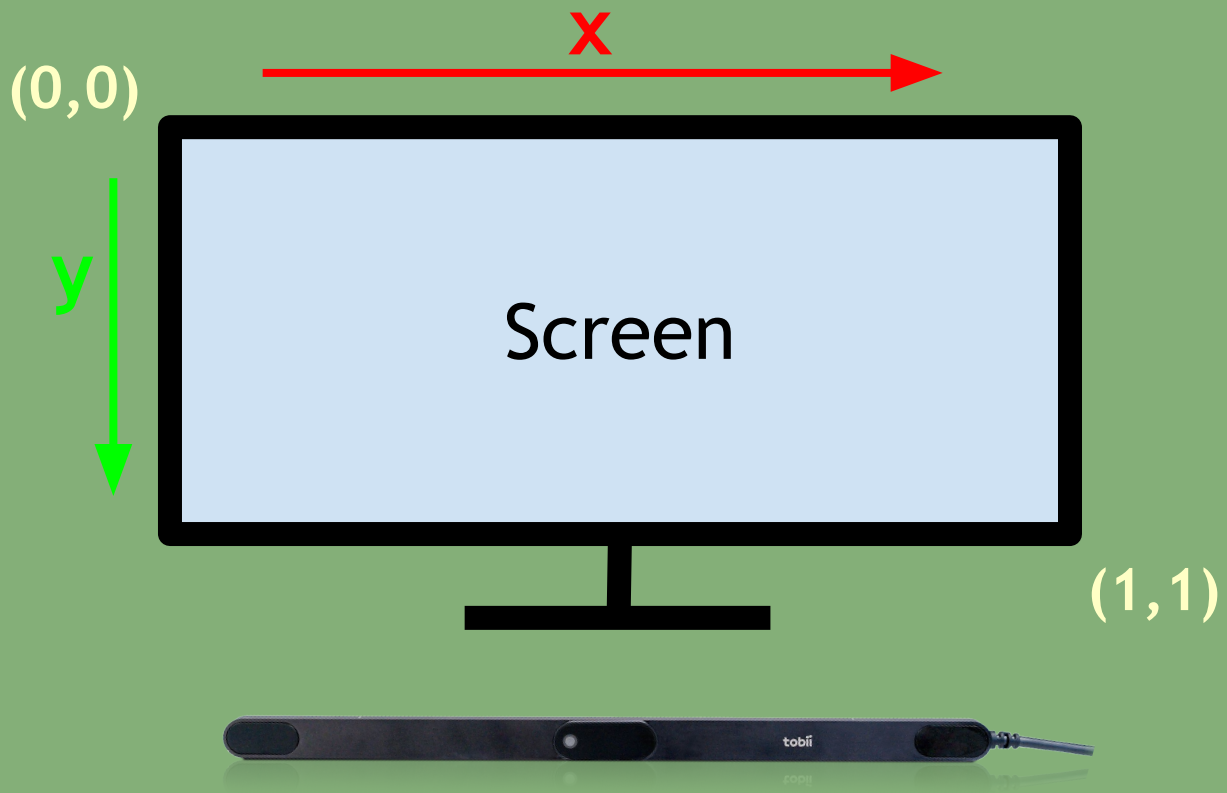
Show frequency

(Heatmap)

Show order

(Rewatch)

Eye-Tracker - Tobii Pro Spark



Points are represented as floats.

Points are relative to the screen.

Demo

- Calibration
- Test
  - Data Collection
- View Results
  - Heatmap
  - Rewatch

How does it work?

- Heatmap
  - Buckets
  - Fluff
  - Color array
- Rewatch
  - Outline
  - Tail
  - Algorithm improvement

Future Additions / Alterations

- Dynamic screen sizing
  - Max width (No covering UI)
  - Data portability
- Thread heatmap generation
  - “Splash” draw
- More rewatch options
  - Shrink
  - Color shift
  - Speed slider

Resources

- Stack overflow
- Microsoft Learn
- Dr. McVey & Dr. Meyer

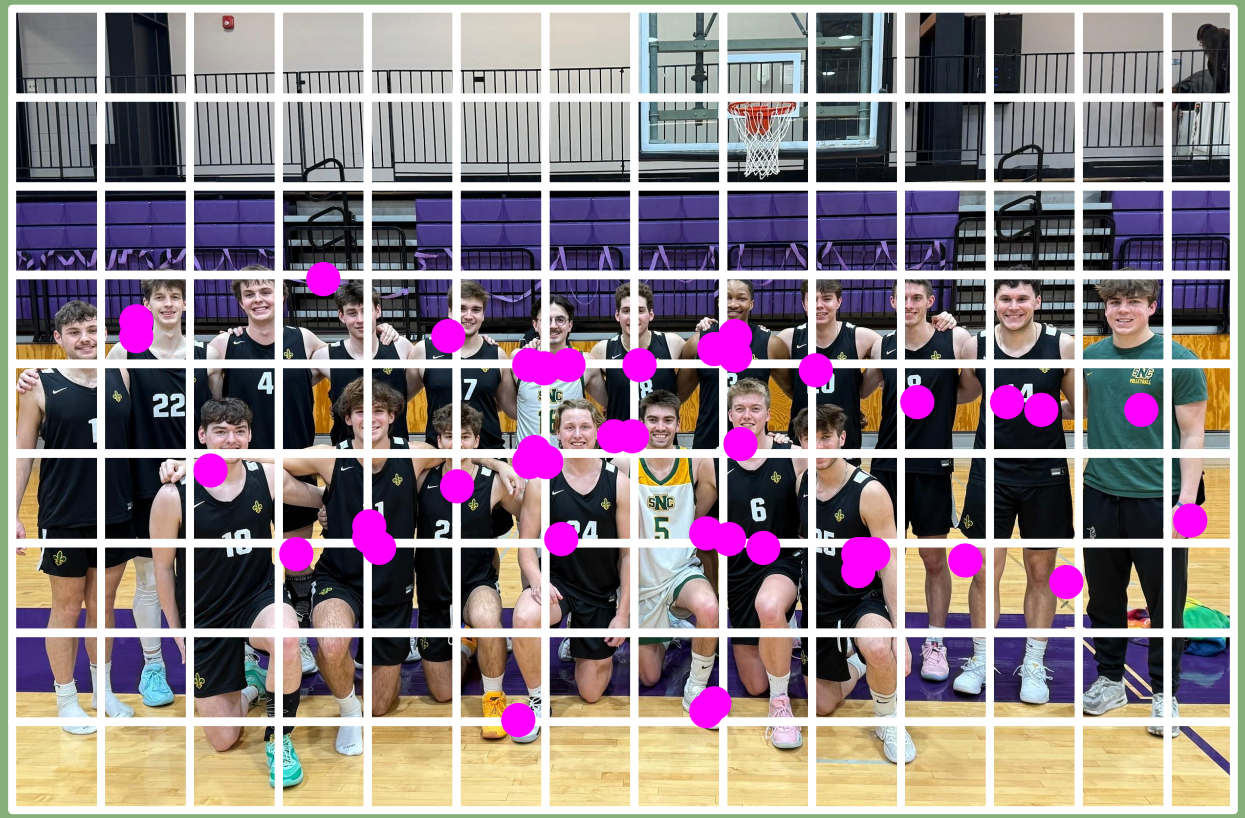
Questions?

Heatmap - Buckets

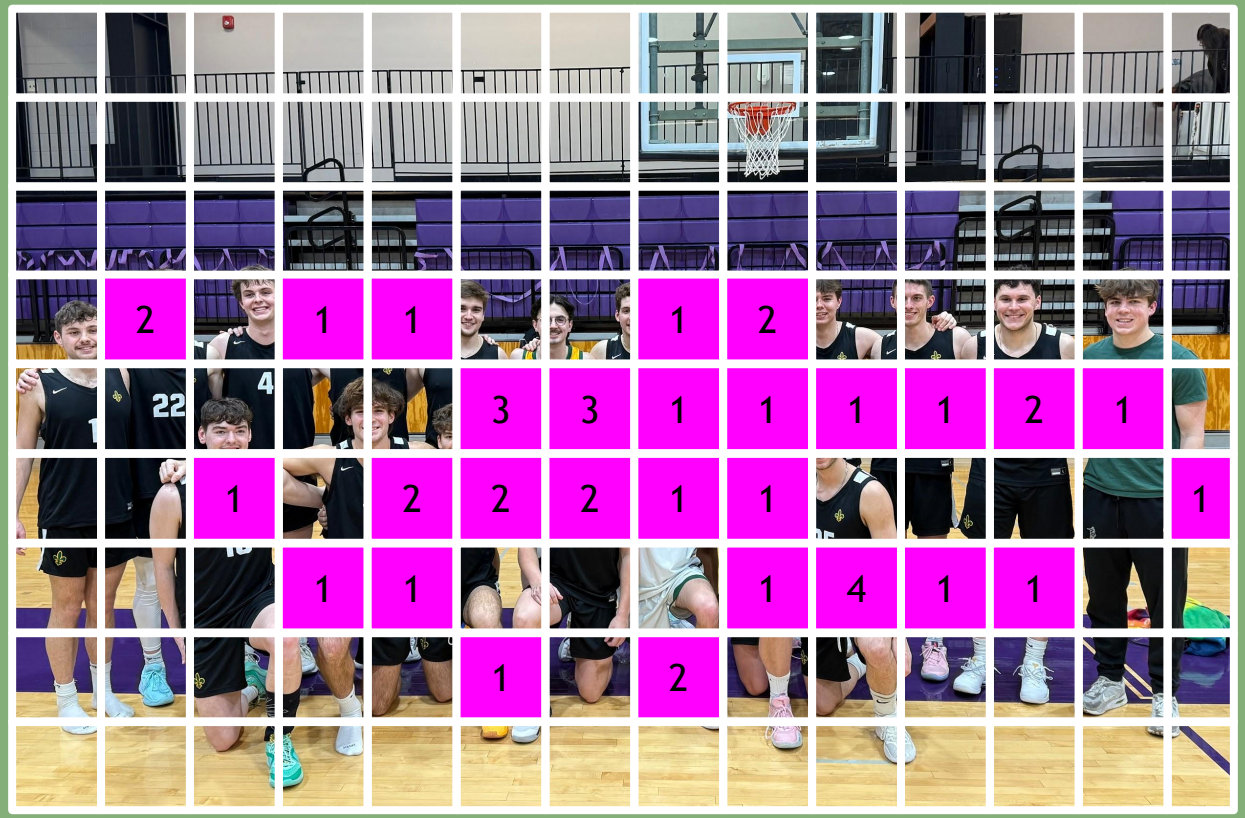
Heatmap - Buckets

Heatmap - Buckets

Heatmap - Buckets

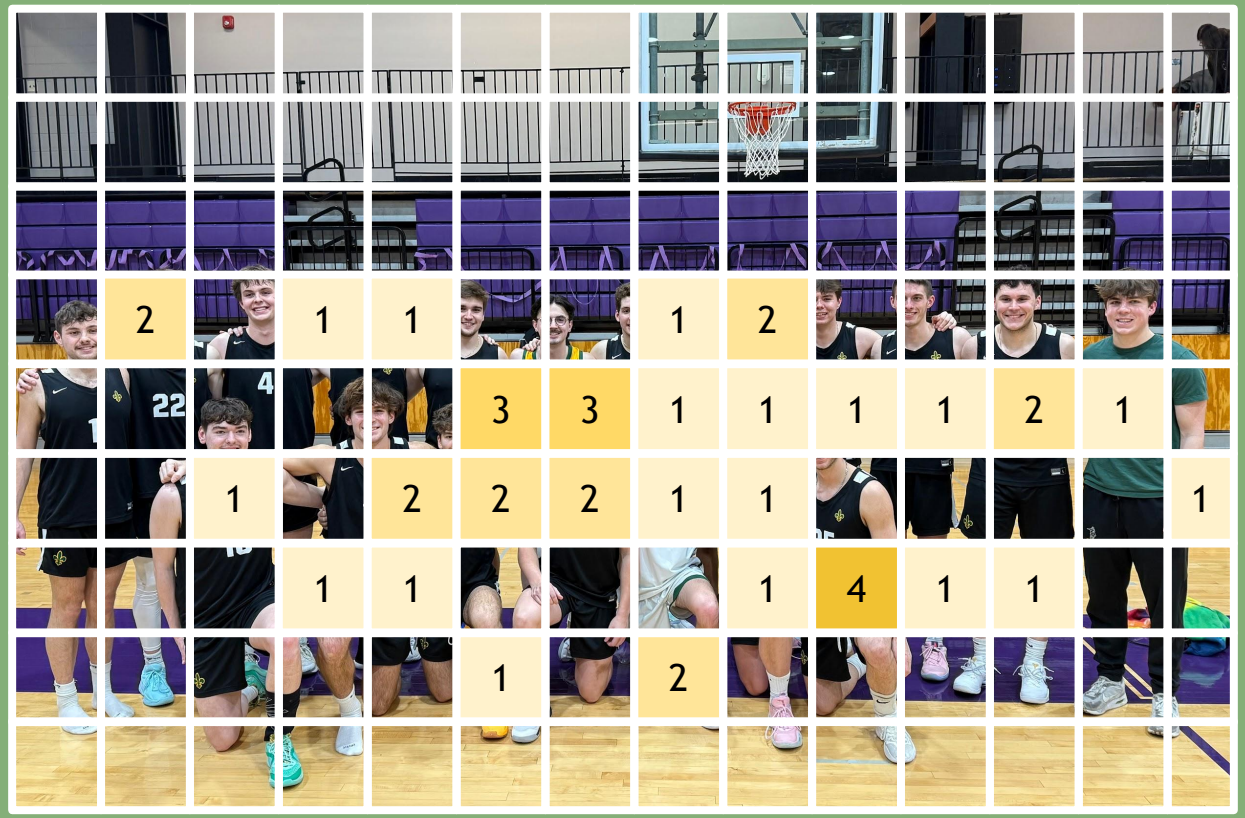


Heatmap - Buckets

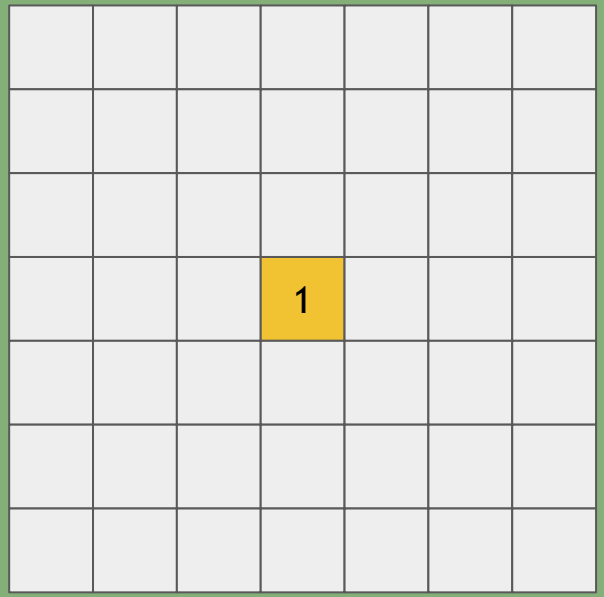


Heatmap - Buckets

Back

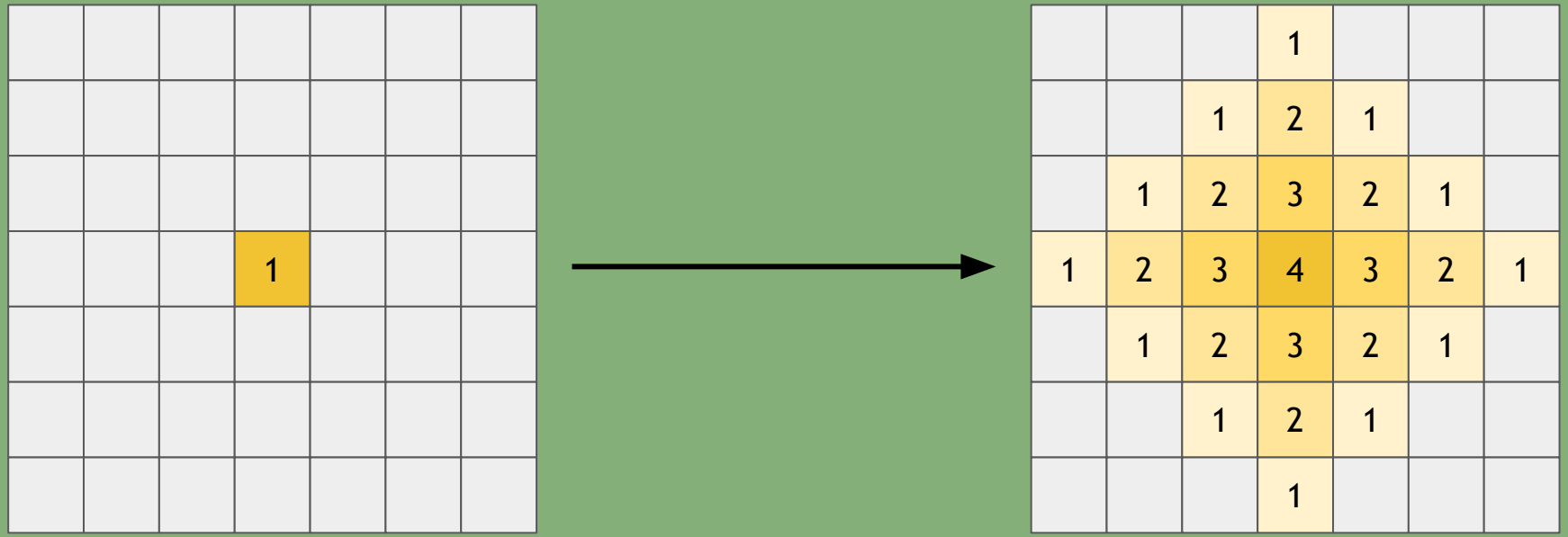


Heatmap - Fluff

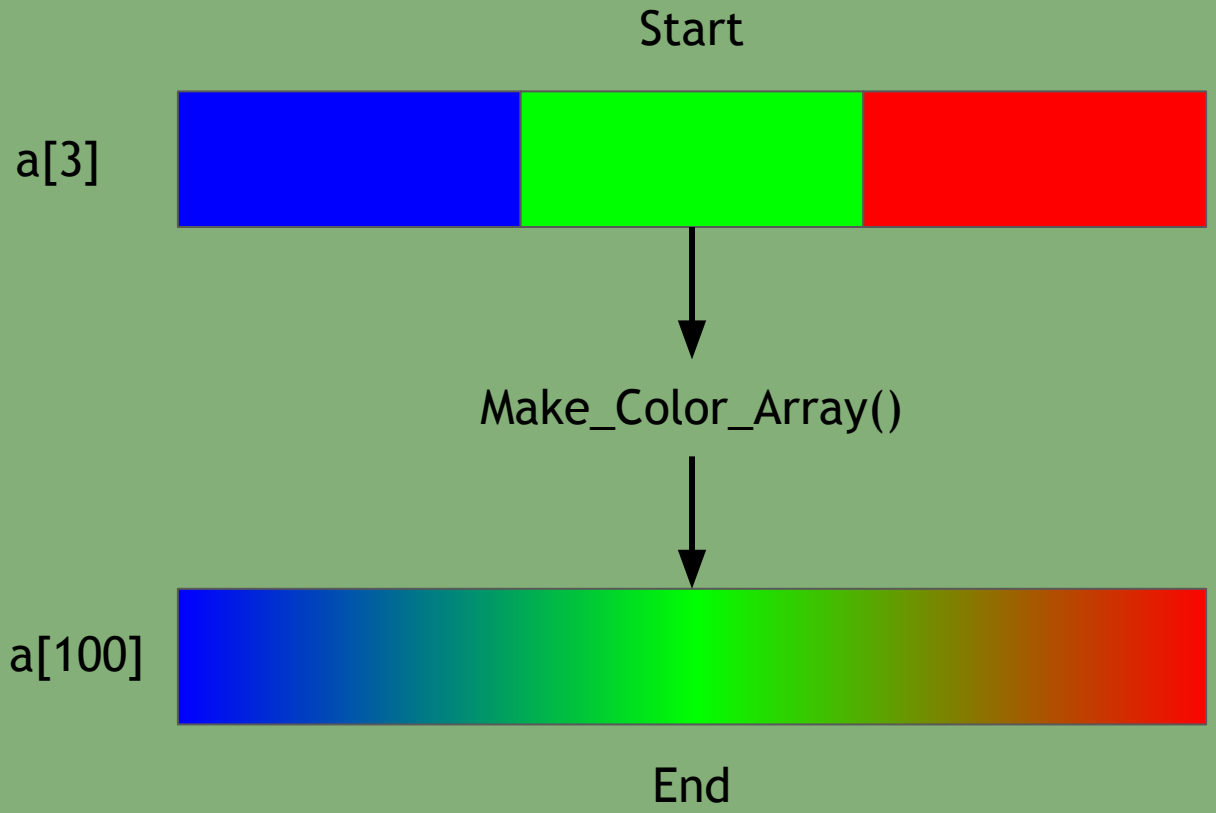


Heatmap - Fluff

Back



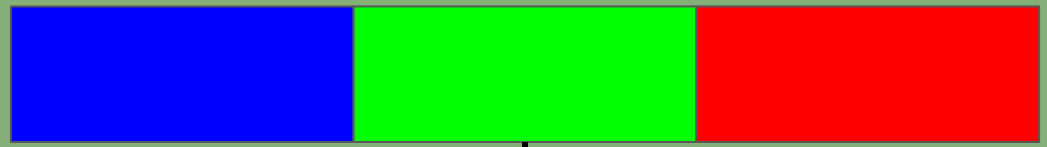
Heatmap - Color array



Heatmap - Color array

Start

a[3]



Make_Color_Array()

$$\frac{\text{bucketVal}}{\text{maxVal}} * 10 = \text{arrayIndex}$$

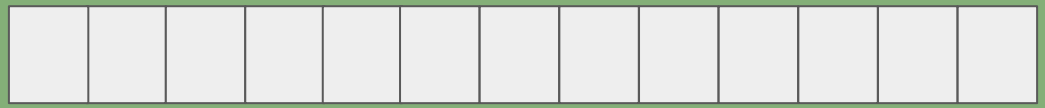
a[100]

End

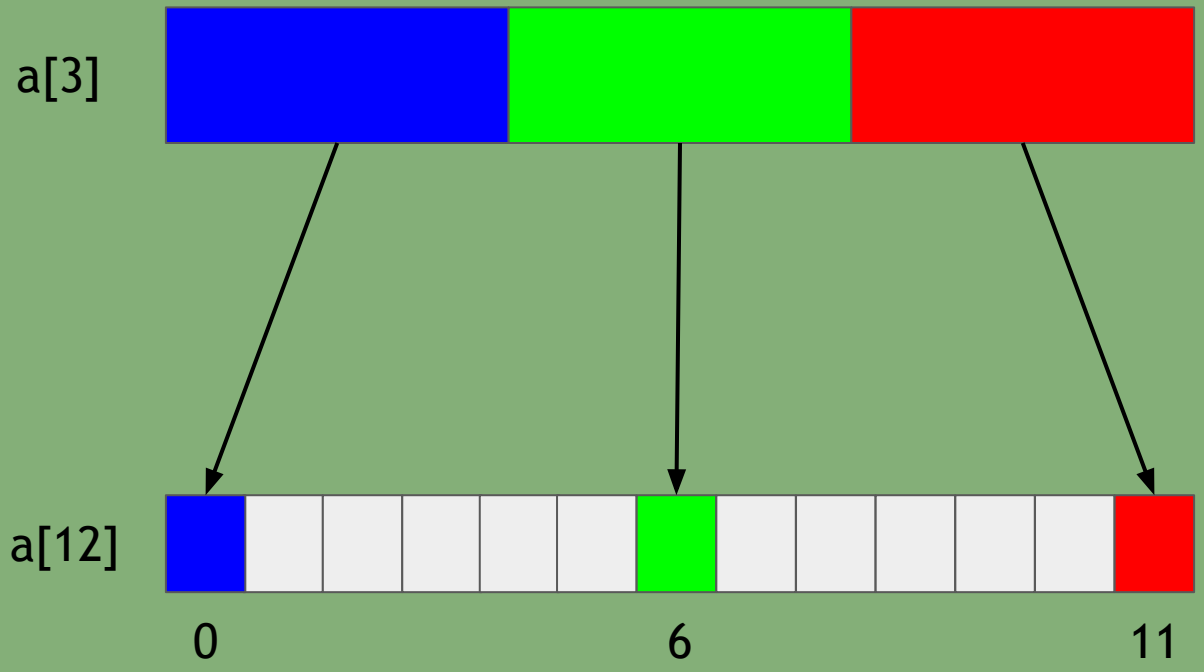
Heatmap - Color array

a[3]

a[12]



Heatmap - Color array



Heatmap - Color array

a[3]

R: 0
G: 0
B: 255

R: 0
G: 255
B: 0

R: 255
G: 0
B: 0

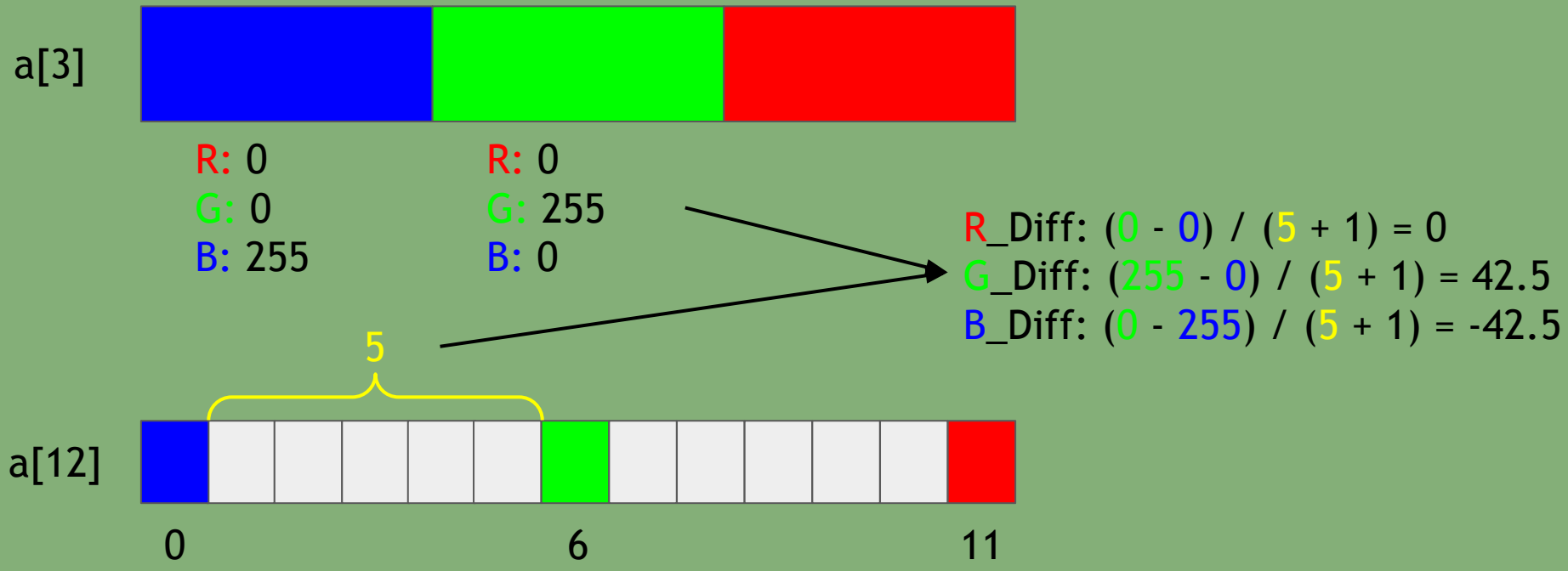
a[12]

0

6

11

Heatmap - Color array



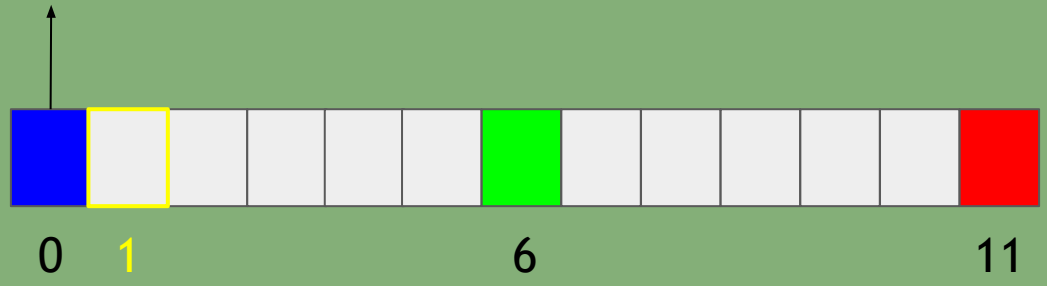
Heatmap - Color array

R_Diff: 0
G_Diff: 42.5
B_Diff: -42.5

a[3]

0 + (0*1) = 0
0 + (42.5*1) = 42.5
255 + (-42.5*1) = 212.5

a[12]



Heatmap - Color array

R_Diff: 0
G_Diff: 42.5
B_Diff: -42.5

a[3]

0 + (0*1) = 0
0 + (42.5*1) = 42.5
255 + (-42.5*1) = 212.5

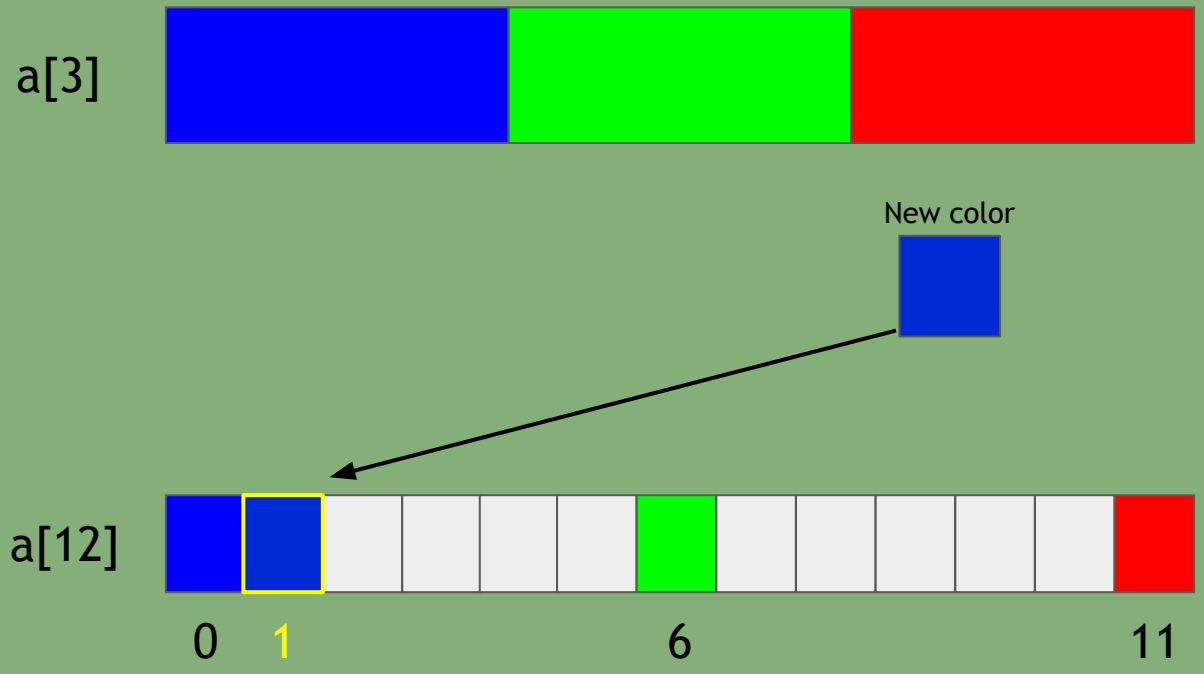
New color

a[12]

0 1 6 11

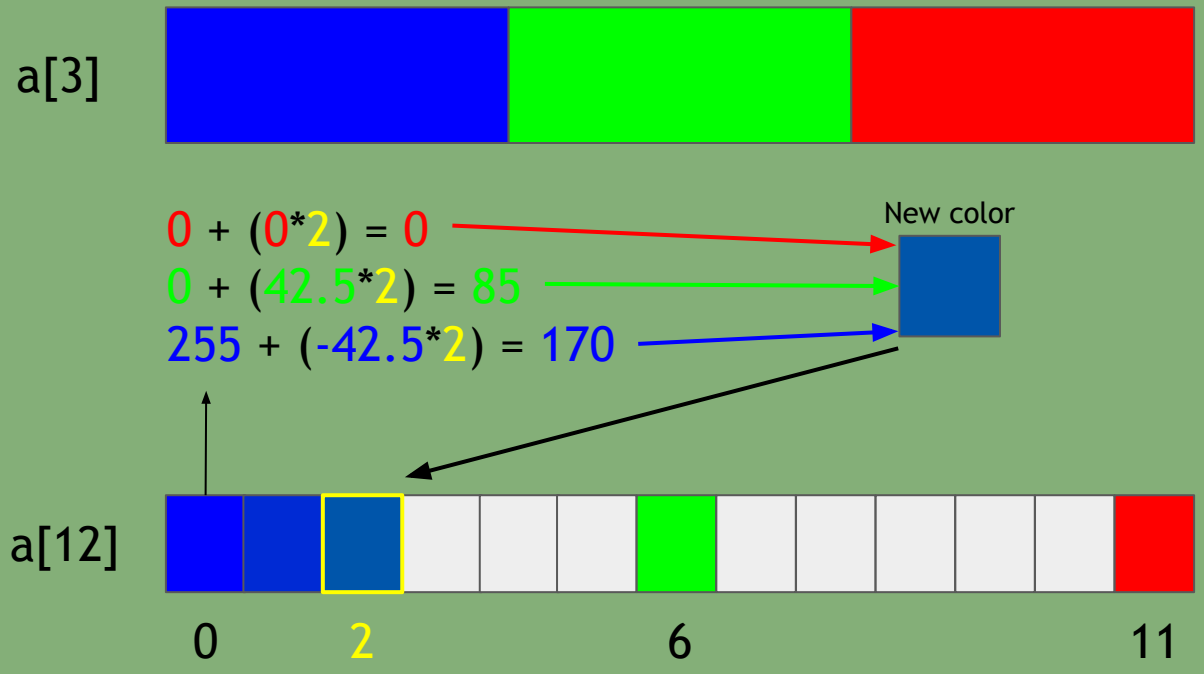
Heatmap - Color array

R_Diff: 0
G_Diff: 42.5
B_Diff: -42.5



Heatmap - Color array

R_Diff: 0
G_Diff: 42.5
B_Diff: -42.5



Heatmap - Color array

R_Diff: 0
G_Diff: 42.5
B_Diff: -42.5

a[3]

a[12]

0 3 6 11

Heatmap - Color array

R_Diff: 0
G_Diff: 42.5
B_Diff: -42.5

a[3]

a[12]

0 4 6 11

Heatmap - Color array

R_Diff: 0
G_Diff: 42.5
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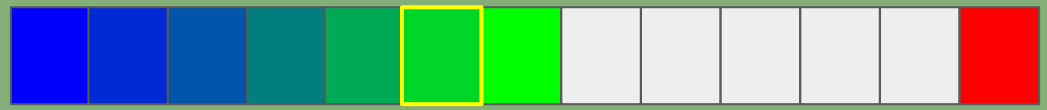
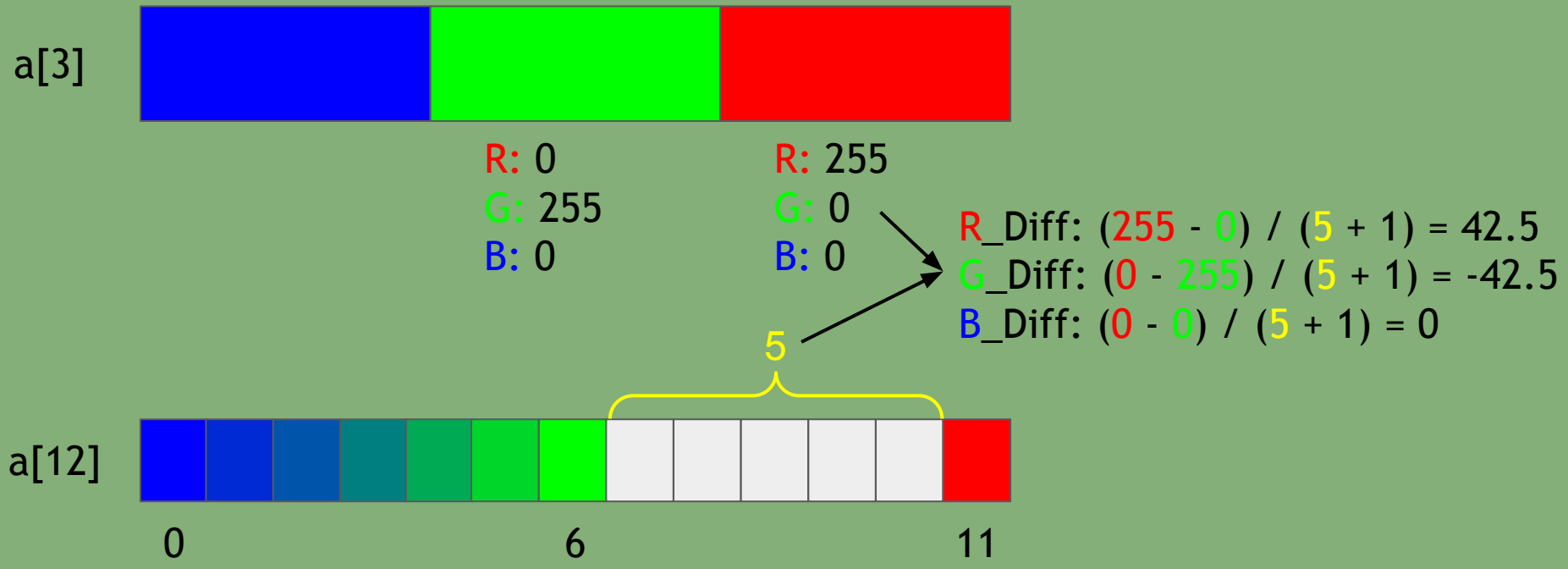
a[3]

a[12]



0 5 6 11

Heatmap - Color array

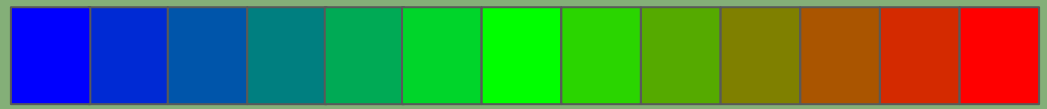


Heatmap - Color array

Back

a[3]

a[12]



0 6 11

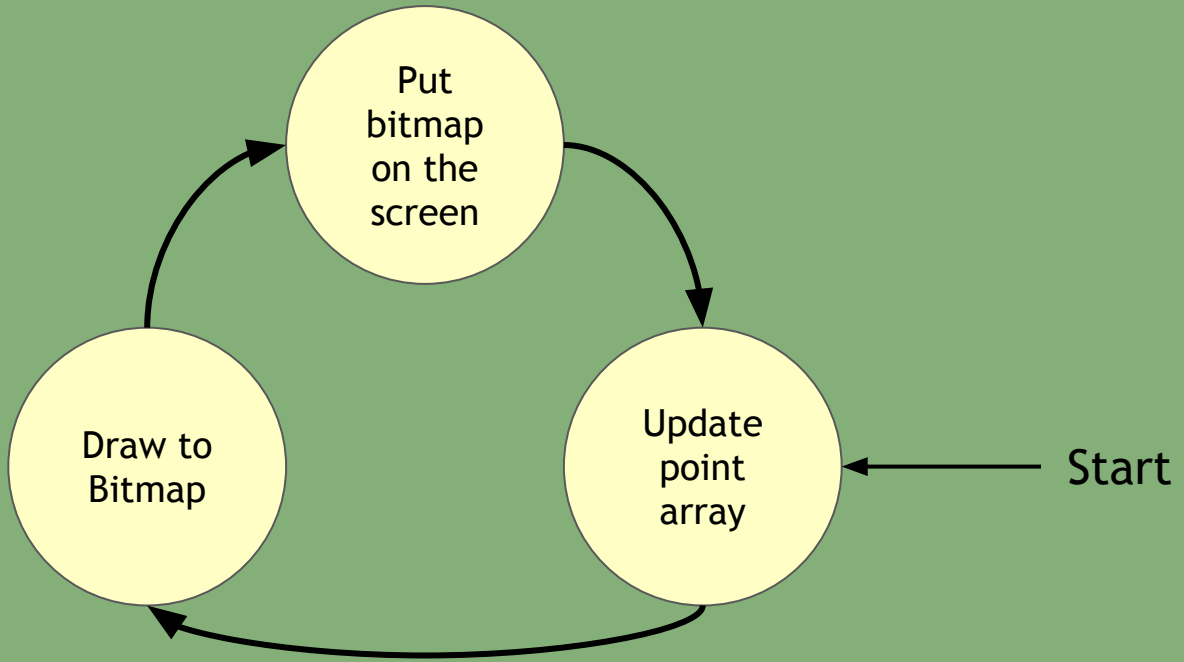
Rewatch - Algorithm Improvement

Back

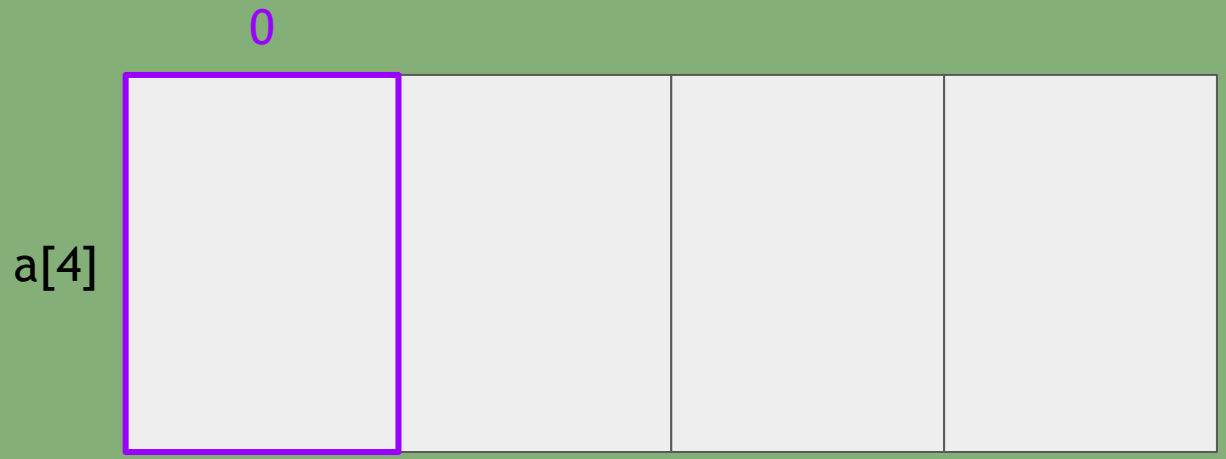
	T1	T2	T3	T4	T5	AVG
Array	32.08	34.79	33.51	34.24	33.35	33.594
Array w/ pixel format	31.37	30.08	32.38	30.33	30.97	31.026
Array w/ pixel format + buffer	25.51	27.22	26.08	25.94	27.33	26.416
List	34.41	35.19	34.64	36.22	35.57	35.206
List w/ pixel format	32.14	30.5	32.02	30.49	31.66	31.362
List w/ pixel format + buffer	27.94	28.15	27.29	28.92	27.08	27.876

Rewatch - Outline

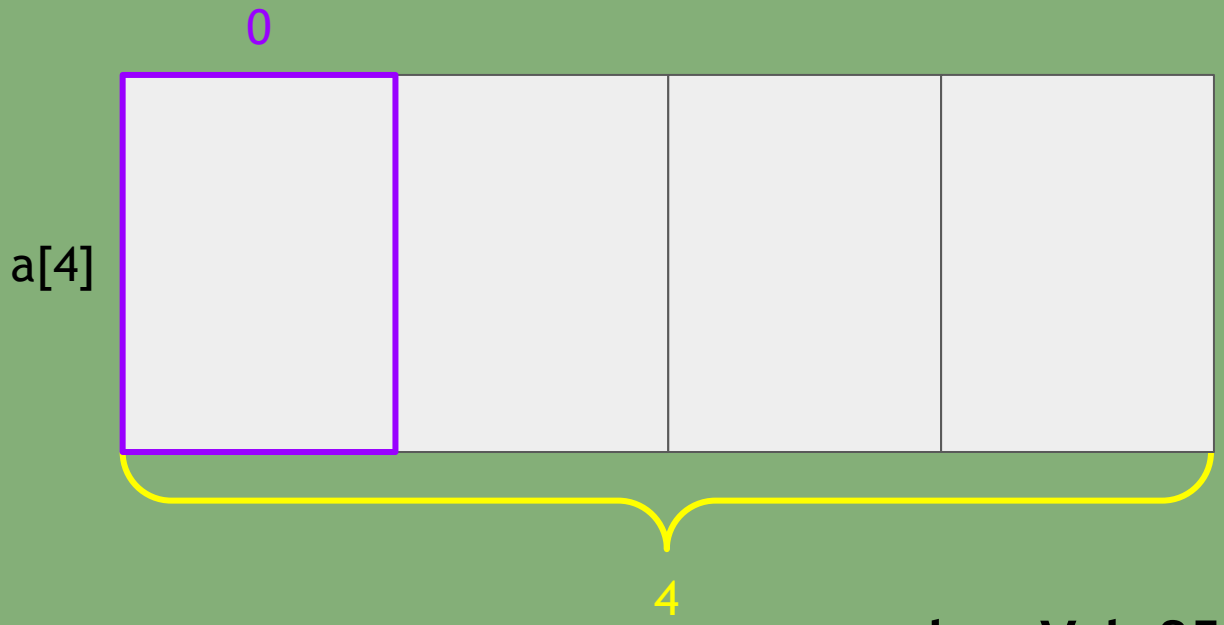
Back



Rewatch - Tail

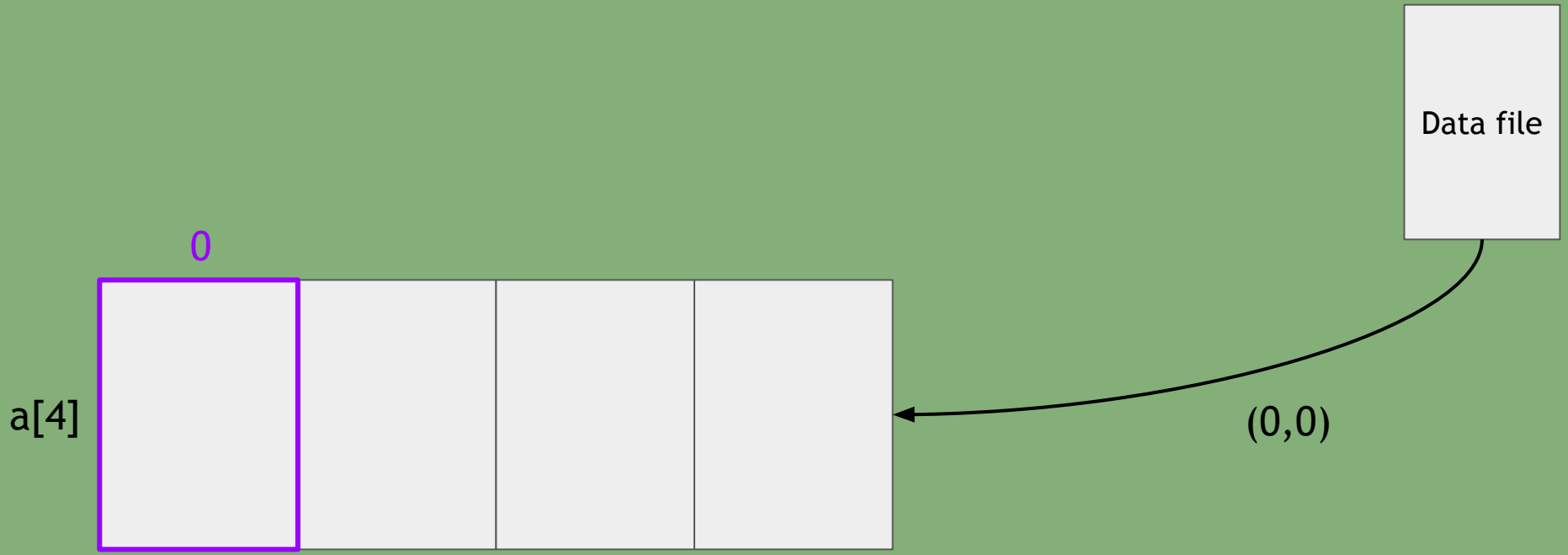


Rewatch - Tail



dec_Val: 255 / 4 = 63.75

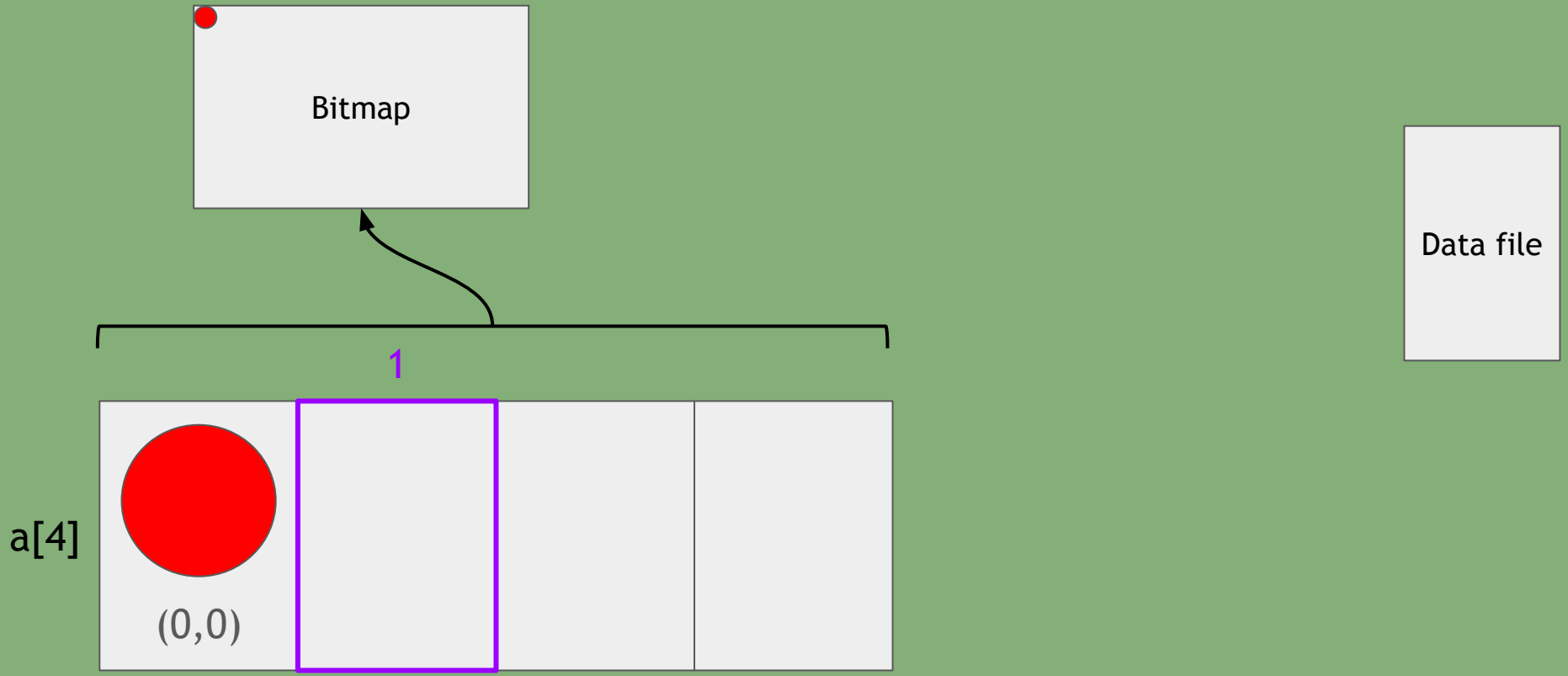
Rewatch - Tail



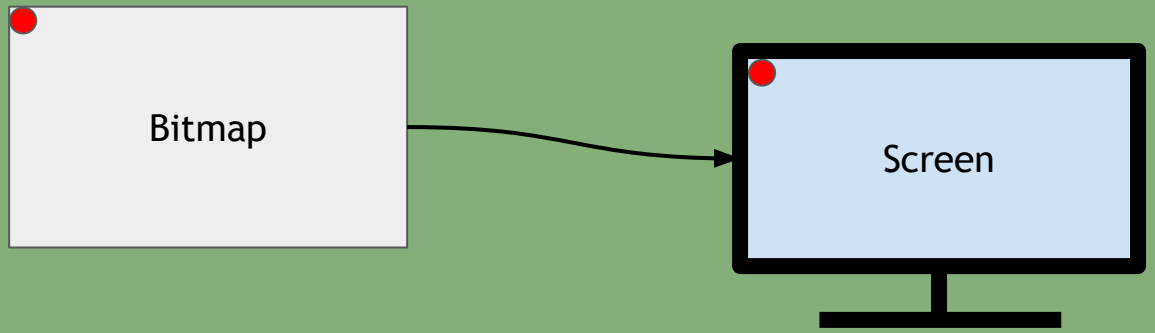
Rewatch - Tail

Data file

Rewatch - Tail

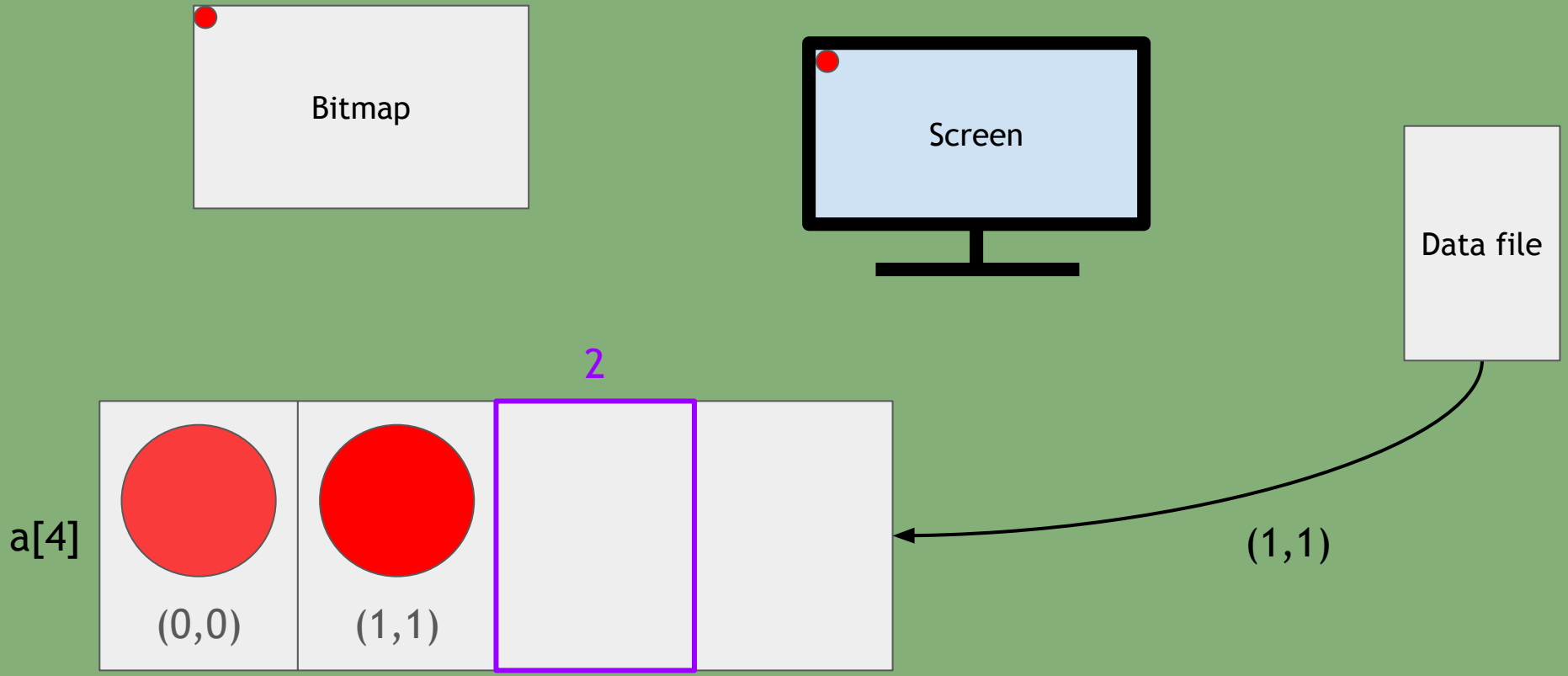


Rewatch - Tail

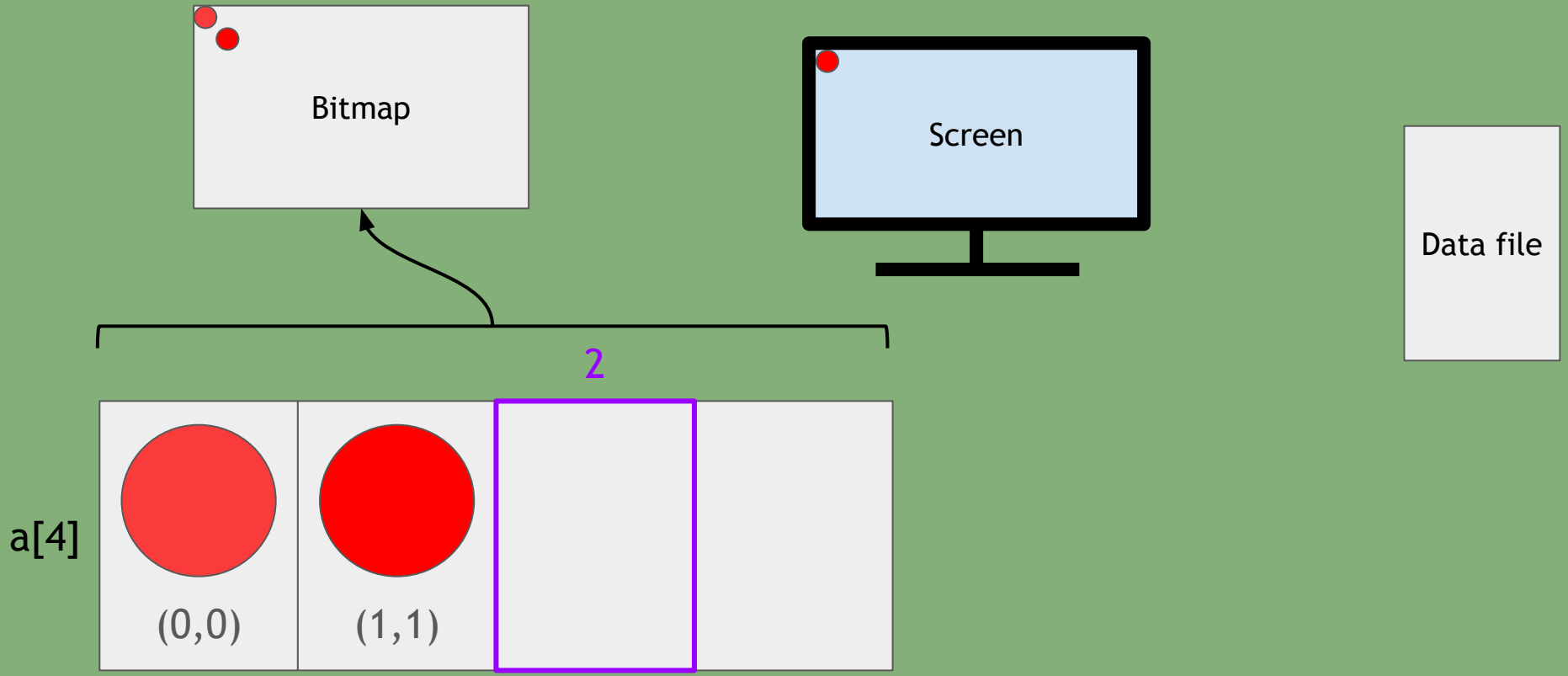


Data file

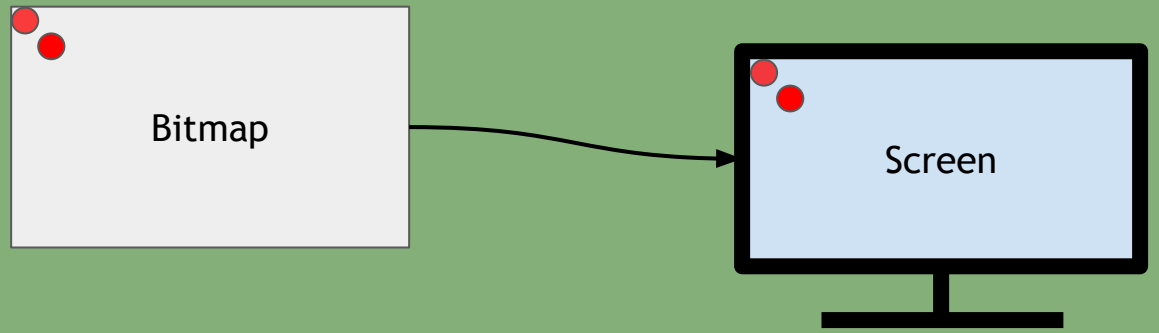
Rewatch - Tail



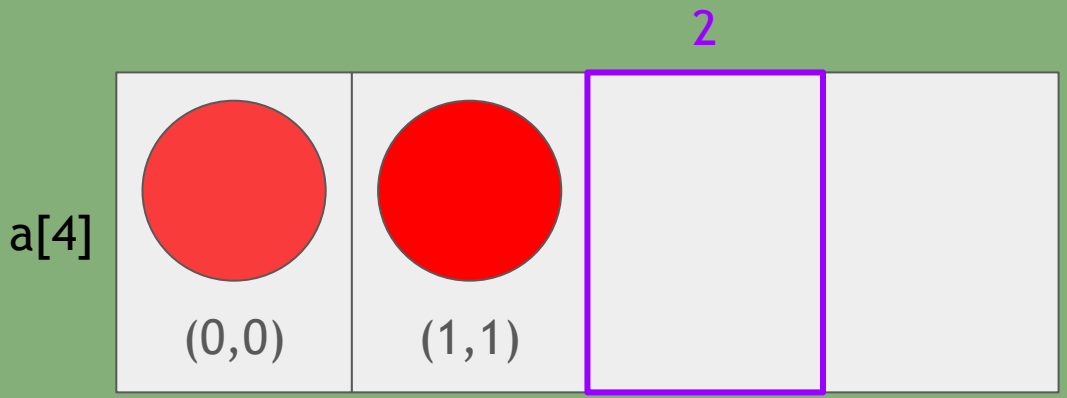
Rewatch - Tail



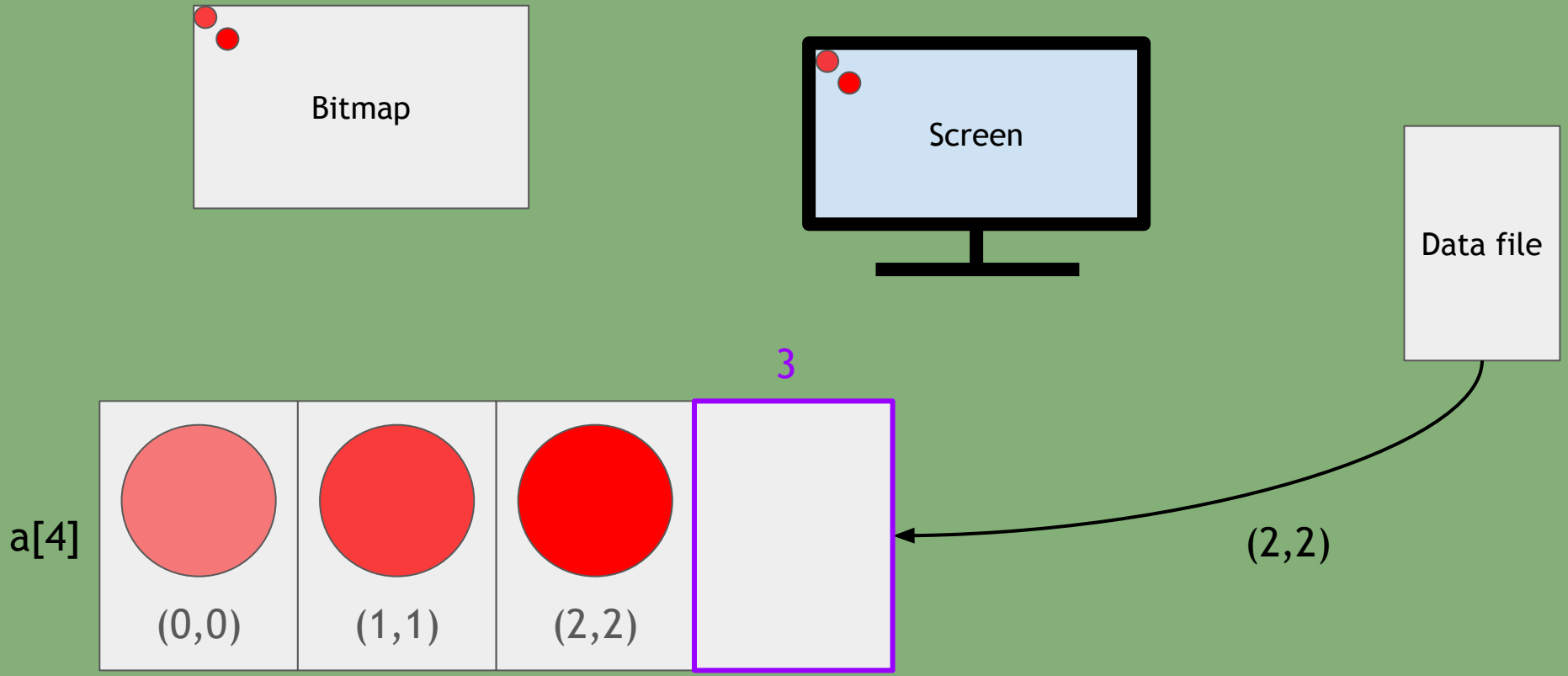
Rewatch - Tail



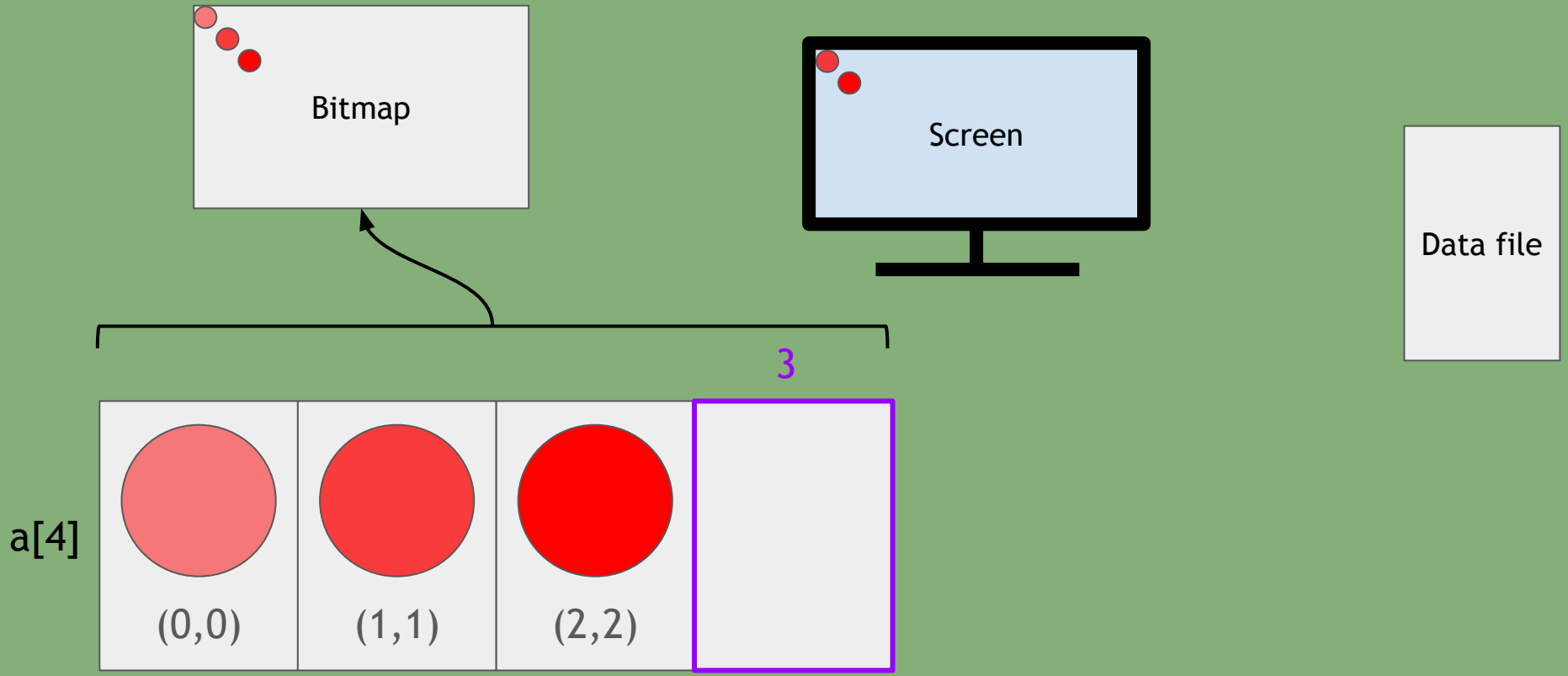
Data file



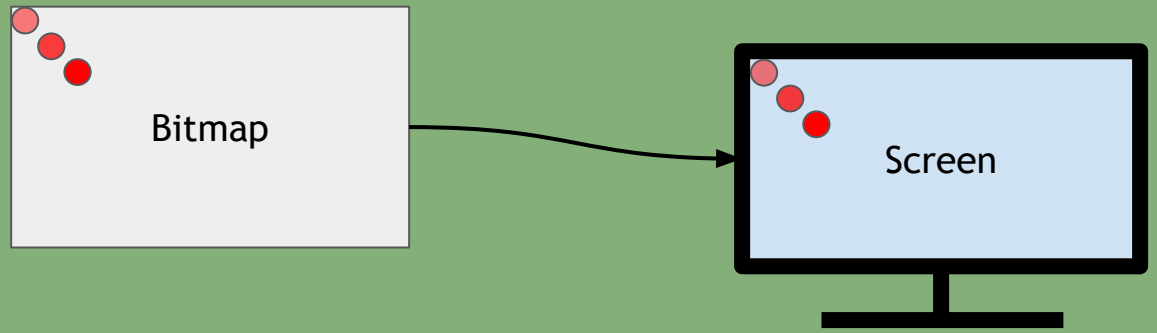
Rewatch - Tail



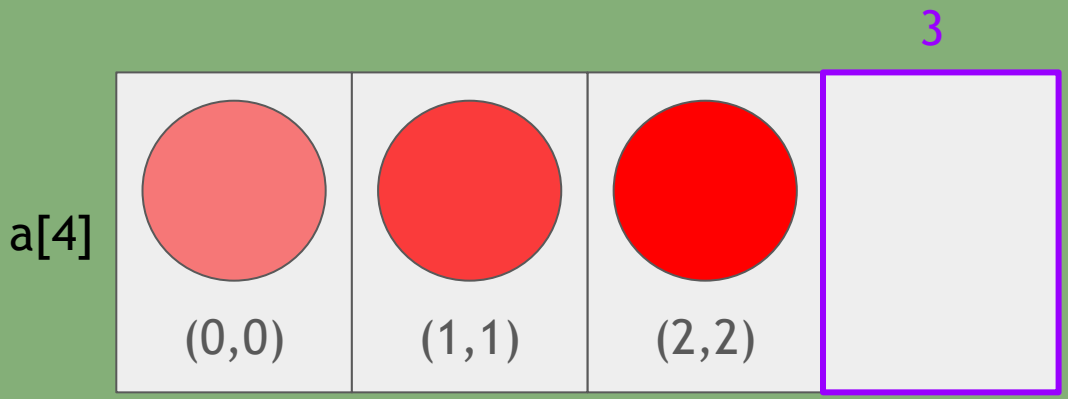
Rewatch - Tail



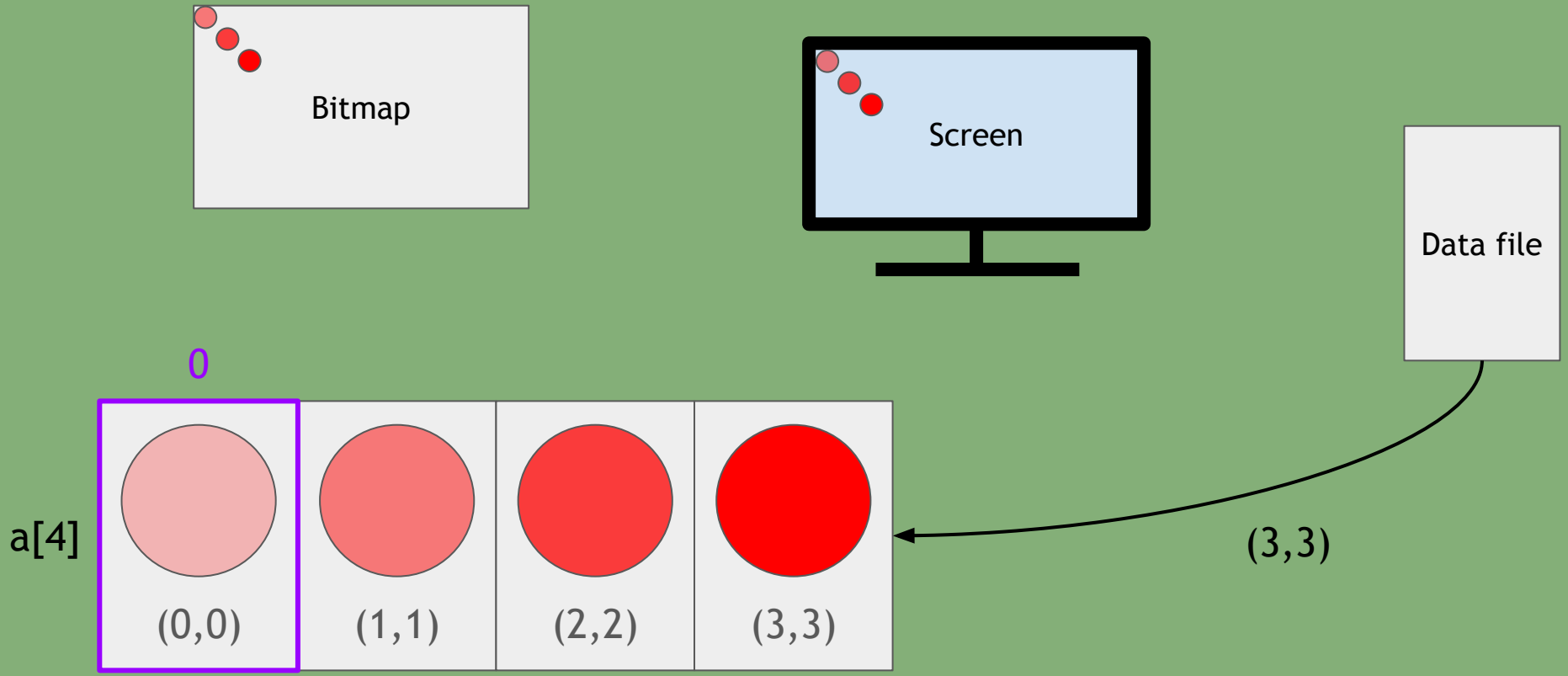
Rewatch - Tail



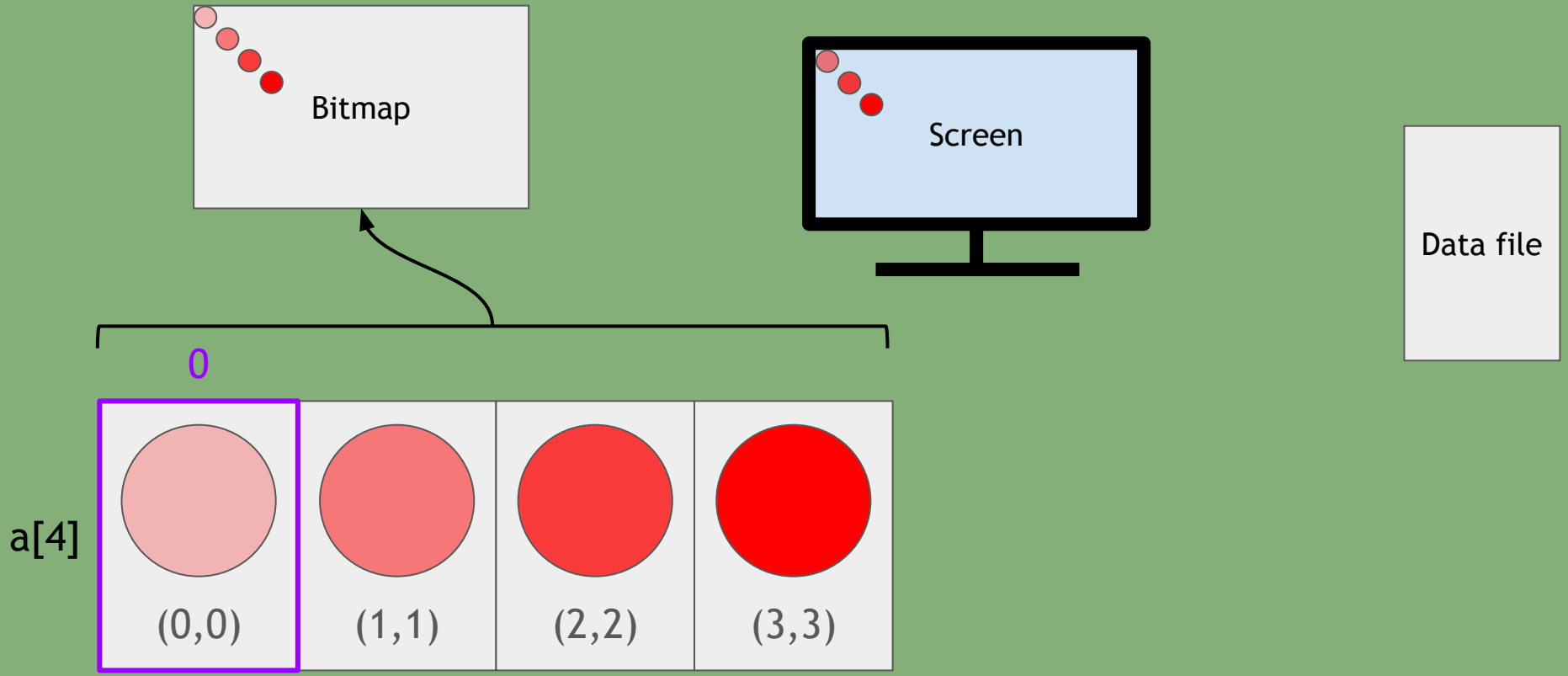
Data file



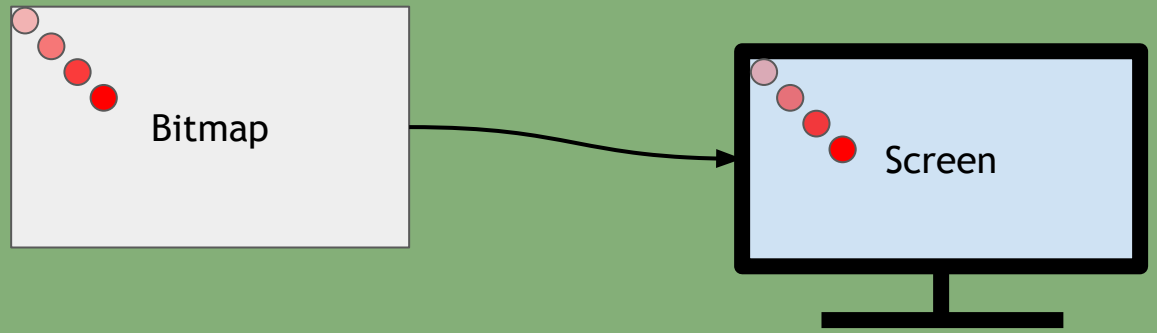
Rewatch - Tail



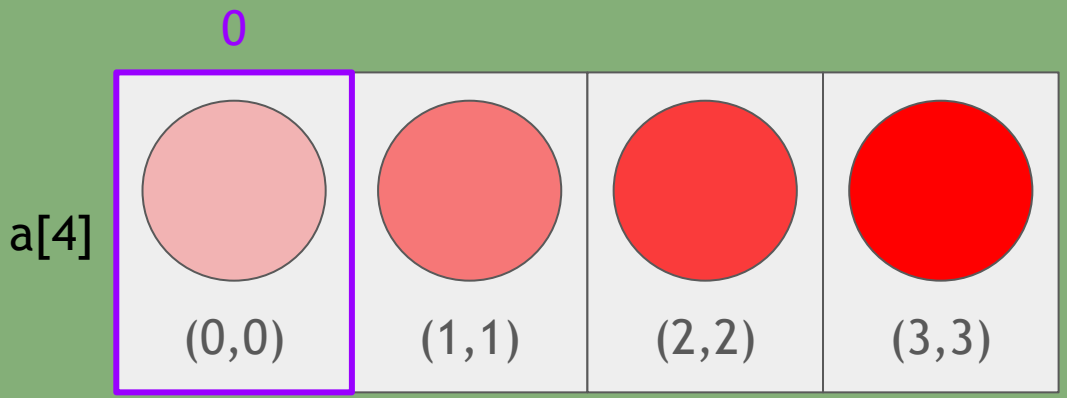
Rewatch - Tail



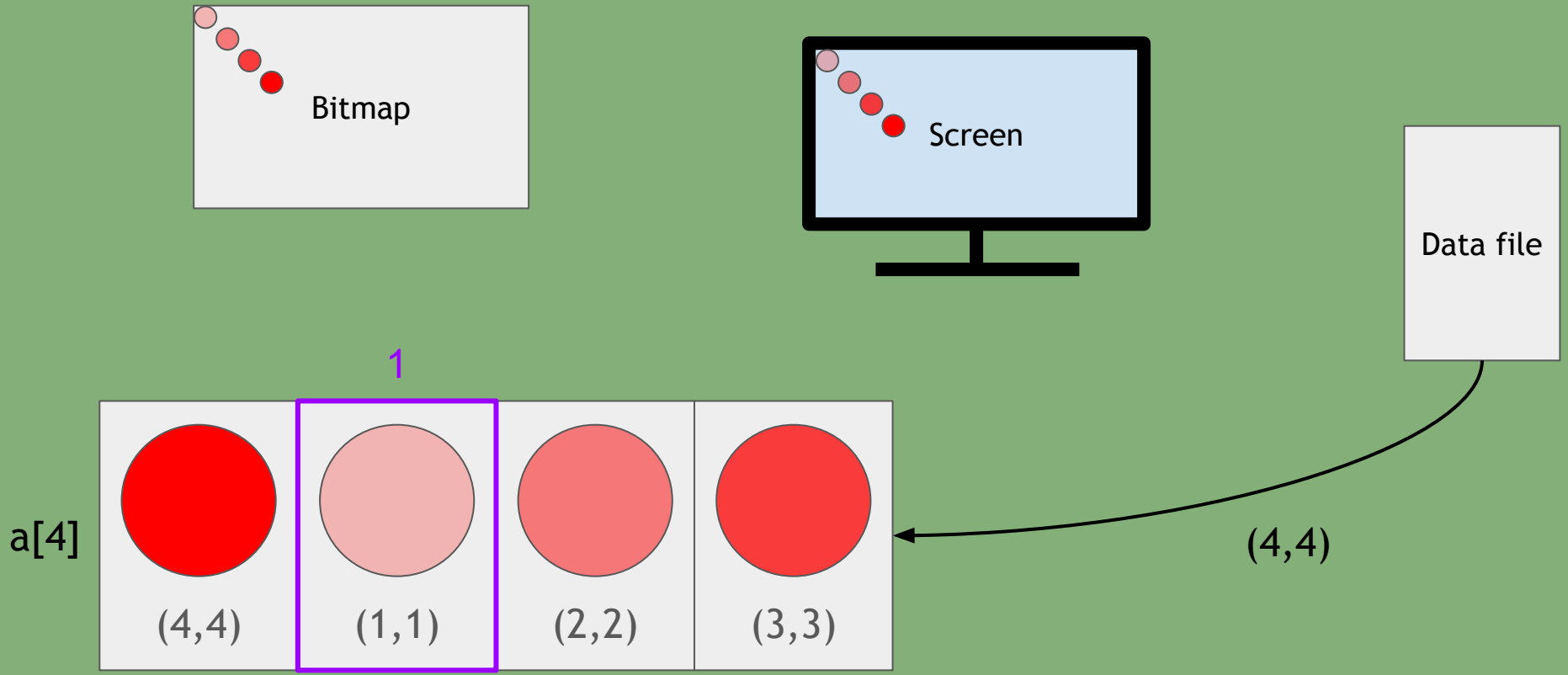
Rewatch - Tail



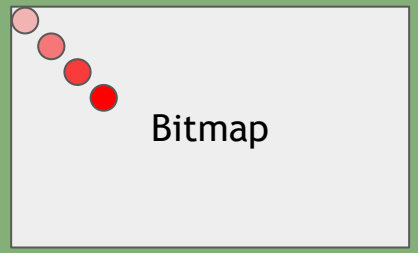
Data file

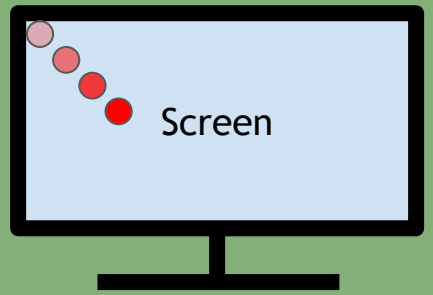


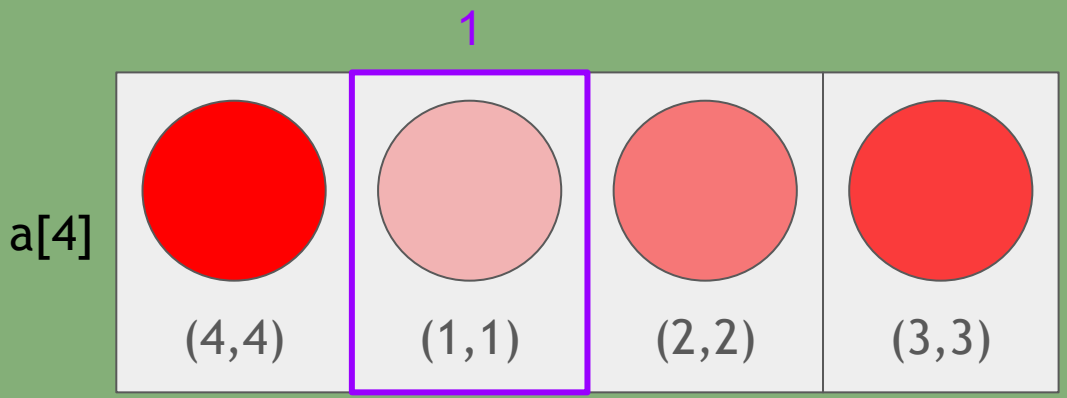
Rewatch - Tail



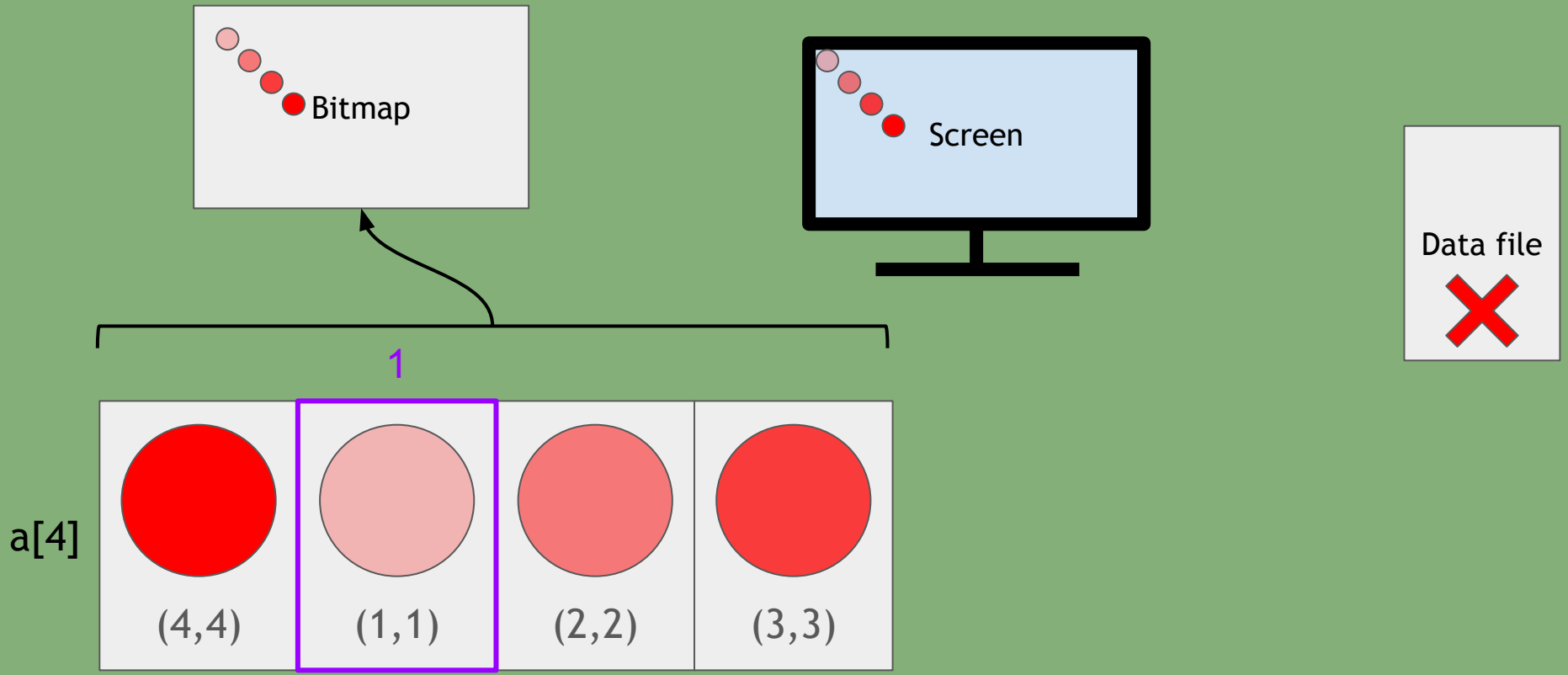
Rewatch - Tail



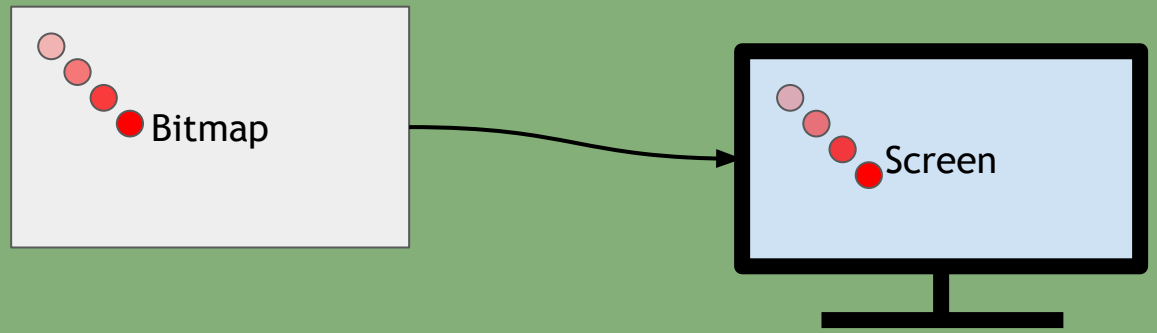




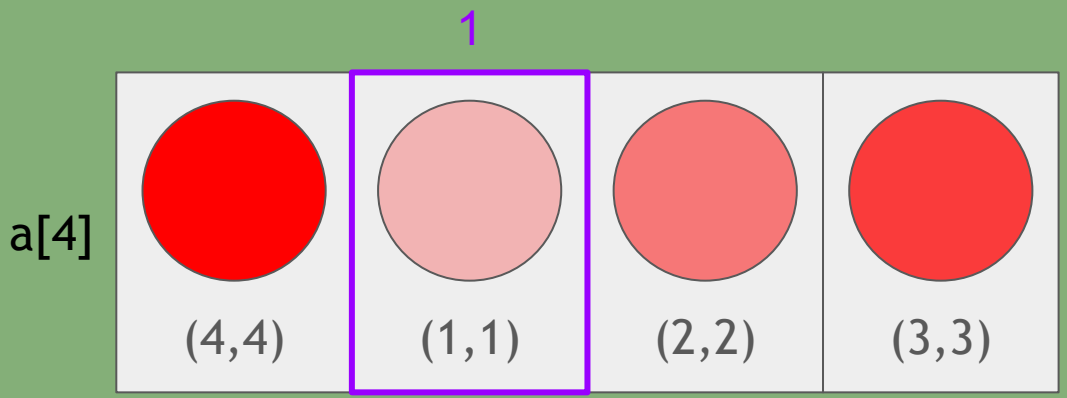
Rewatch - Tail



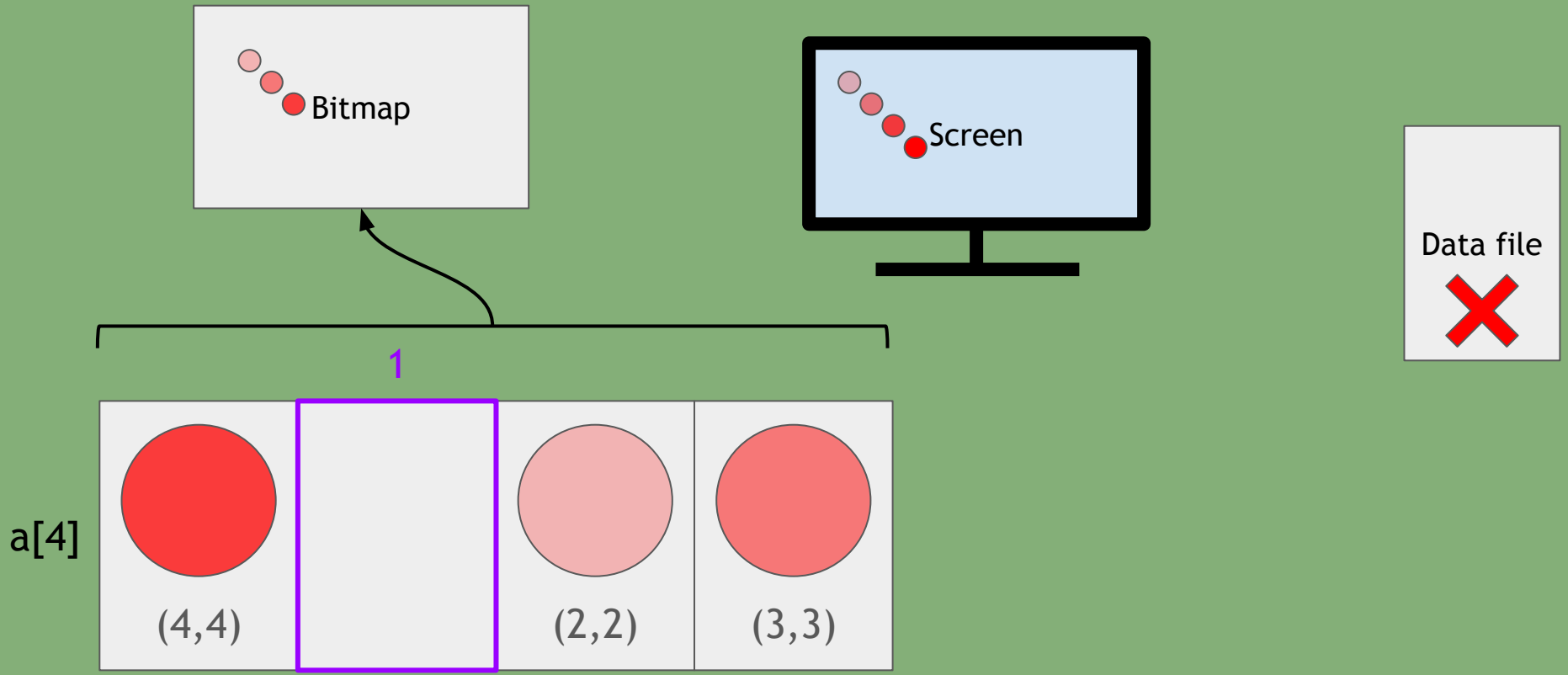
Rewatch - Tail



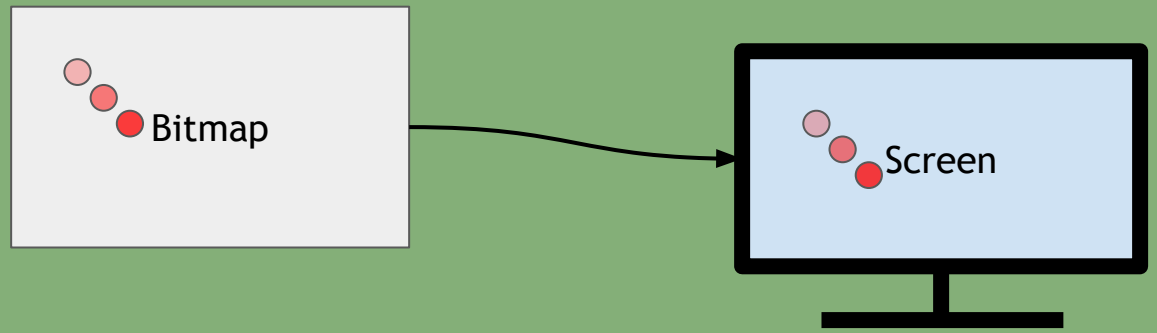
Data file



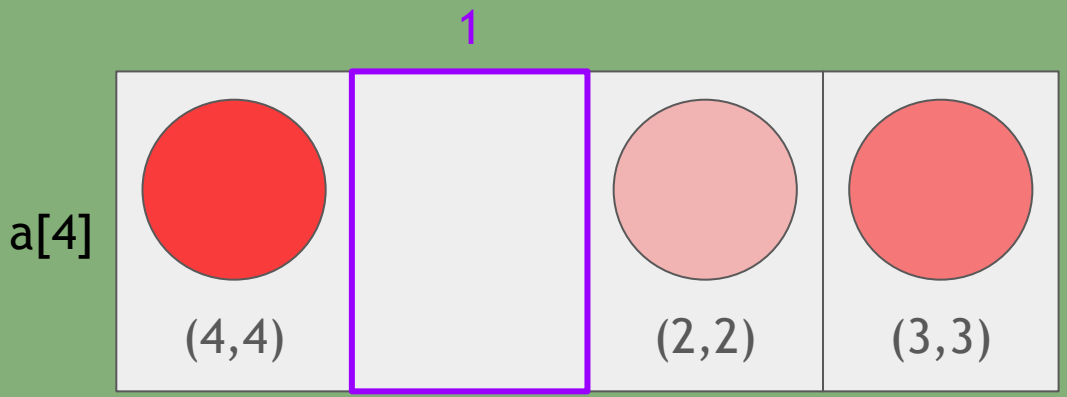
Rewatch - Tail



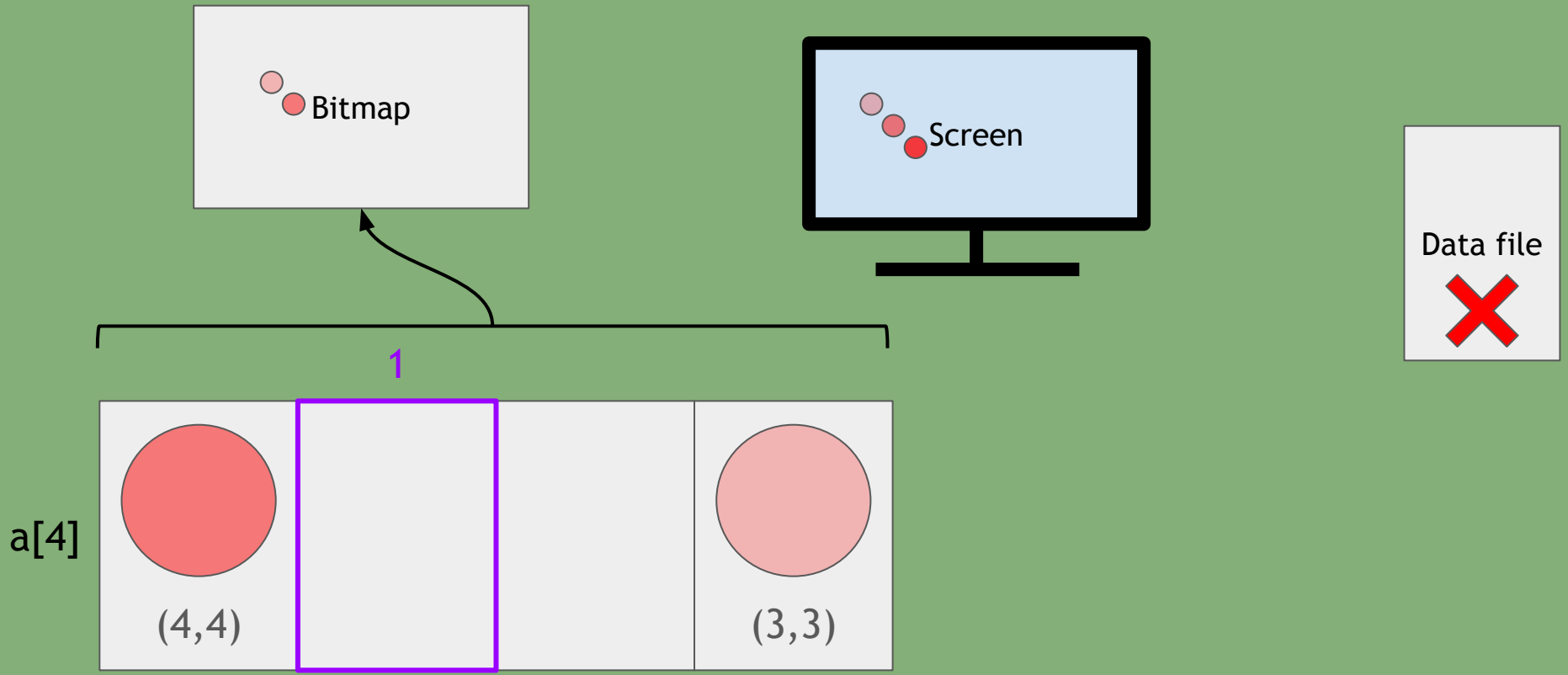
Rewatch - Tail



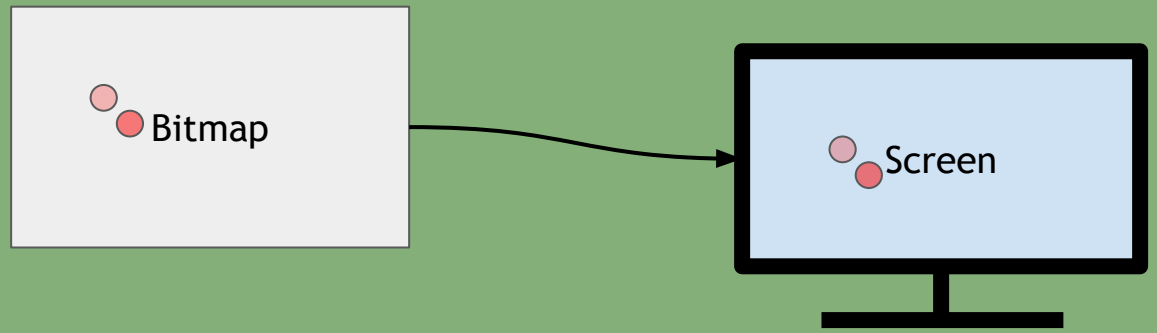
Data file



Rewatch - Tail

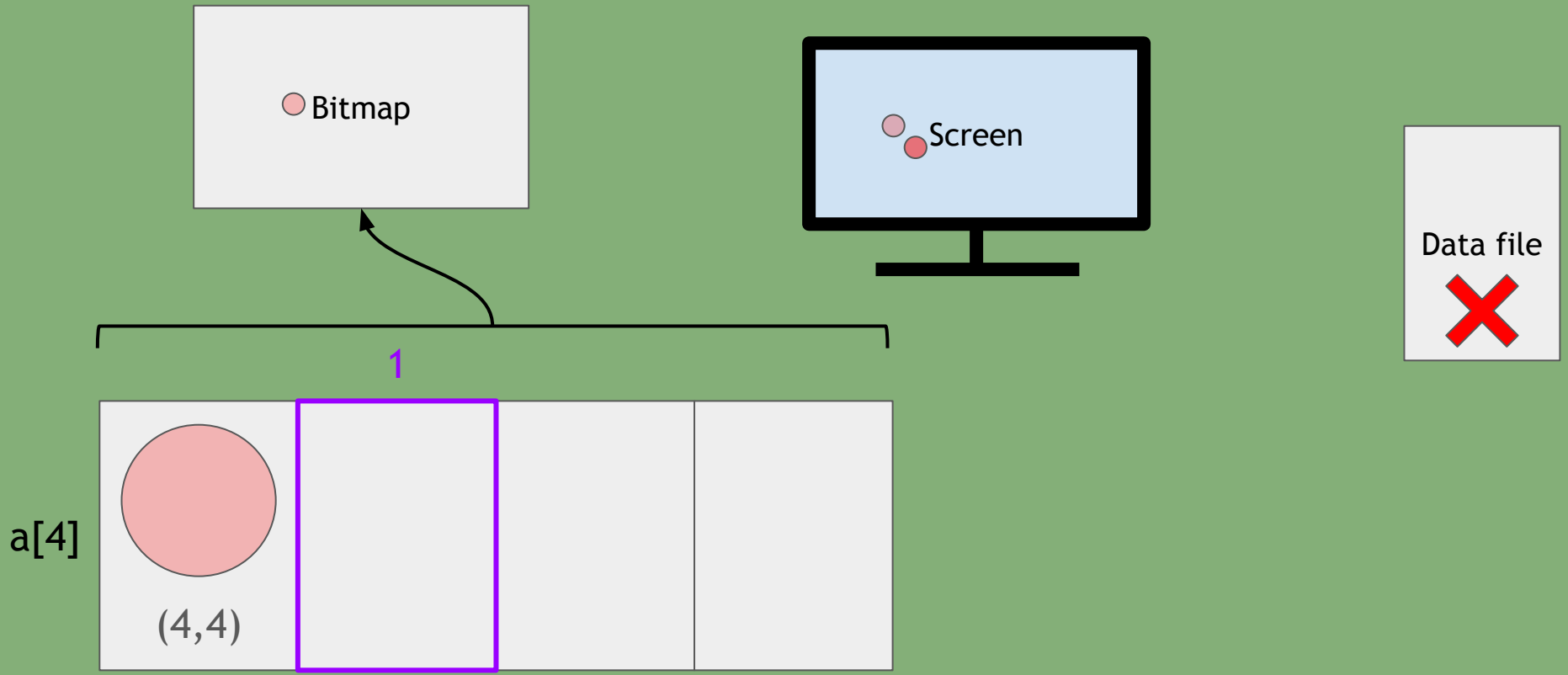


Rewatch - Tail

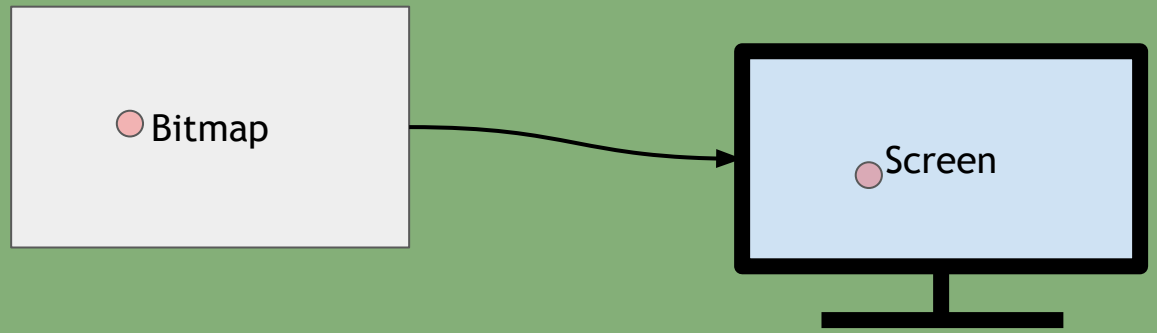


Data file

Rewatch - Tail

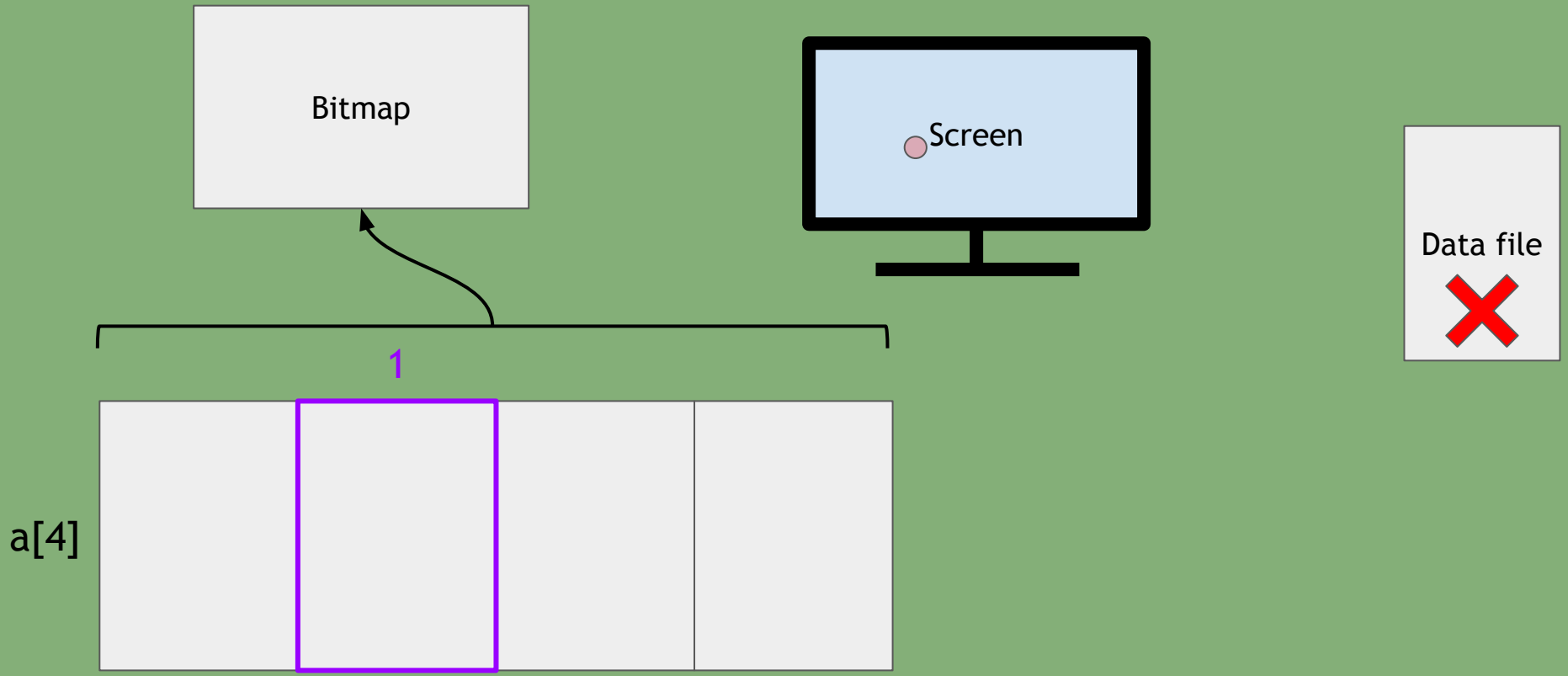


Rewatch - Tail



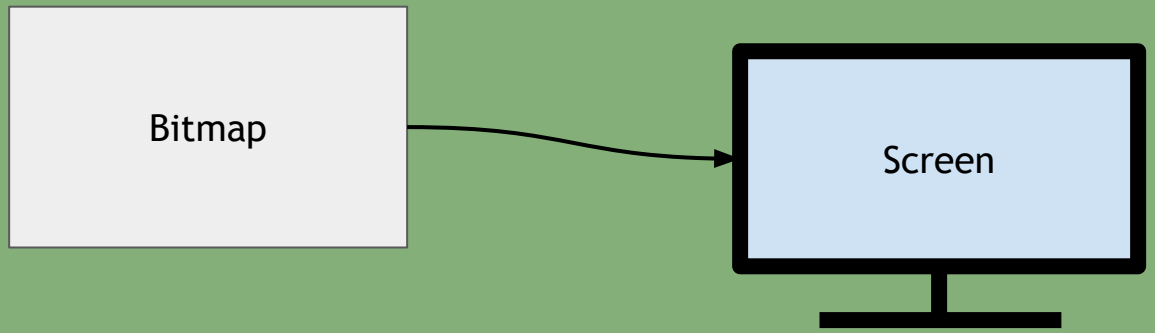
Data file

Rewatch - Tail



Rewatch - Tail

Back



Data file