DIP Final 壁畫復原

第13組

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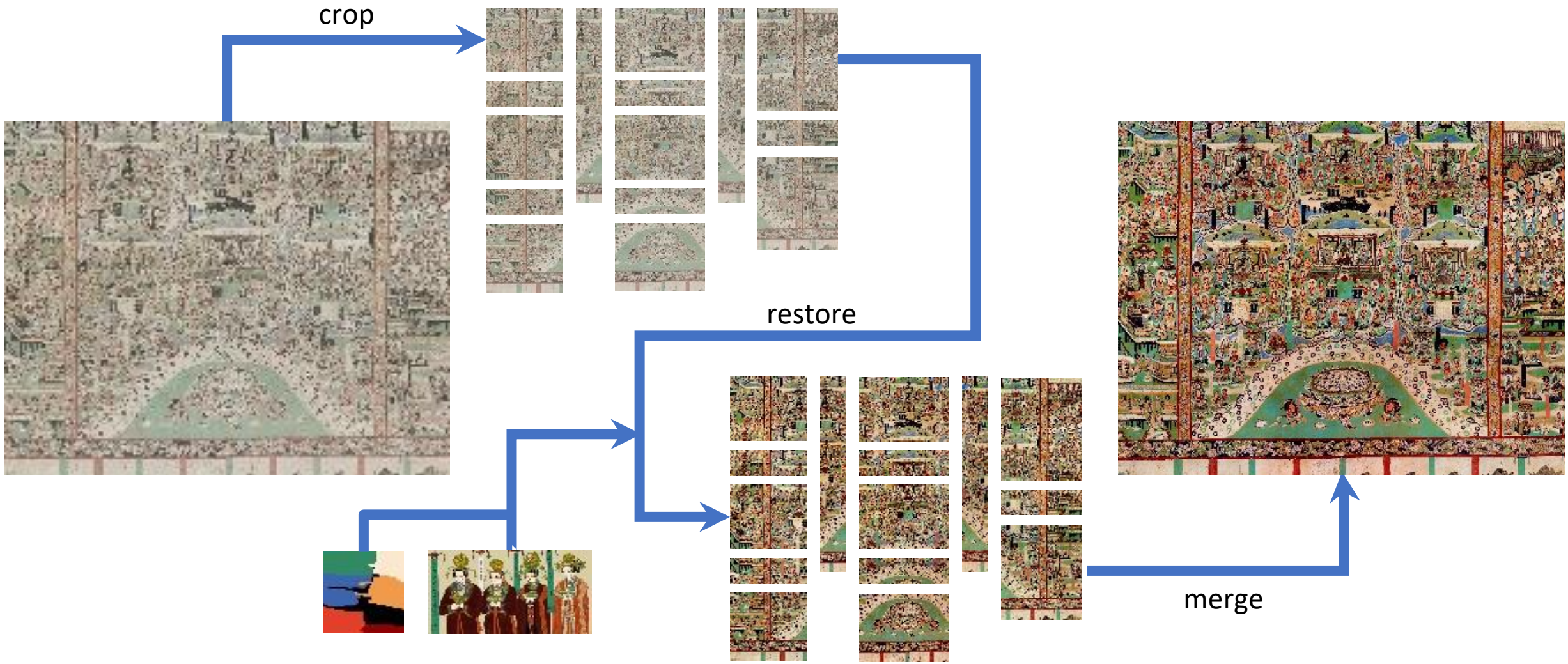
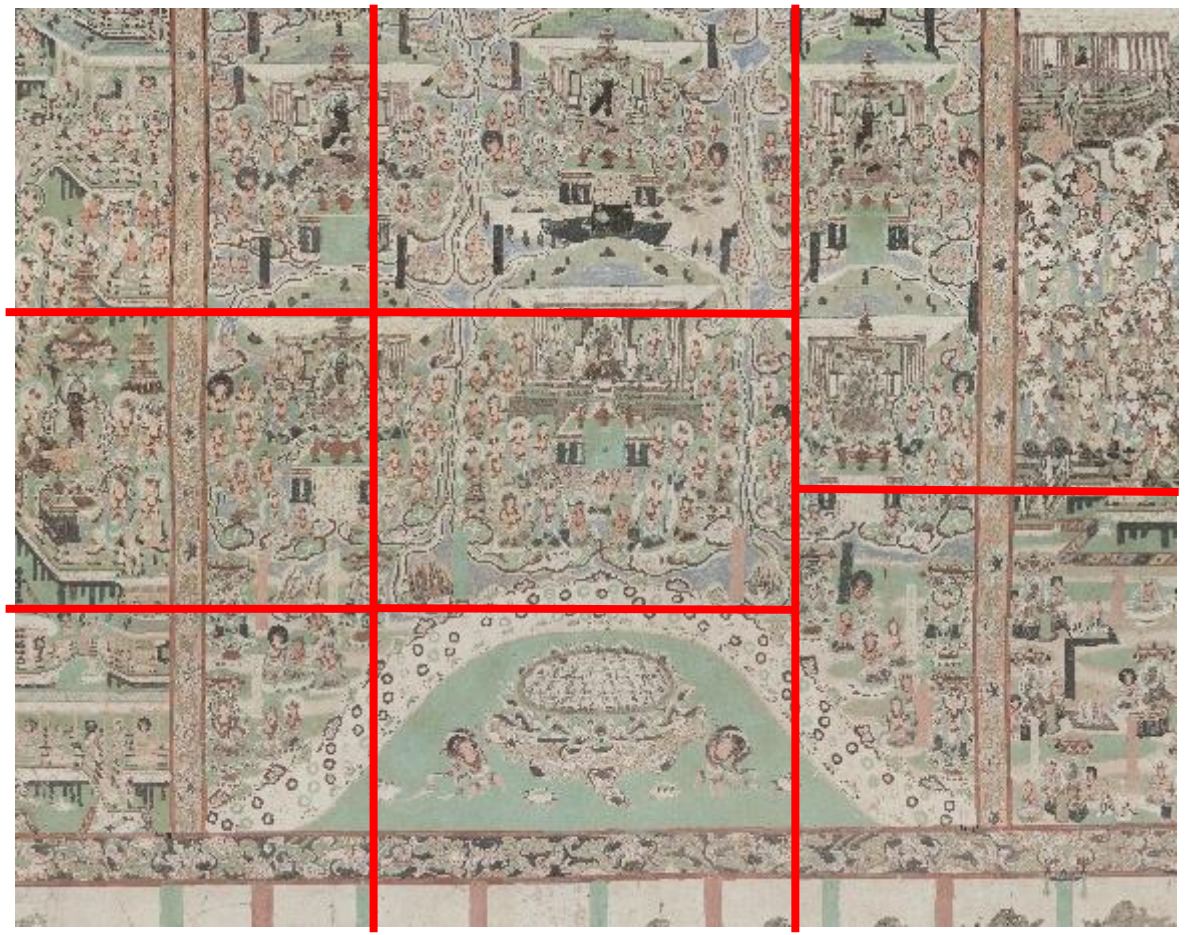
Pipeline

Pipeline

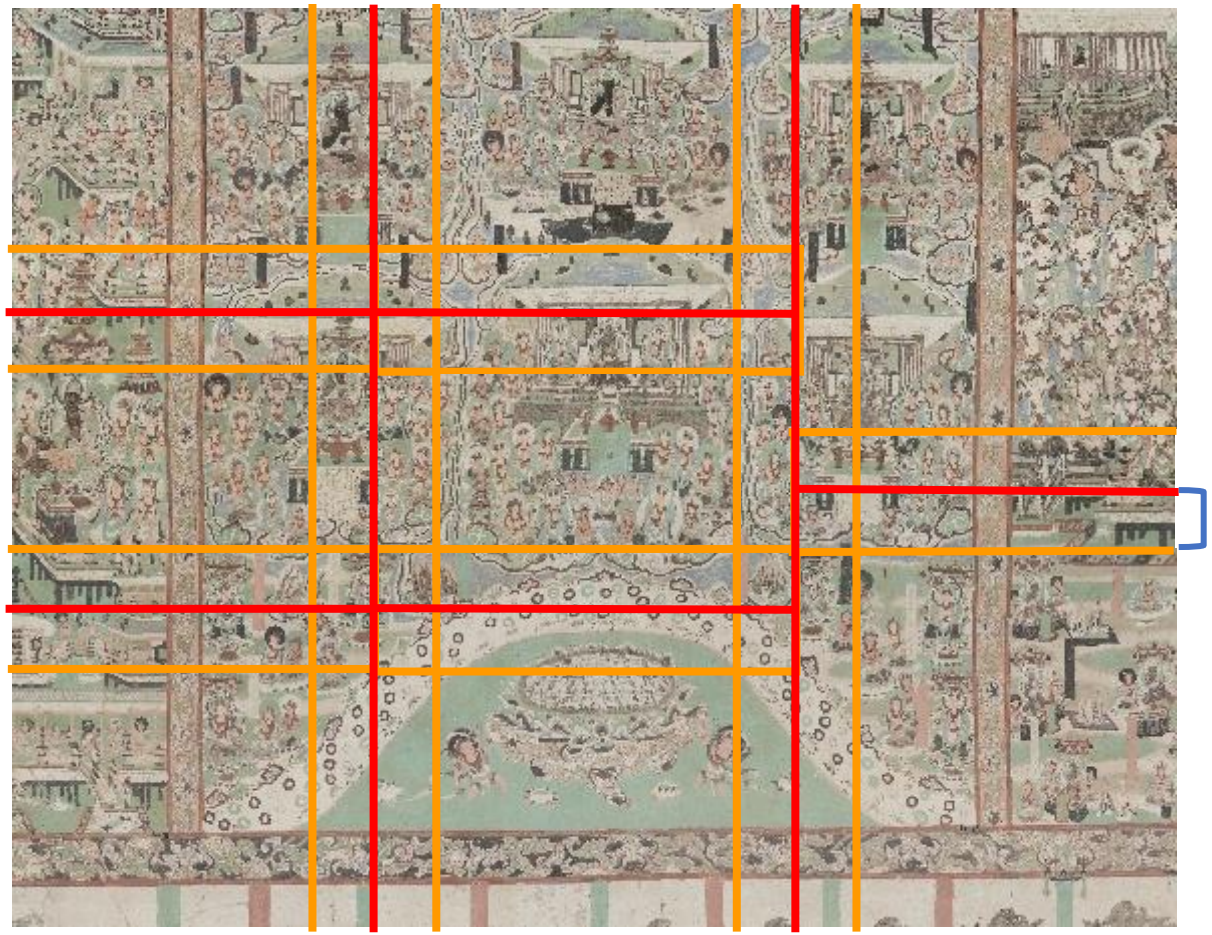


Crop

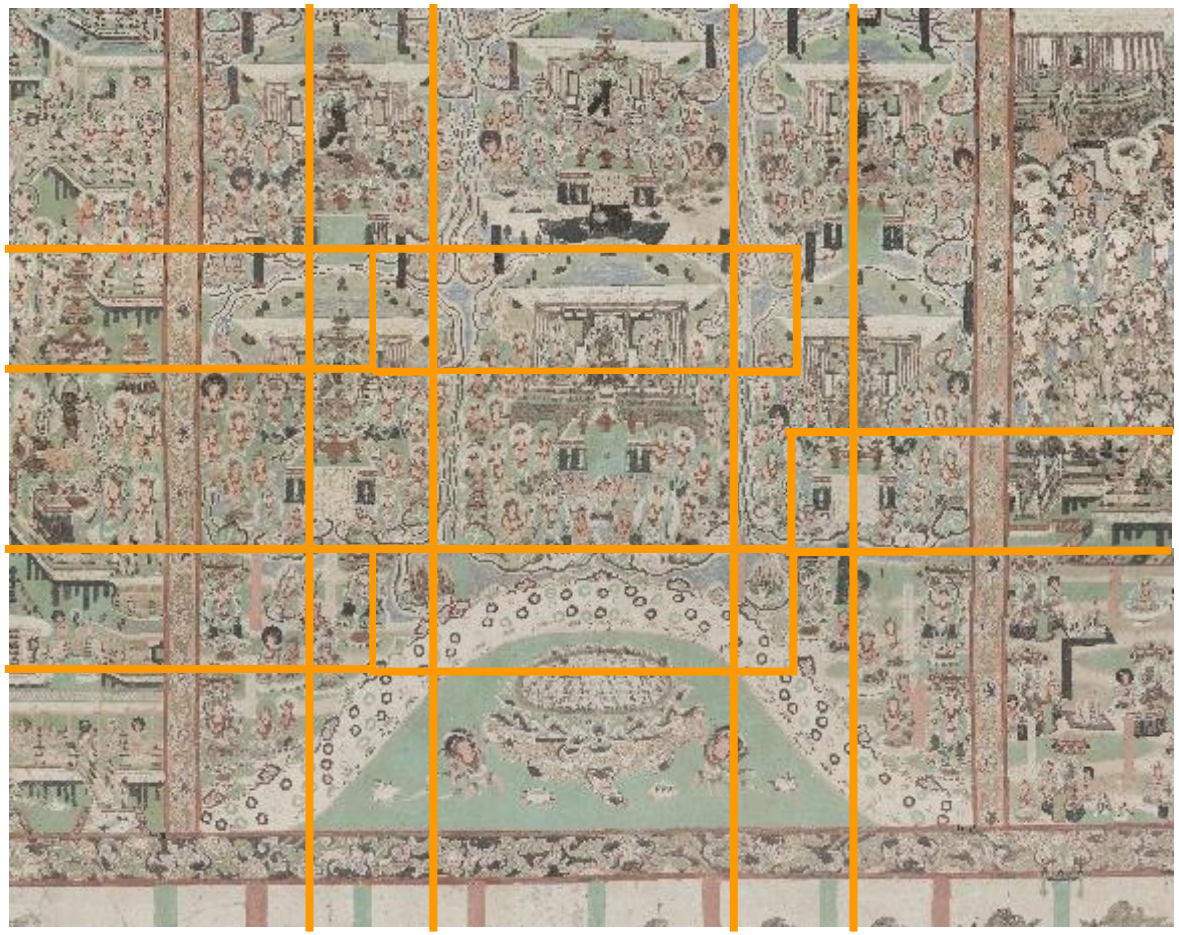
Crop



Crop



Crop



Crop

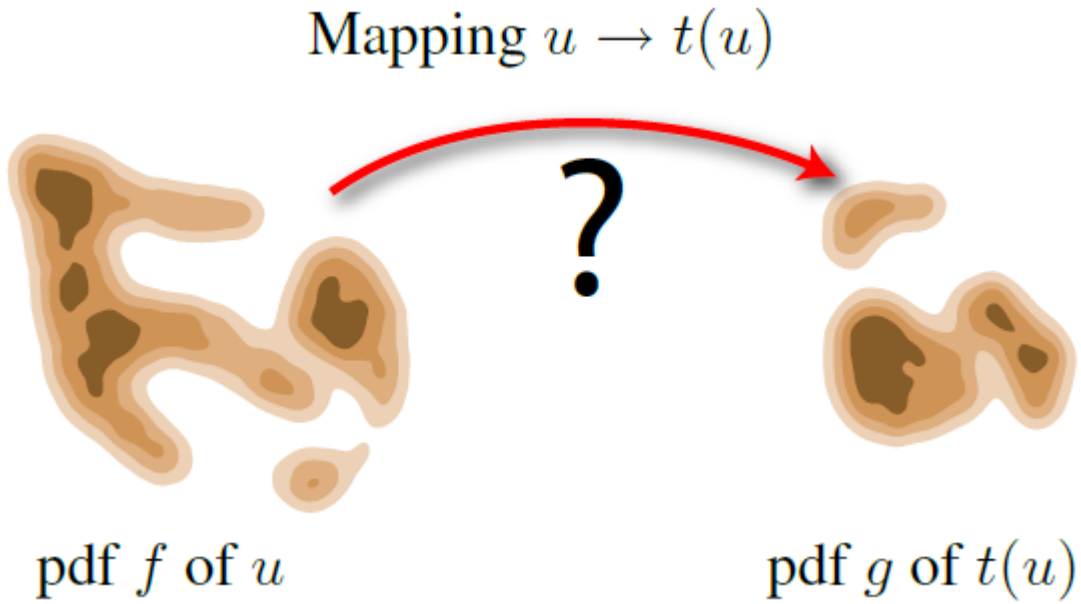
Restore

- Color transfer
- Gain compensation
- Denoise

Restore (color transfer)

Pitié, F., Kokaram, A.: The Linear Monge-Kantorovitch Colour Mapping for Example-Based Colour Transfer. In: Proc. of CVMP 2007 (2007)

Restore (color transfer)



$t(u) = T * u + t_0$

Restore (color transfer)

Linear transformation can be achieve, when **original distributions f** and the **target distributions g** are **multivariate Gaussian distributions (MVG)**

$$\begin{cases} t(u) = T(u - \mu_u) + \mu_v \\ T\Sigma_u T^T = \Sigma_v \end{cases}$$

Restore (color transfer)

Solve the equation

$$
\begin{aligned}
T\Sigma_u T^T &= \Sigma_v \\
T\left(AA^T\right)T^T &= BB^T \\
(TA)(TA)^T &= BB^T
\end{aligned}
$$

$$\text{set } TA = B \text{ and take } T = BA^{-1}$$

Restore (color transfer)

Decompose by **Square Root Decompsition**

$$\Sigma_u = P_u^T D_u P_u \text{ and } \Sigma_u^{1/2} = P_u^T D_u^{1/2} P_u$$

$$\Sigma_v = P_v^T D_v P_v \text{ and } \Sigma_v^{1/2} = P_v^T D_v^{1/2} P_v$$

$$T = \Sigma_v^{1/2} \Sigma_u^{-1/2}$$

Restore (color transfer)

Restore (Gain compensation)

+

=

0.7

0.3

Restore (denoise)

image = cv2.bilateralFilter(img,9,75,75)

Merge

- Linear Blending
- Multi-Band Blending

Merge (Linear Blending)

alpha

1

0

0

1

cv2.addWeighted(left, alpha, right, 1-alpha, 0.0)

0

1

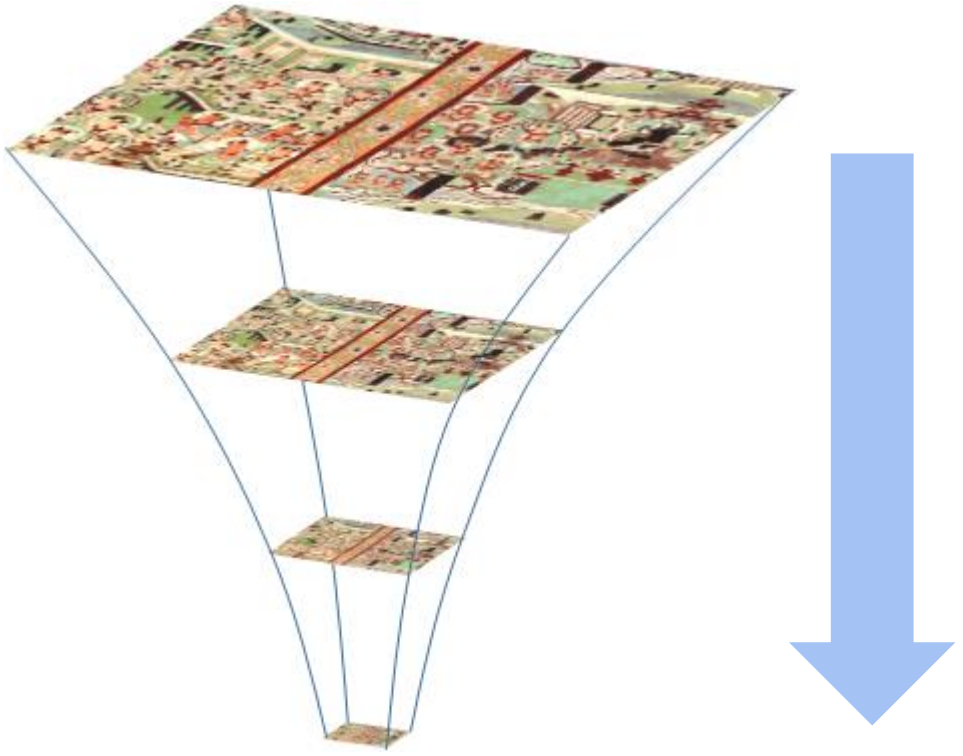
0

Merge (Linear Blending)

Merge
(just put it together)

Linear Blending

Merge (Multi-Band)



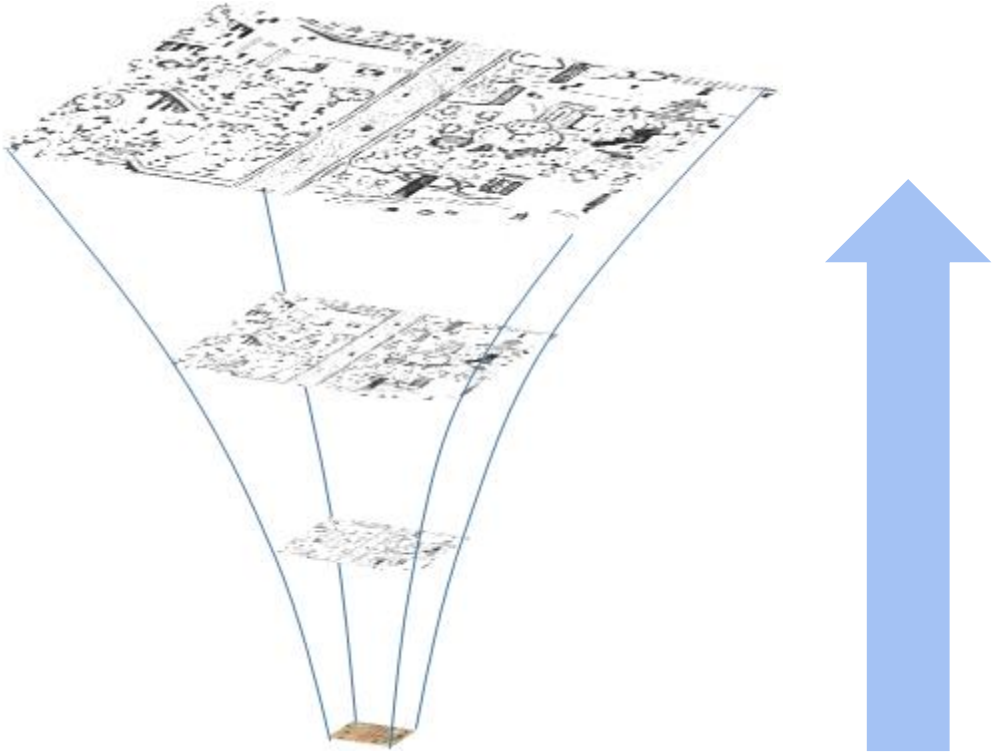
Gaussian Pyramid

1. Input image filtering by Gaussian Filter

1. Downsample

1. Output image repeat previous two steps until default layer

Merge (Multi-Band)



Laplacian Pyramid

Ln=Gn−EXPAND(Gn−1)

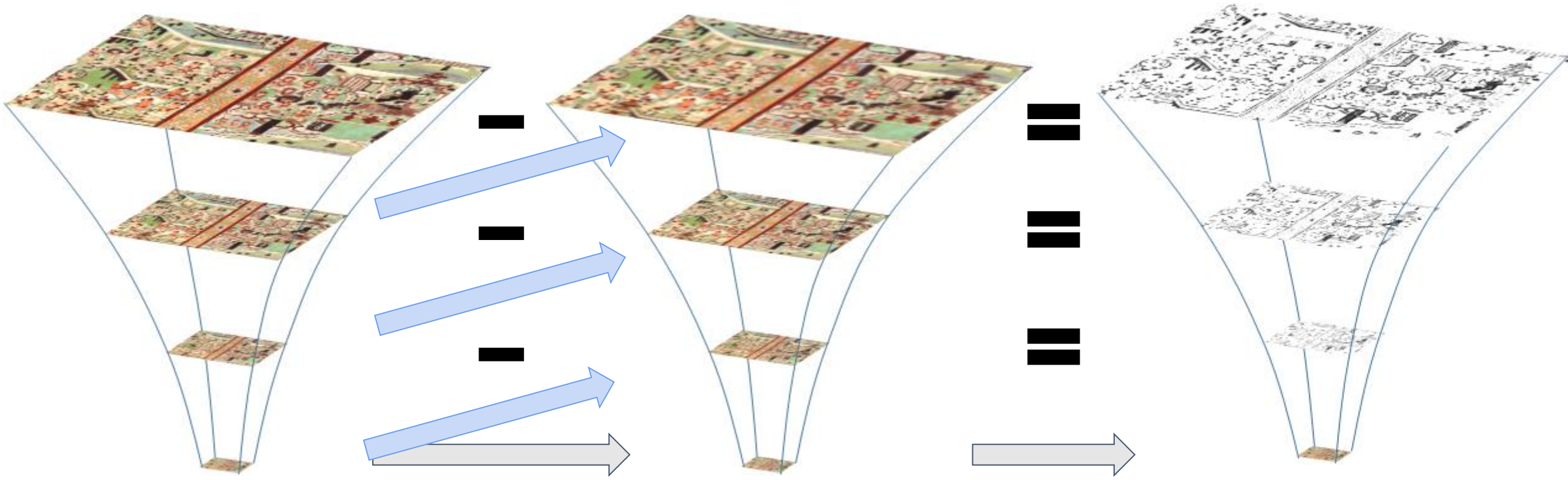
1. Input previous layer image from Gaussian Pyramid

1. Upsample to expand image

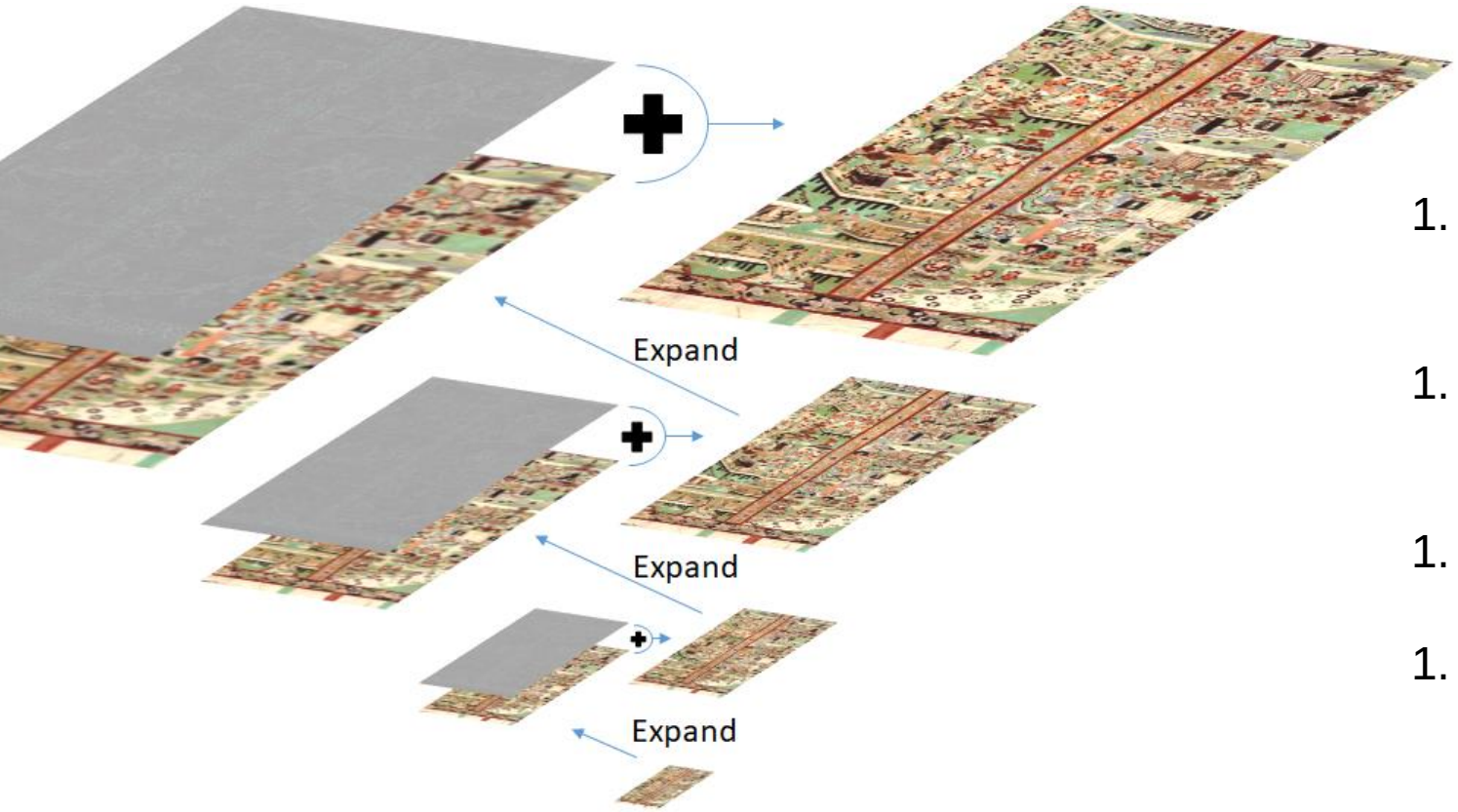
1. Get the Laplacian image by using Gaussian Pyramid subtract expand image

1. repeat until first layer

Merge (Multi-Band)



Merge (Multi-Band)



Multi-Band

Gn=Ln+EXPAND(Gn−1+Ln−1)

1. merge two image pyramid (both Ln & Gn) by linear blending

1. Input previous layer image from Gaussian Pyramid and Laplacian Pyramid

1. Upsample to expand image

1. Get the Multi-band image by using Laplacian Pyramid add expand image

1. repeat until first layer

Merge (Multi-Band)

Merge
(just put it together)

Linear Blending

Multi-Band Blending

Result