

Side Window Filtering

Paper Number : 5176

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Input



BOX

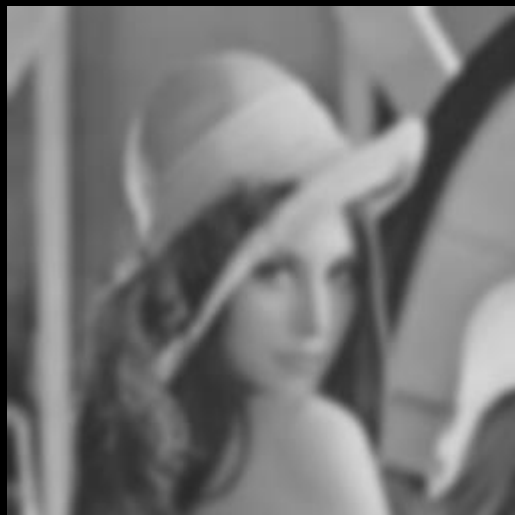


3x3, 10 iterations

Input



BOX



3x3, 10 iterations

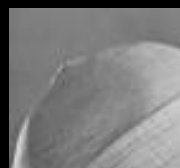
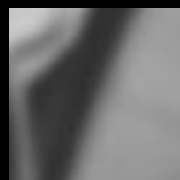
Input



SBOX



3x3, 10 iterations

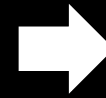
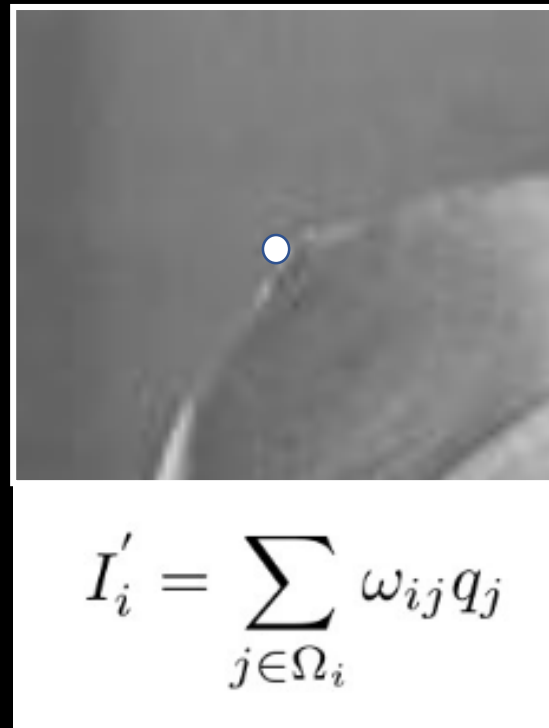


What does Traditional Filtering do?

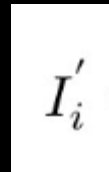
Step 1



Step 2

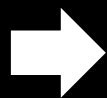
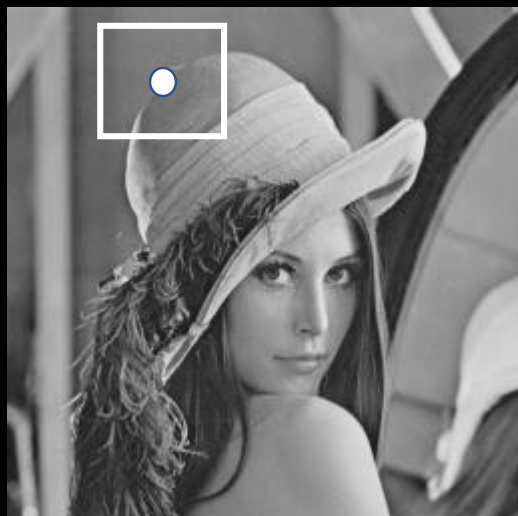


Step 3



What does Traditional Filtering do?

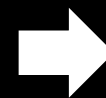
Step 1



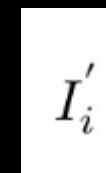
Step 2

$$I'_i = \sum_{j \in \Omega_i} \omega_{ij} q_j$$

Box filter
Gaussian filter
Guided filter
⋮

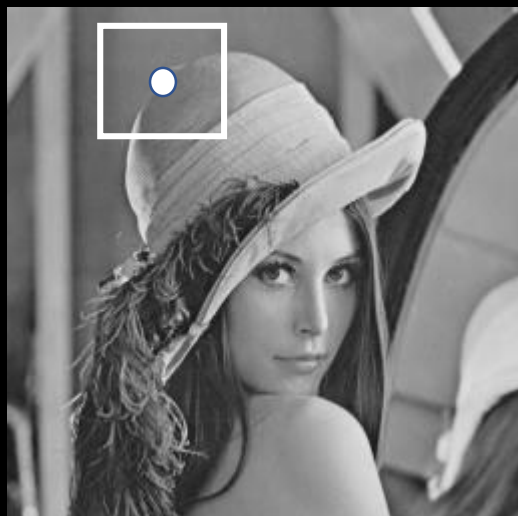


Step 3



What does Traditional Filtering do?

Step 1



Is this right?

Step 2

$$I'_i = \sum_{j \in \Omega_i} \omega_{ij} q_j$$

Box filter
Gaussian filter
Guided filter

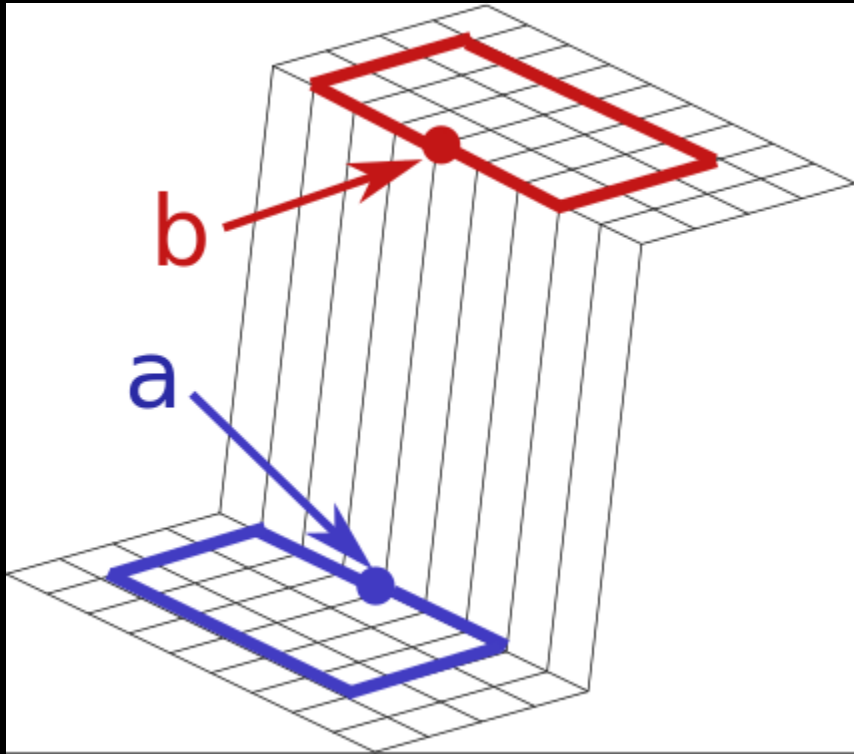
⋮

Step 3

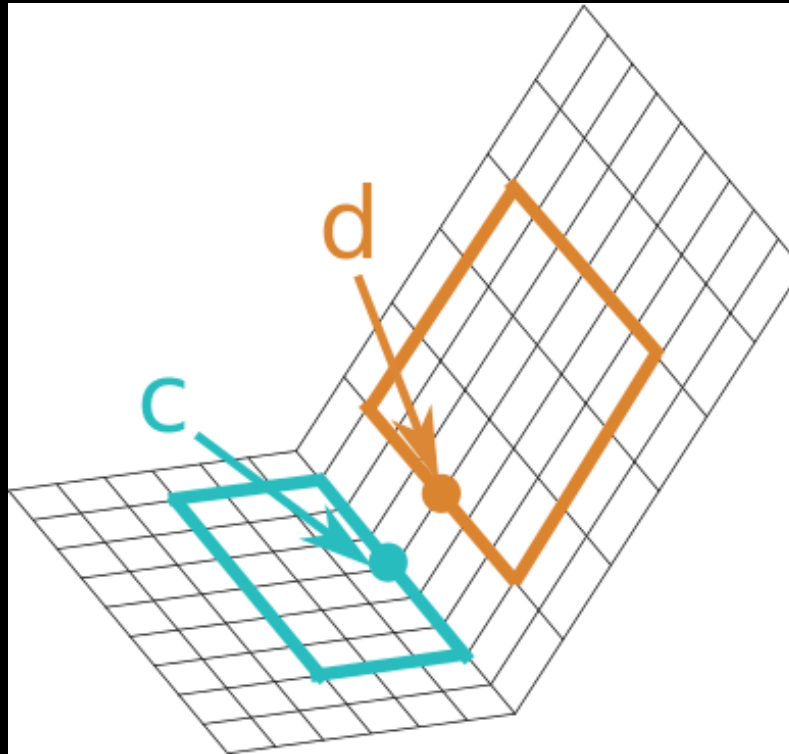
I'_i

Theoretical Analysis

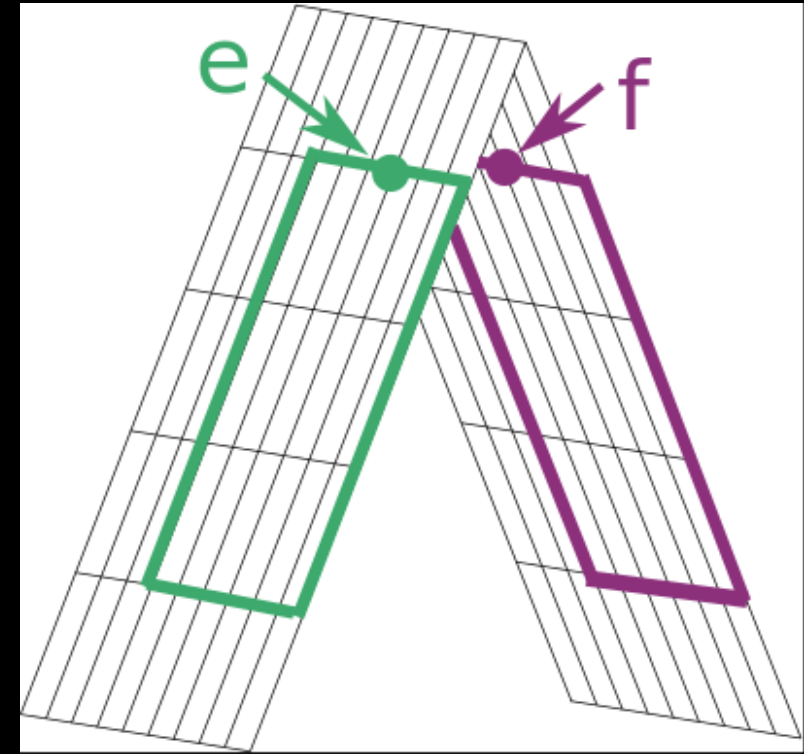
Step Edge



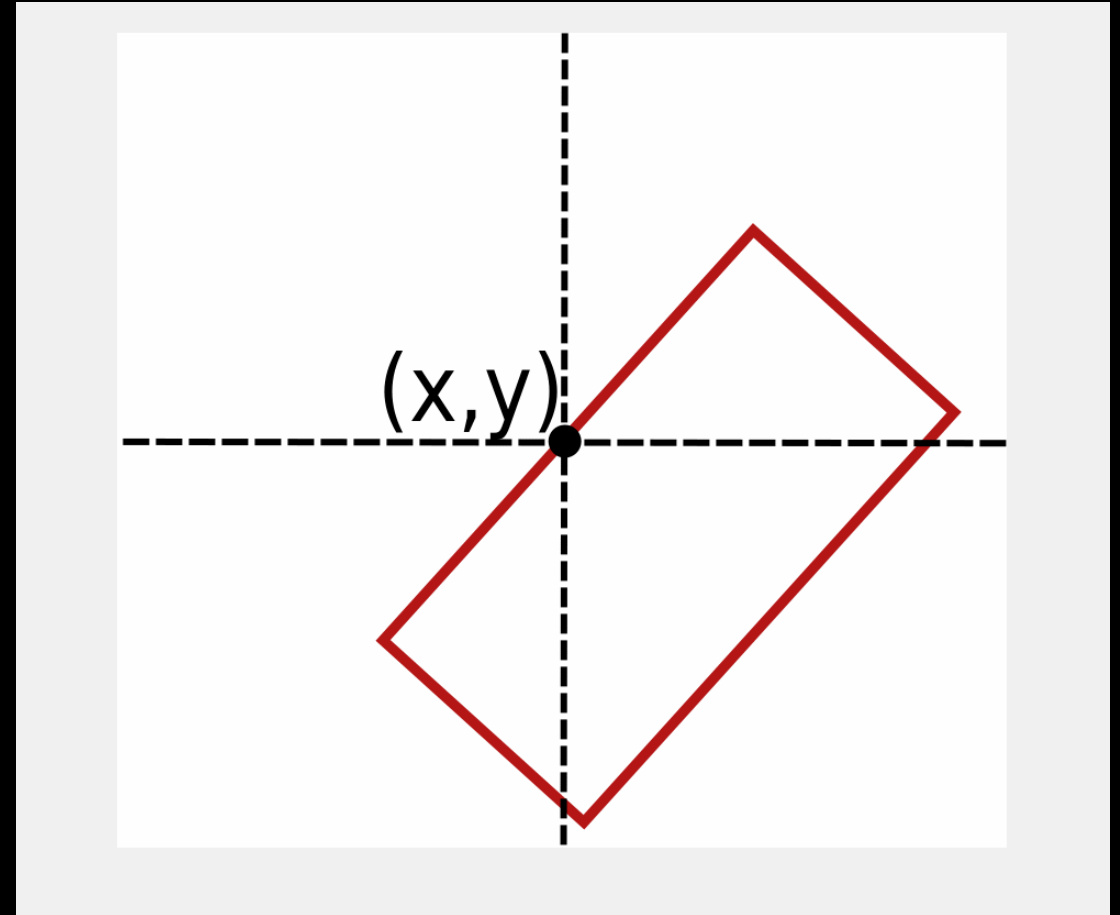
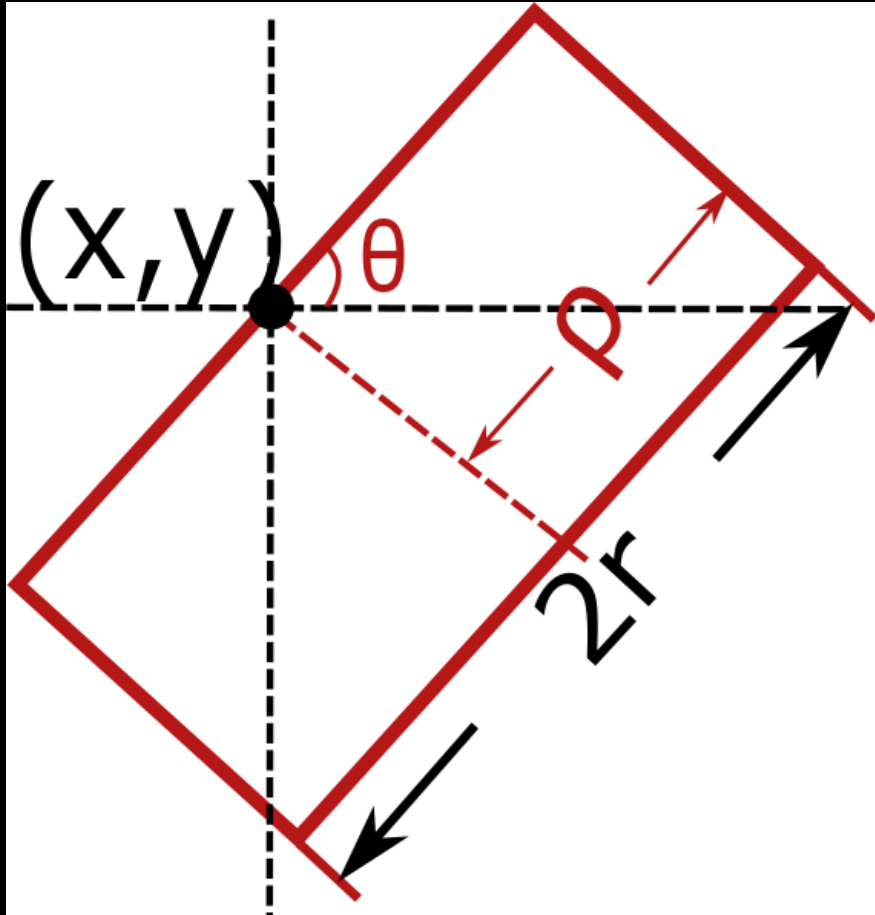
Ramp Edge



Roof Edge

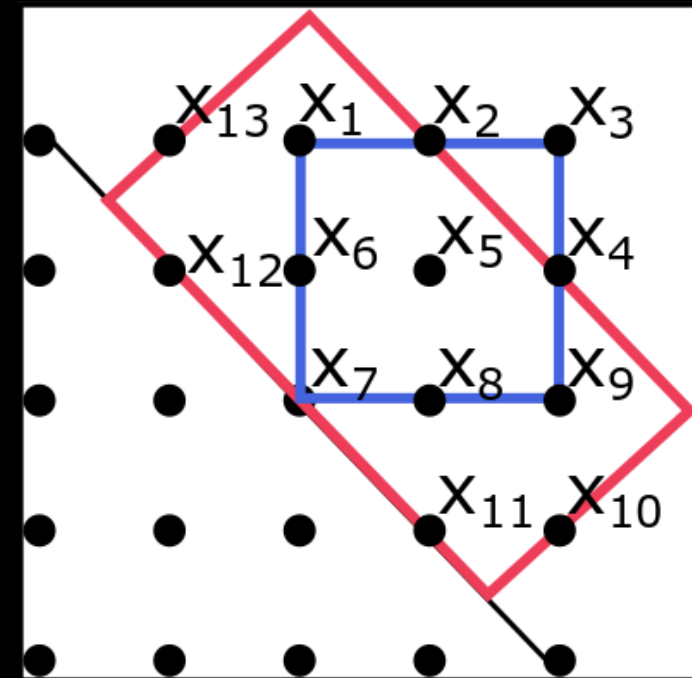
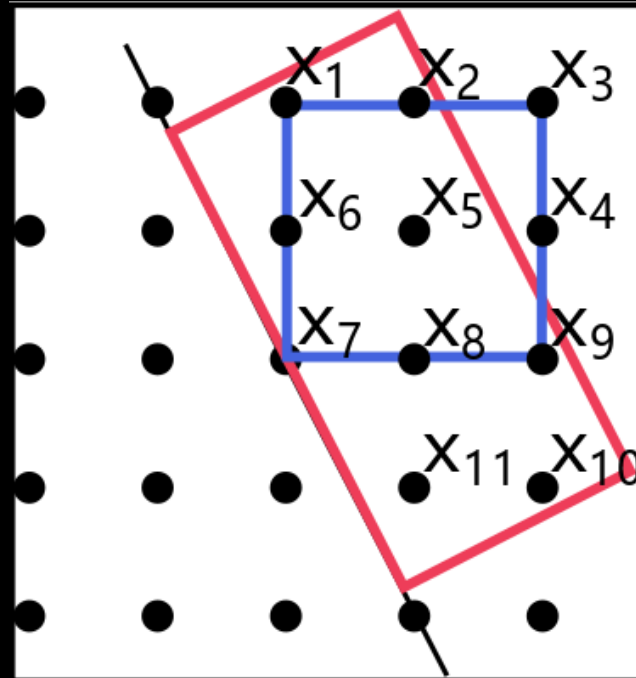


Side Window (optimal)

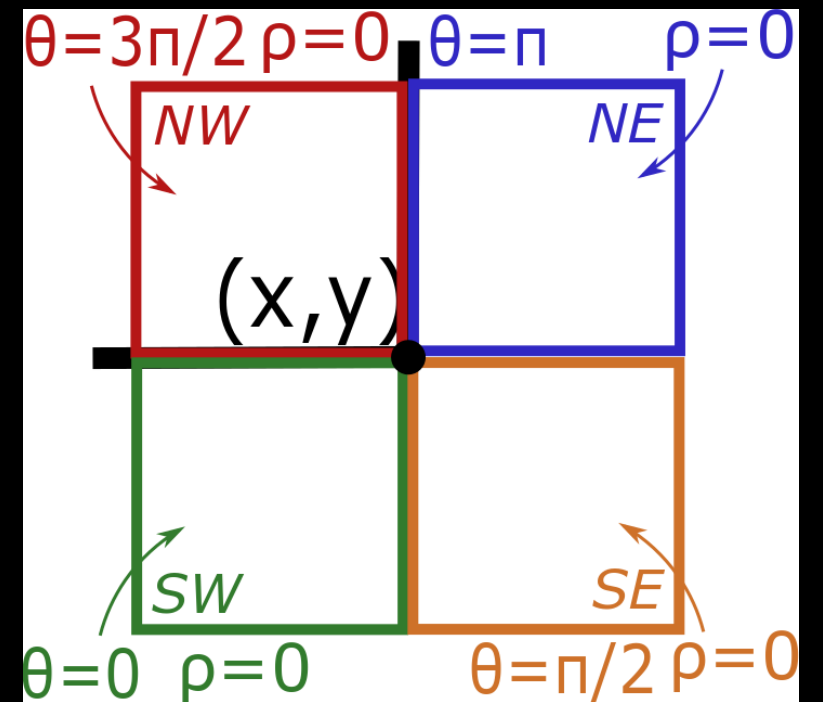
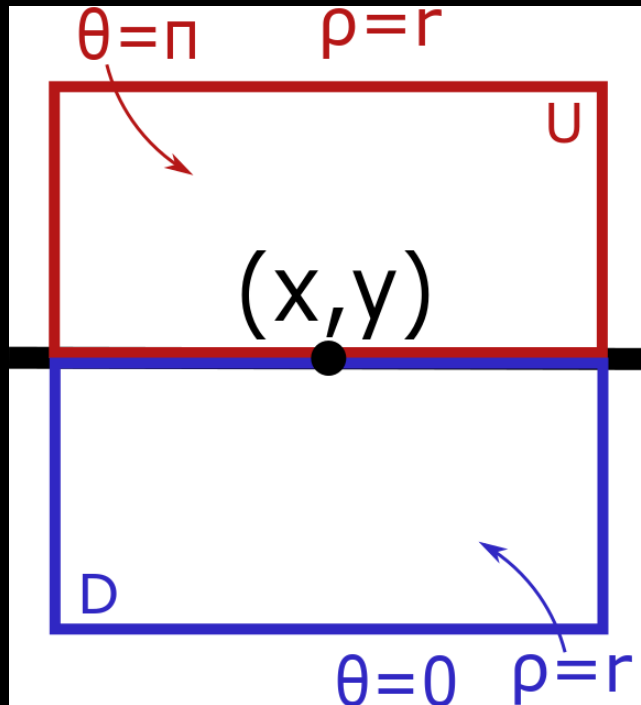
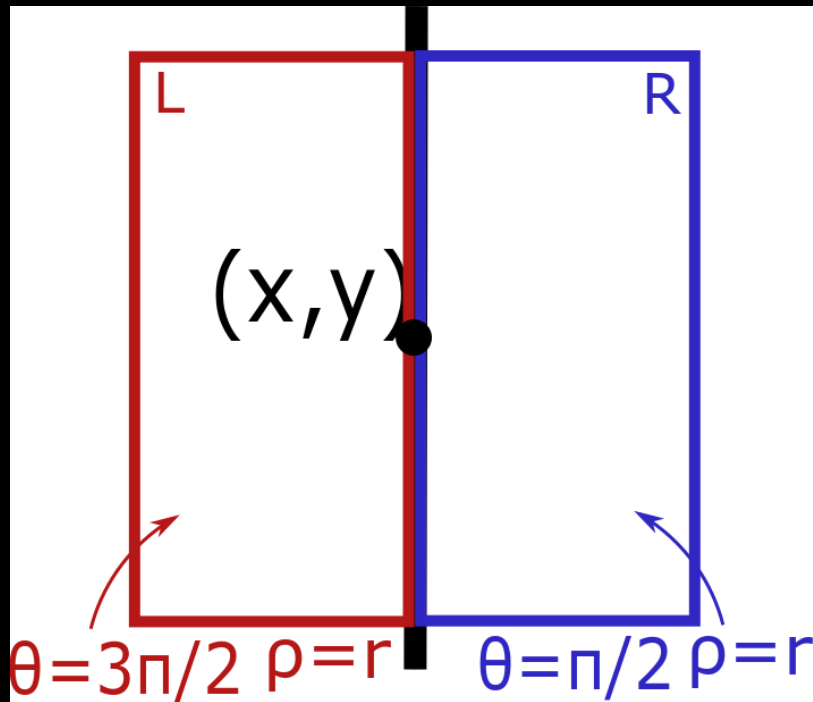


Side Window (optimal)

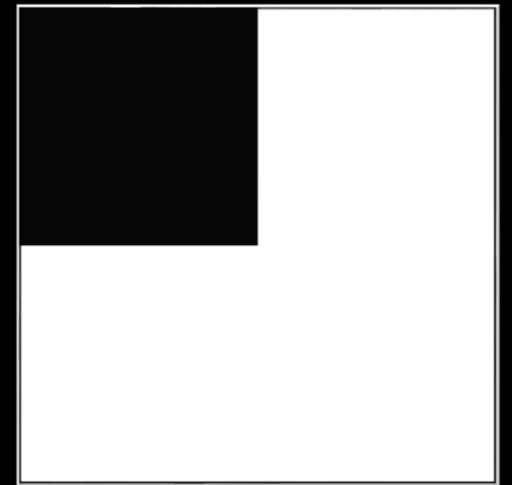
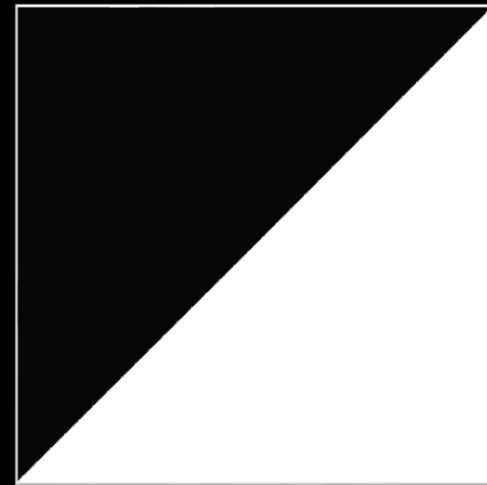
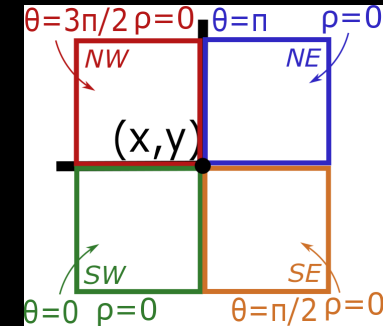
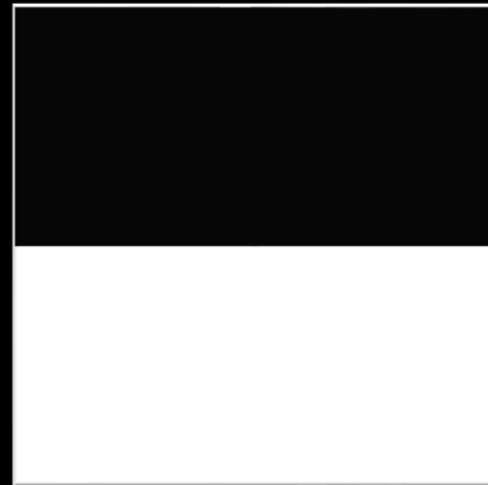
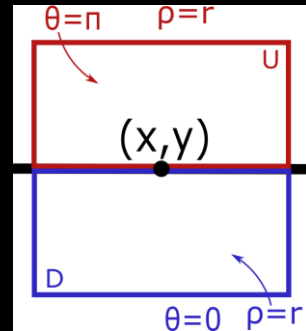
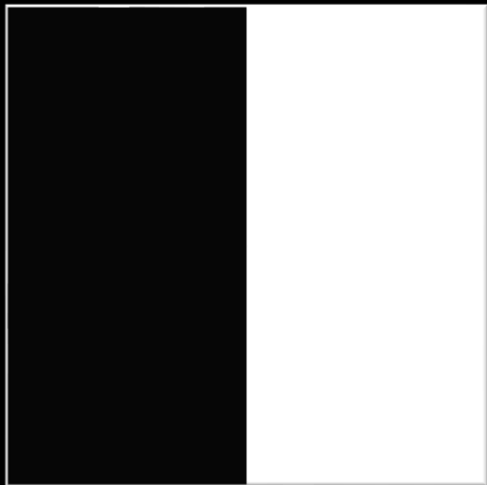
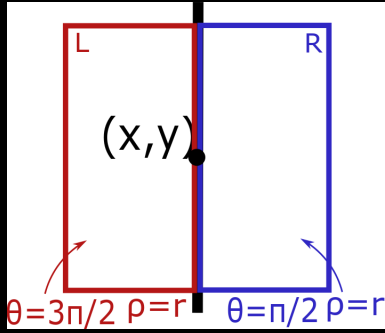
r	Window Size	Number of Side window
1	3x3	8
2	5x5	16
3	7x7	32



8 Side Windows



8 Side Windows



Side Window Filtering

Step 1



Step 2



$$I_i^{\theta, \rho, r} = F(q_i, \theta, \rho, r)$$

Step 3

$$I'_{SWF} = \underset{\forall I_i^{\theta, \rho, r}}{\operatorname{argmin}} \|q_i - I_i^{\theta, \rho, r}\|_2^2$$

Side Window Filtering

Step 1



Step 2

$$I_i'^{\theta, \rho, r} = F(q_i, \theta, \rho, r)$$

Box filter
Gaussian filter
Guided filter
Bilateral filter
Median filter
⋮

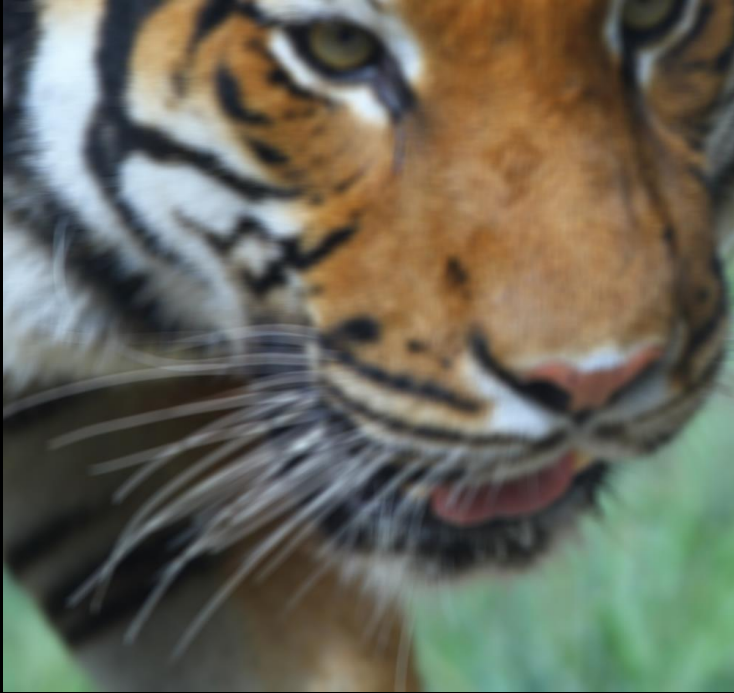
Step 3

$$I'_{SWF} = \underset{\forall I_i'^{\theta, \rho, r}}{\operatorname{argmin}} \|q_i - I_i'^{\theta, \rho, r}\|_2^2$$

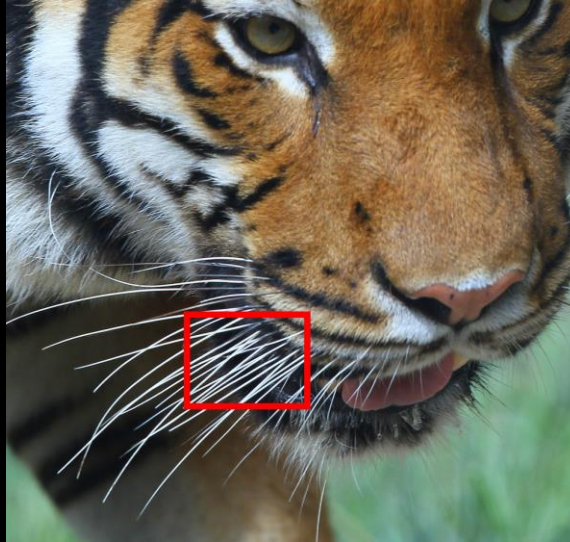
SBOX
SGAU
SGUI
SBIL
SMED
⋮

Application-Image Smoothing

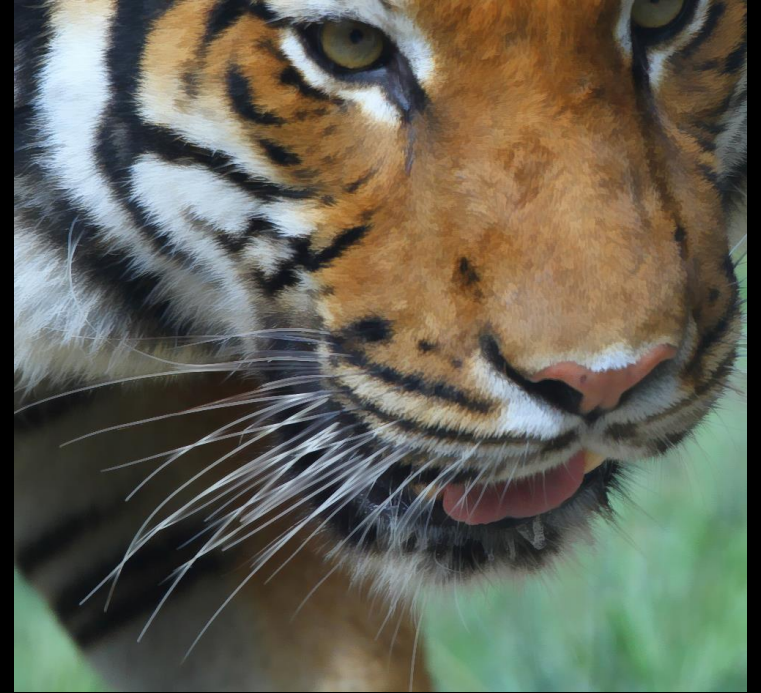
BOX



Input



SBOX

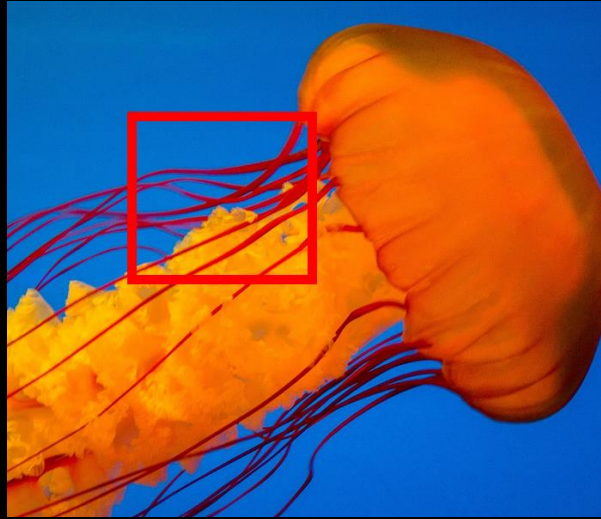


Application-Image Smoothing

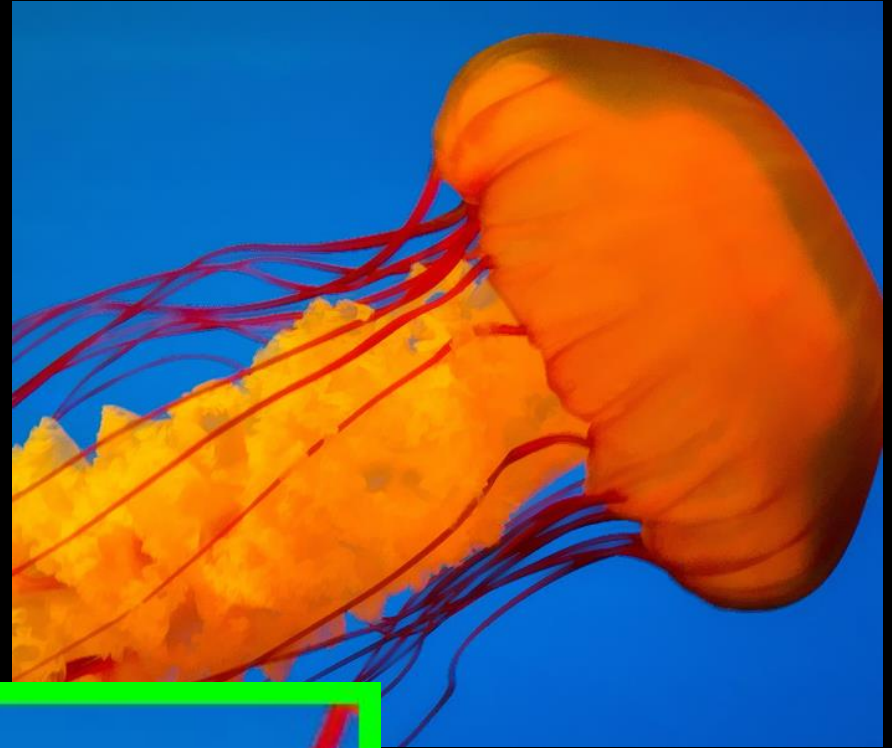
GAU



Input



SGAU

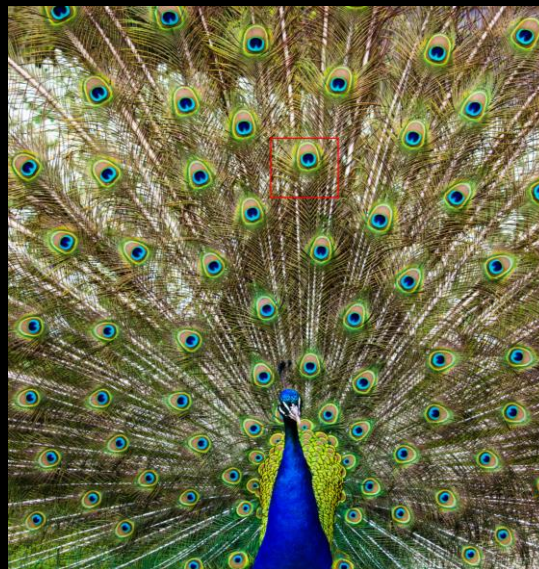


Application-Image Smoothing

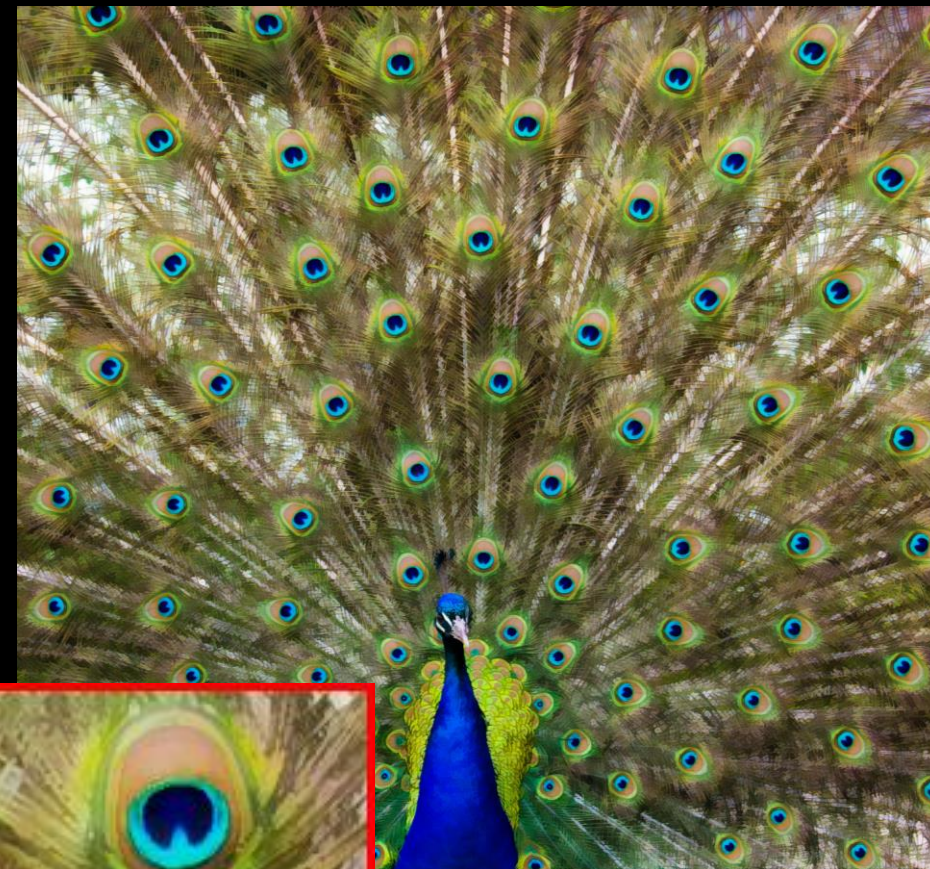
MED



Input

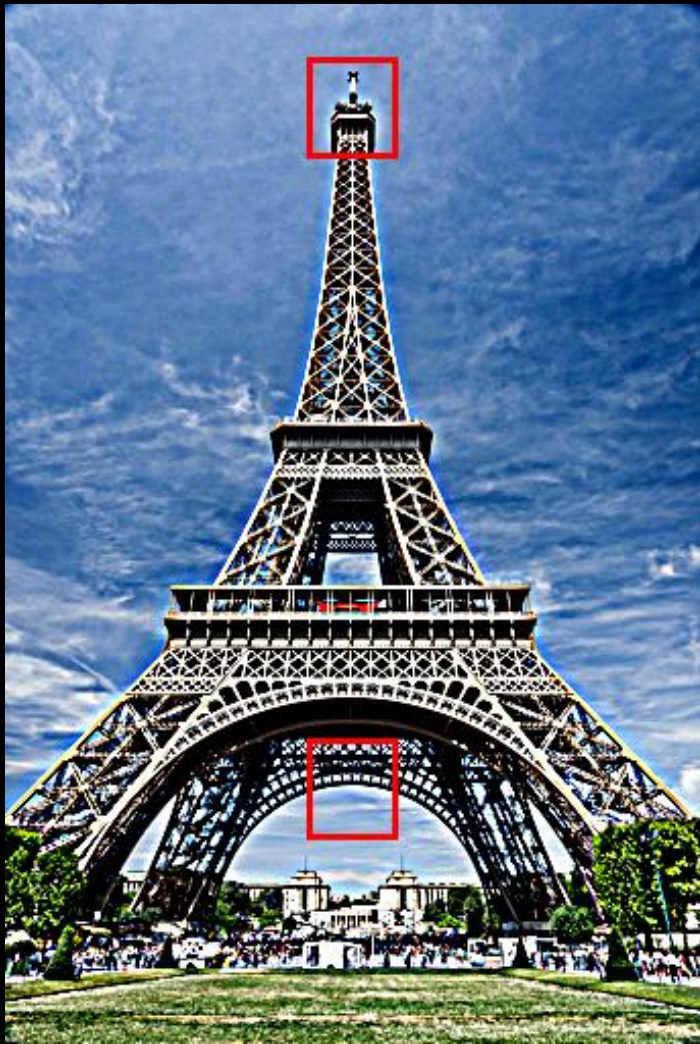


SMED

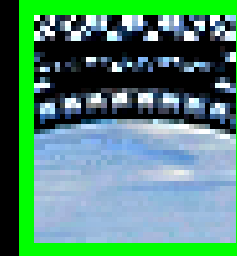
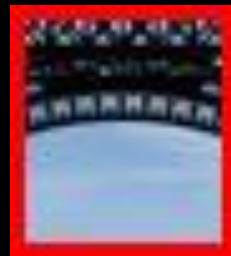
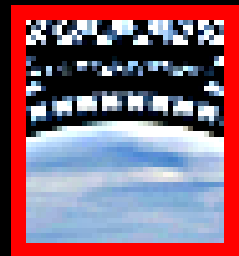
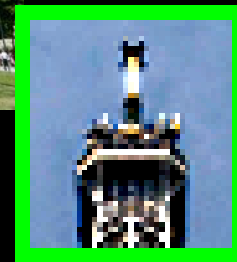
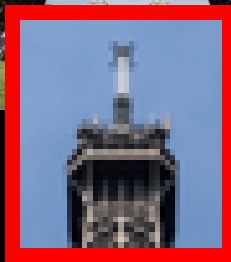
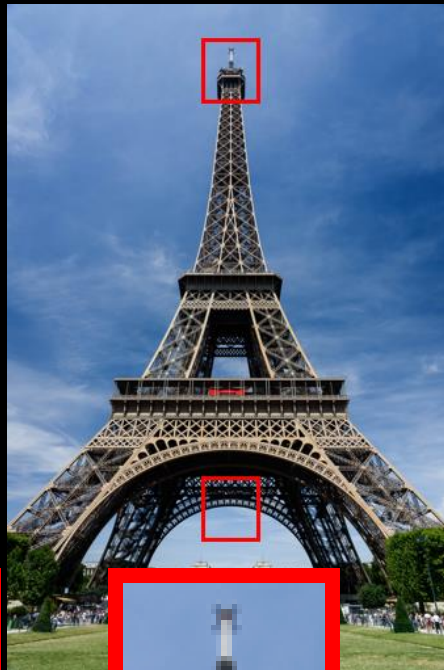


Application-Image Enhancement

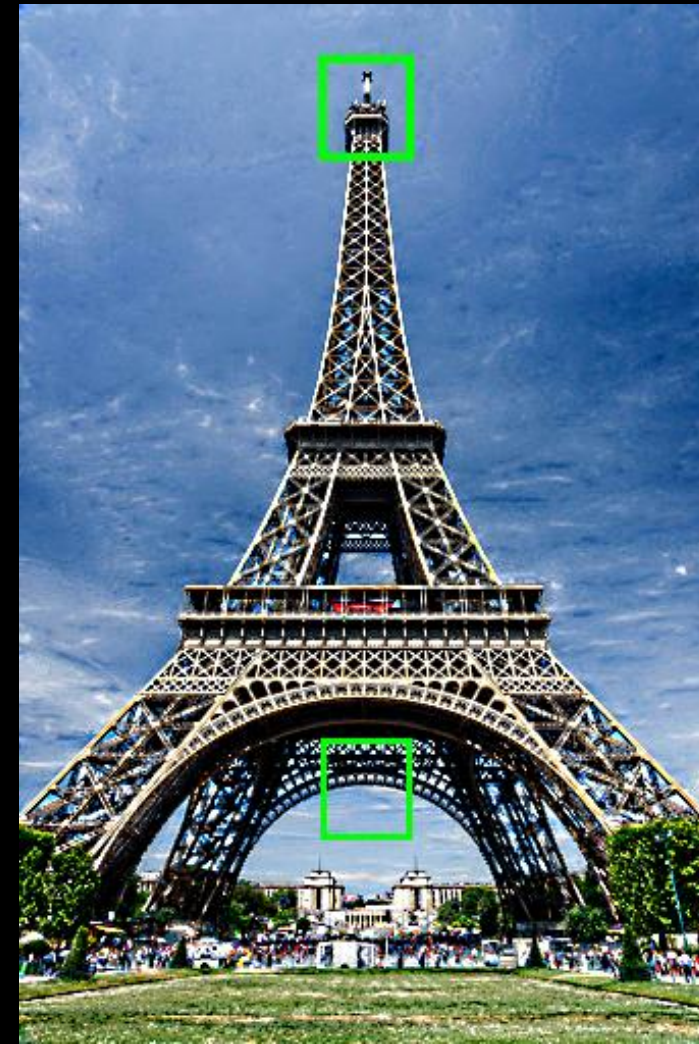
BIL



Input



SBIL

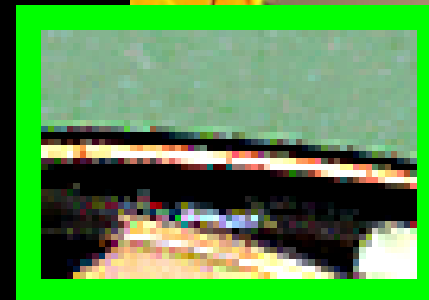
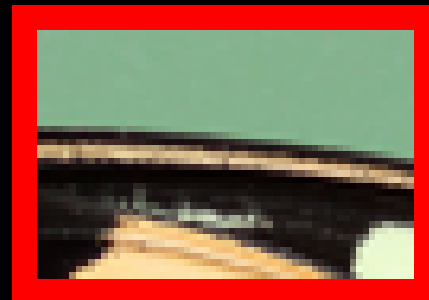


Application-Image Enhancement

GUI

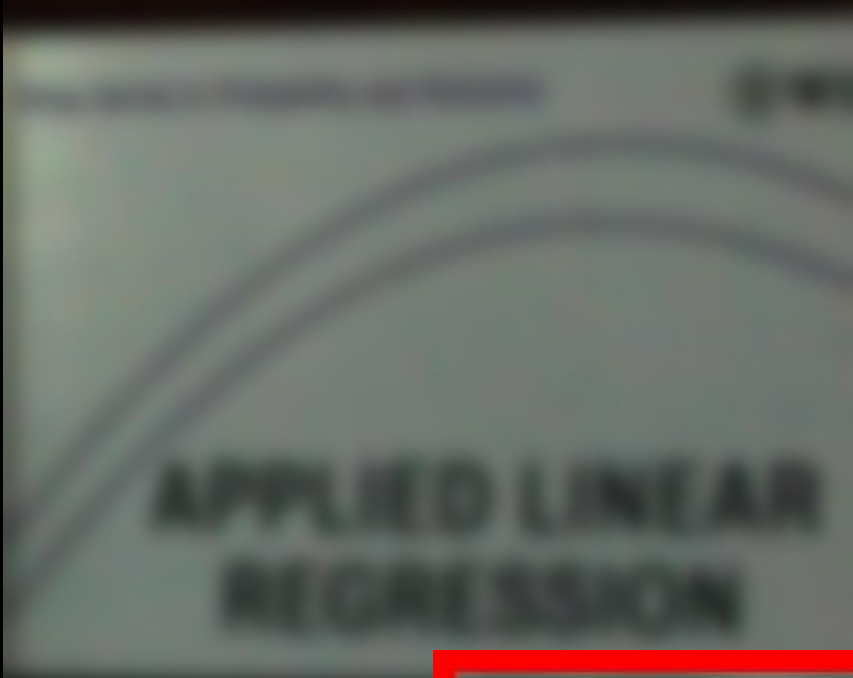
Input

SGUI

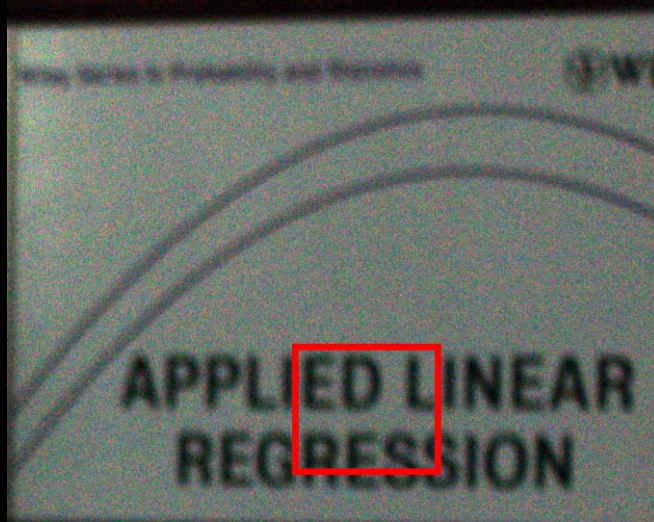


Application-Image Denoising

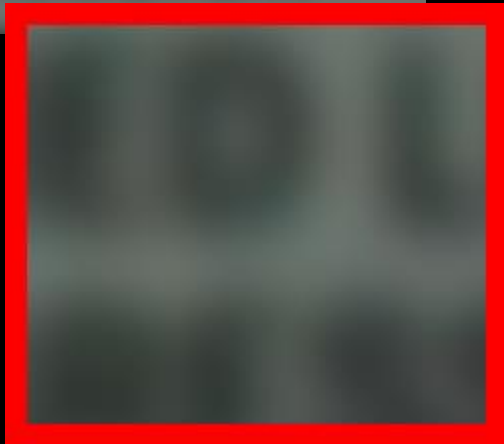
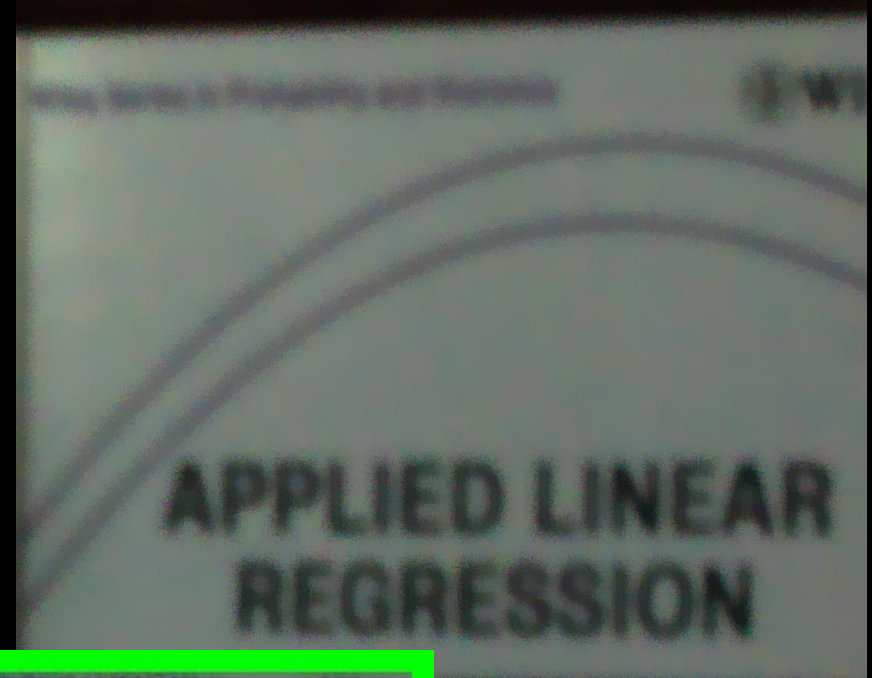
BOX



Input



SBOX

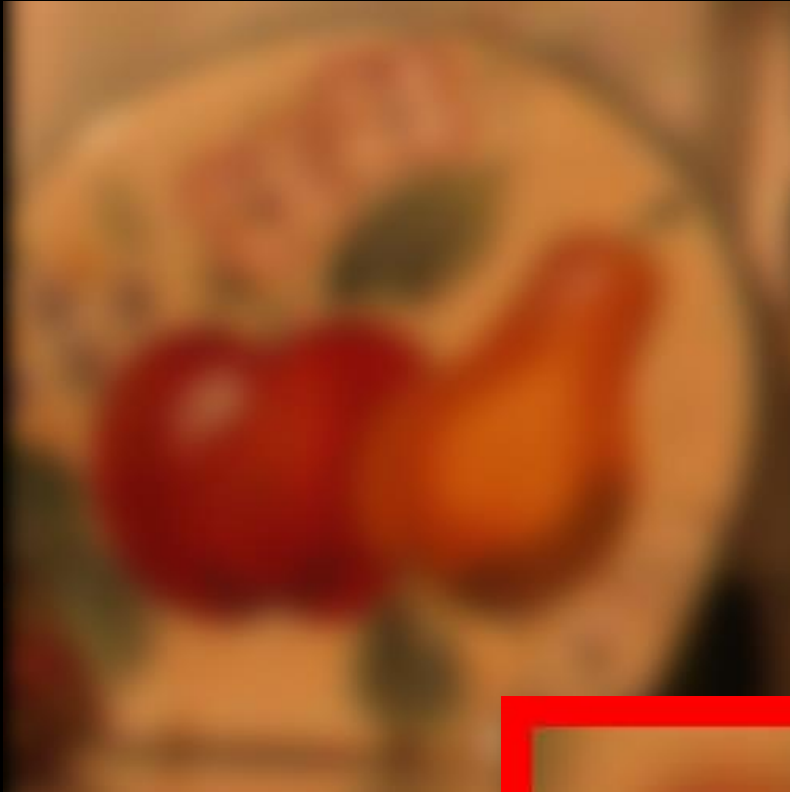


Application-Image Denoising

GAU

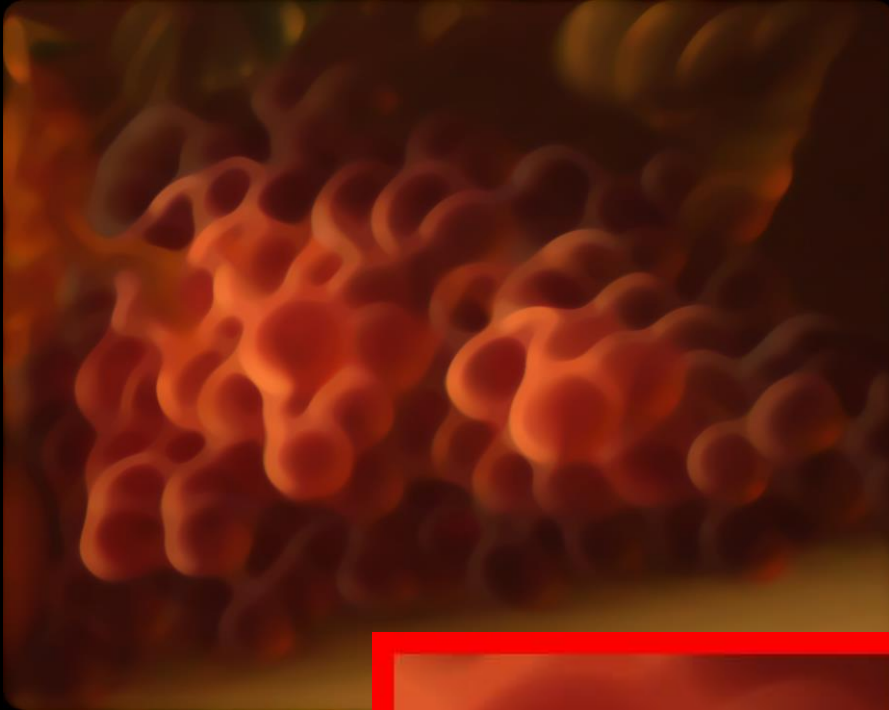
Input

SGAU



Application-Image Denoising

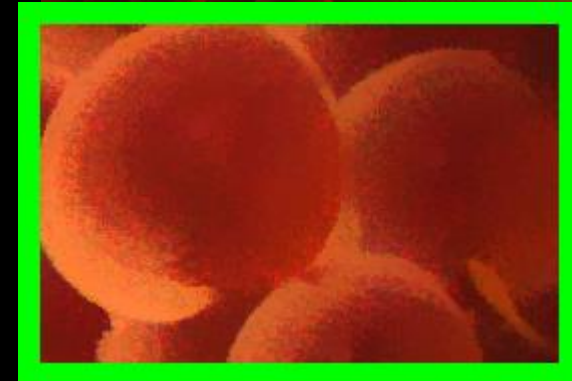
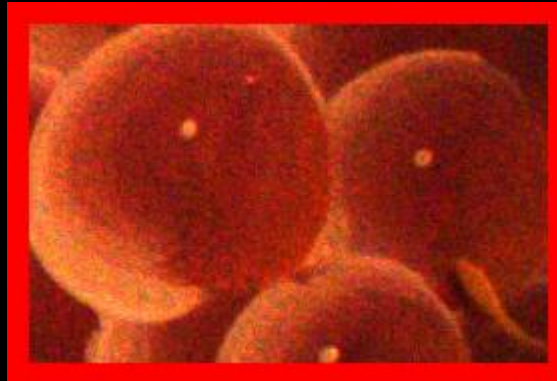
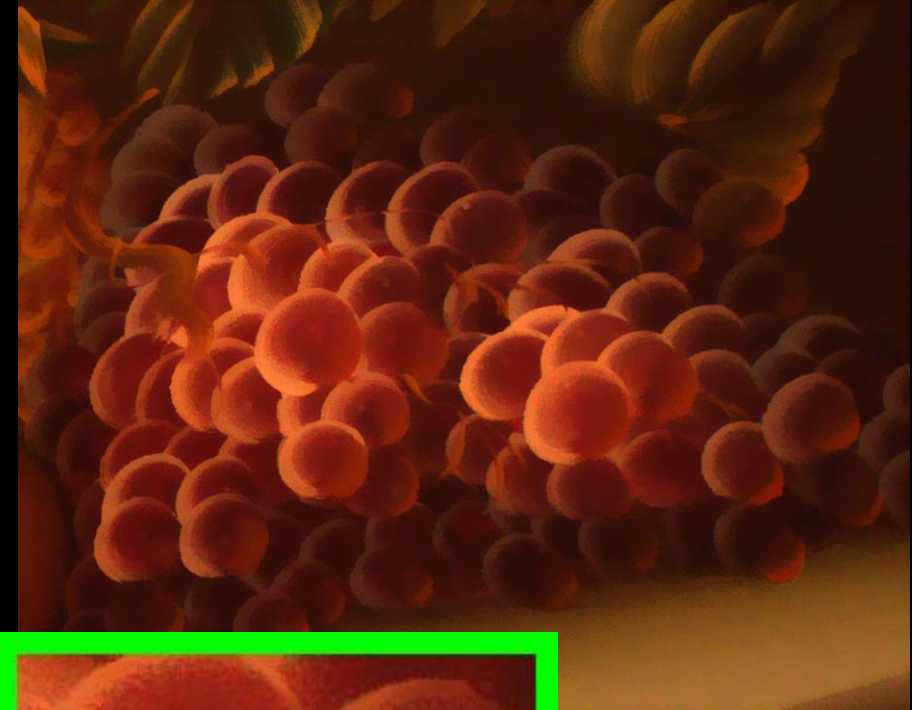
MED



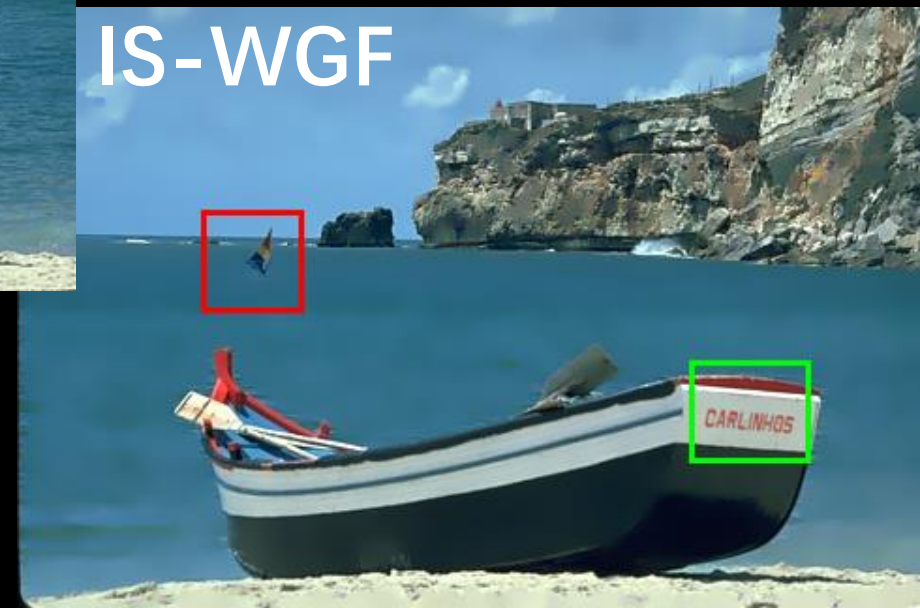
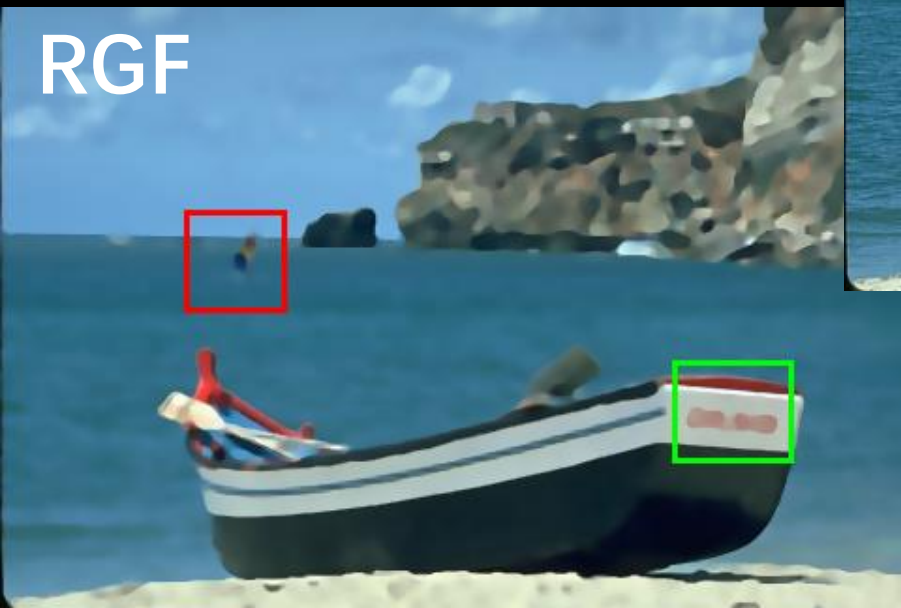
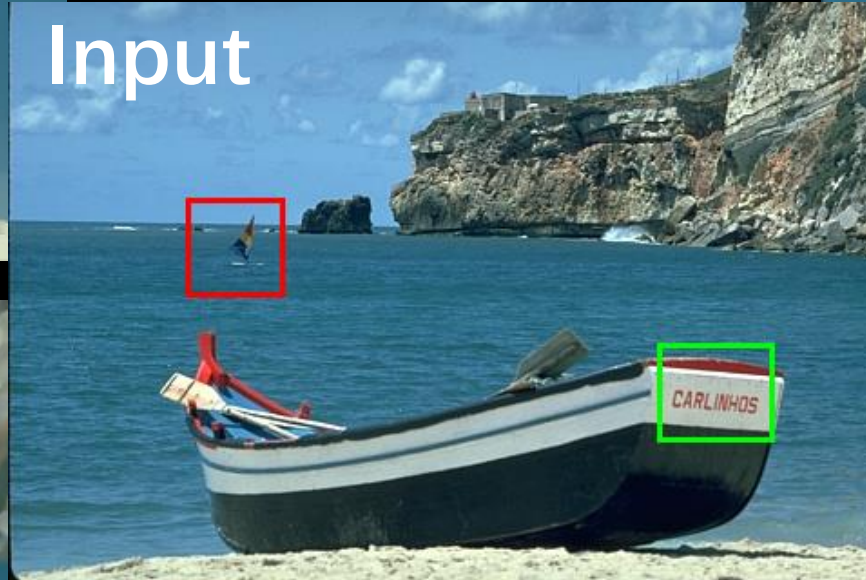
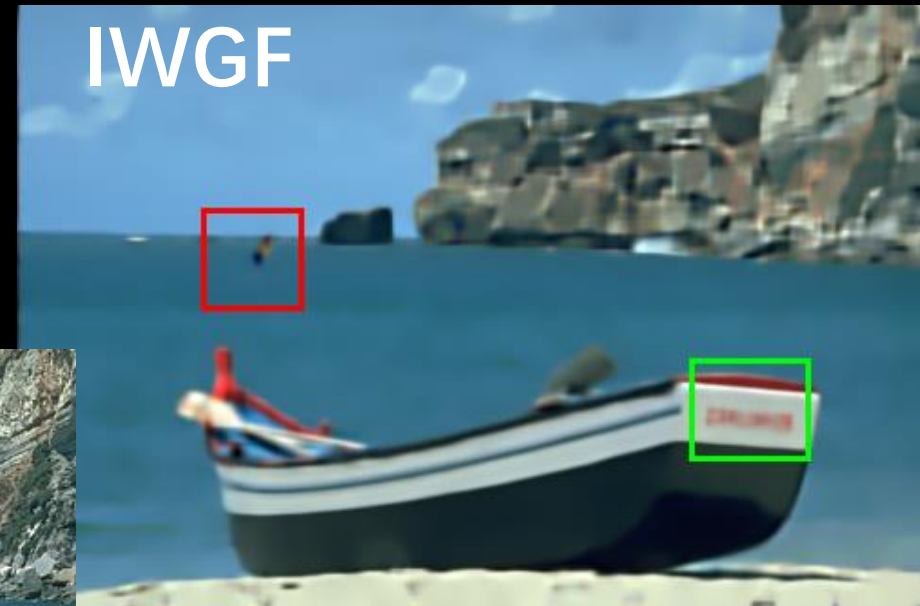
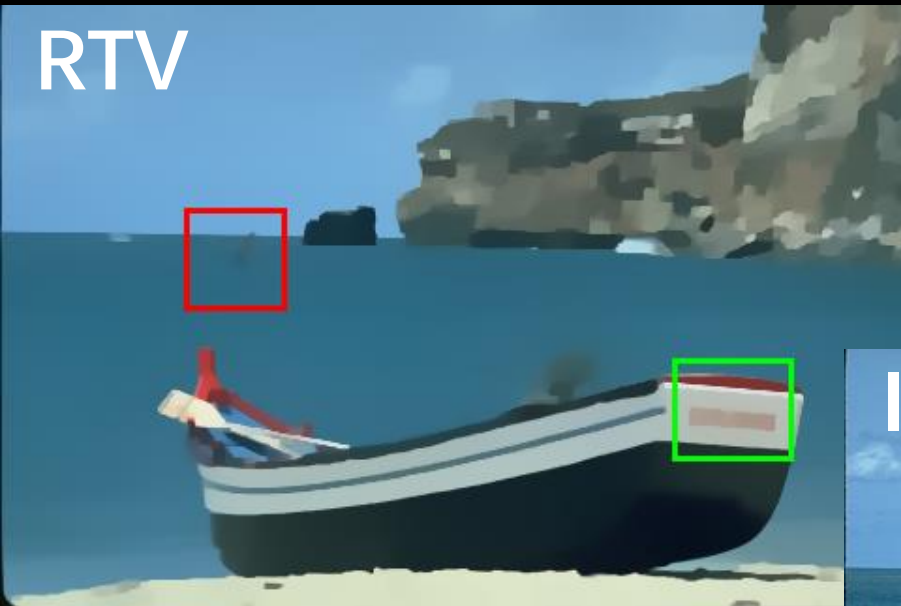
Input



SMED



Application-Texture Removing

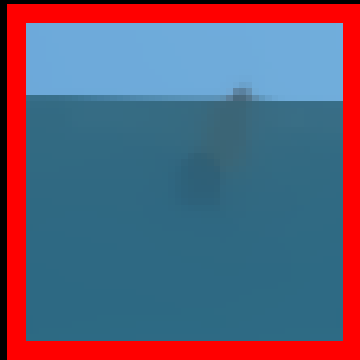


Application-Texture Removing

Input



RTV



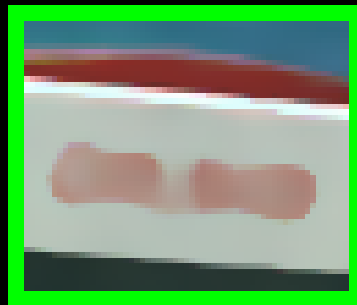
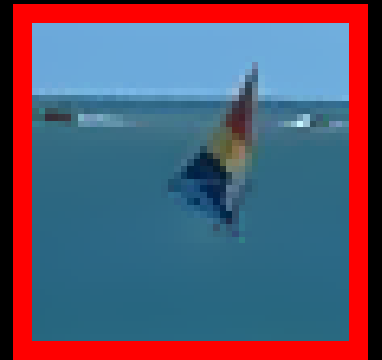
RGF



IWGF

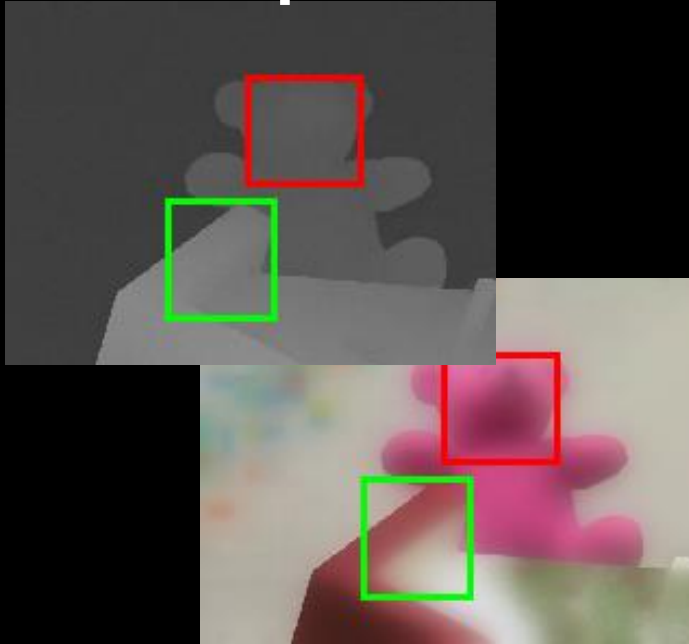


IS-WGF

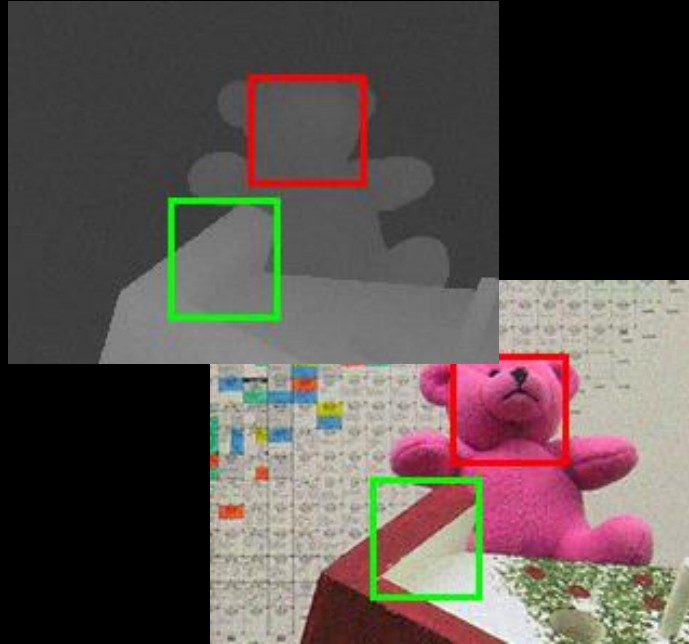


Application-Mutual Structure Extraction

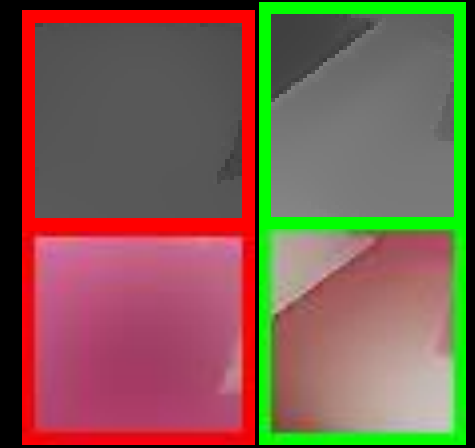
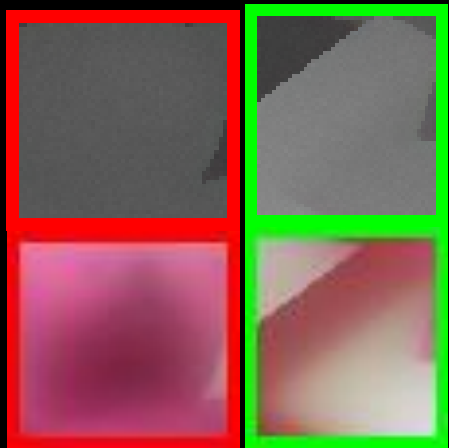
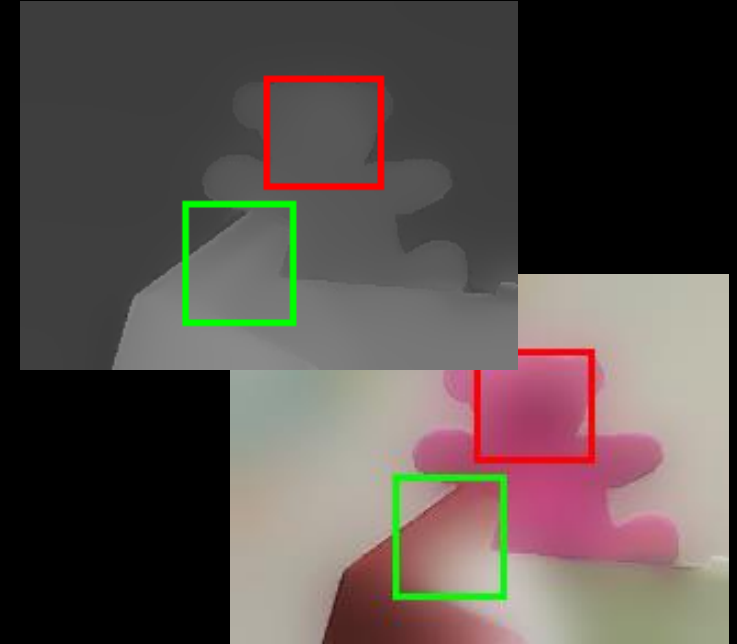
Input



MJF



MS-WGF

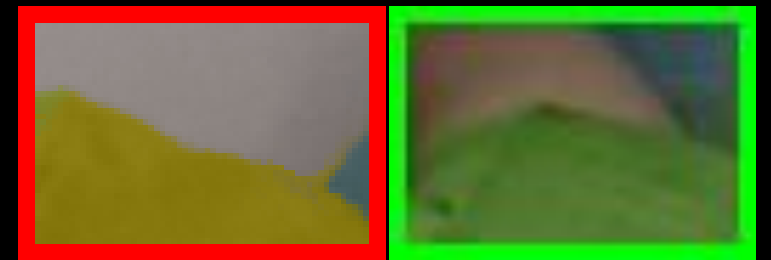
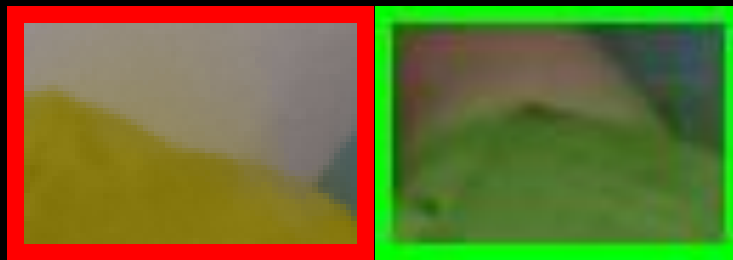
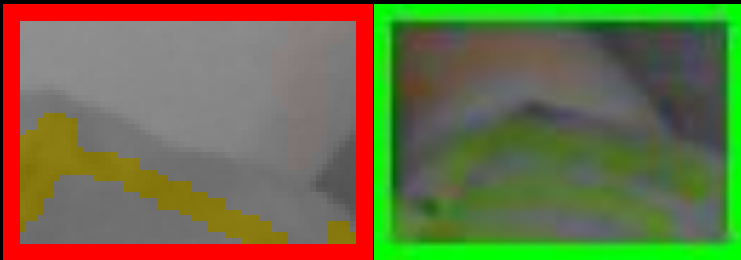
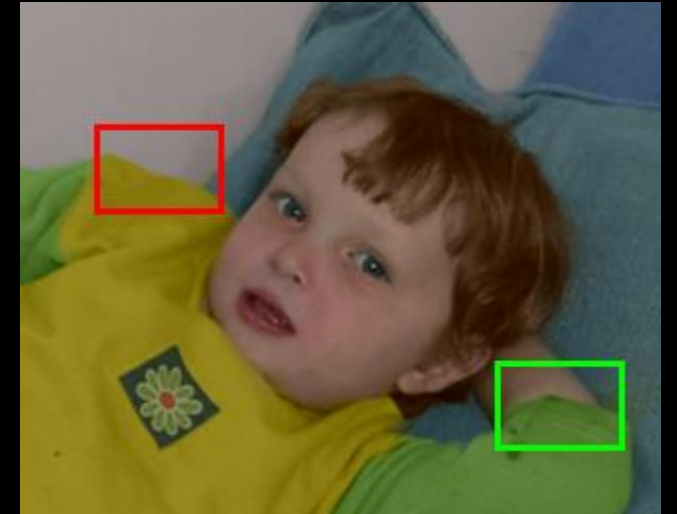
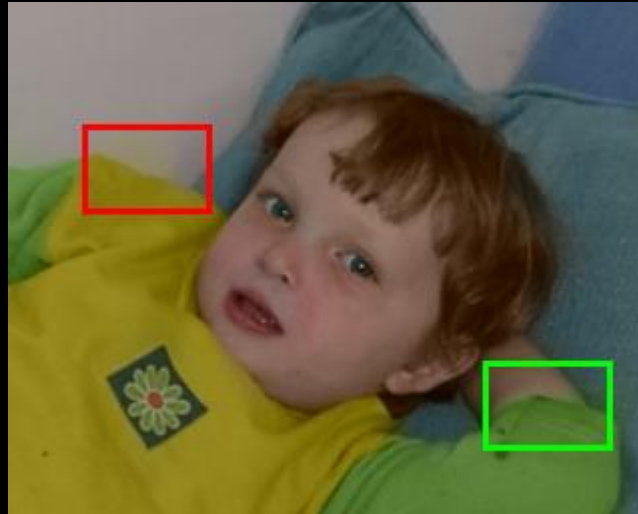
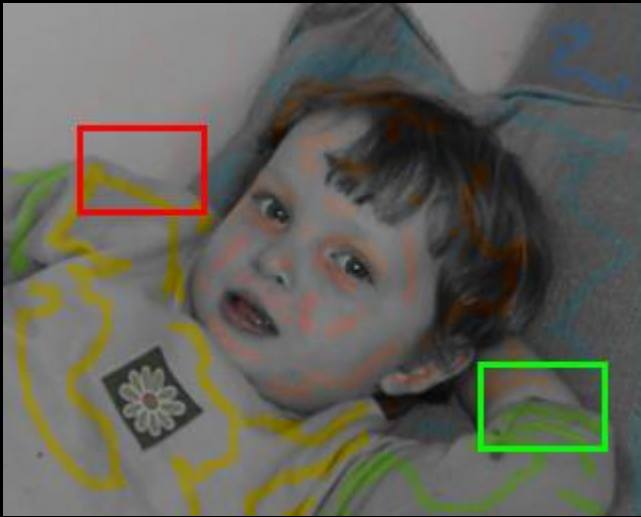


Application-Colorization

Input

[14]

Ours



THANK YOU

Paper Number : 5176