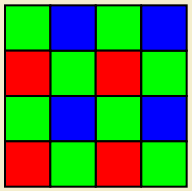
# Introduction to Demosaicking of Bayer sampled color images

Slides from: Prof. Eric Dubois, Univ. of Ottawa

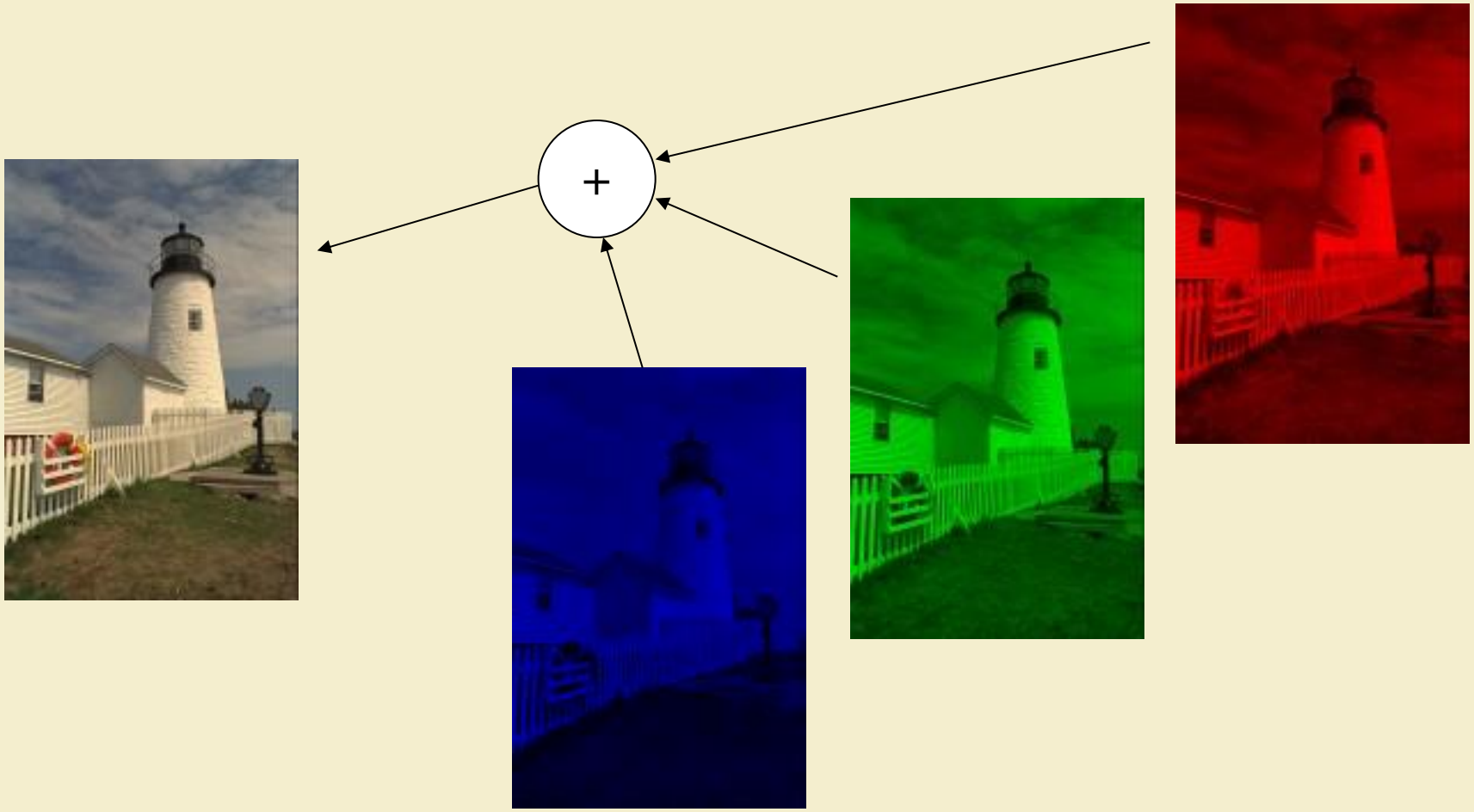
# Problem Statement

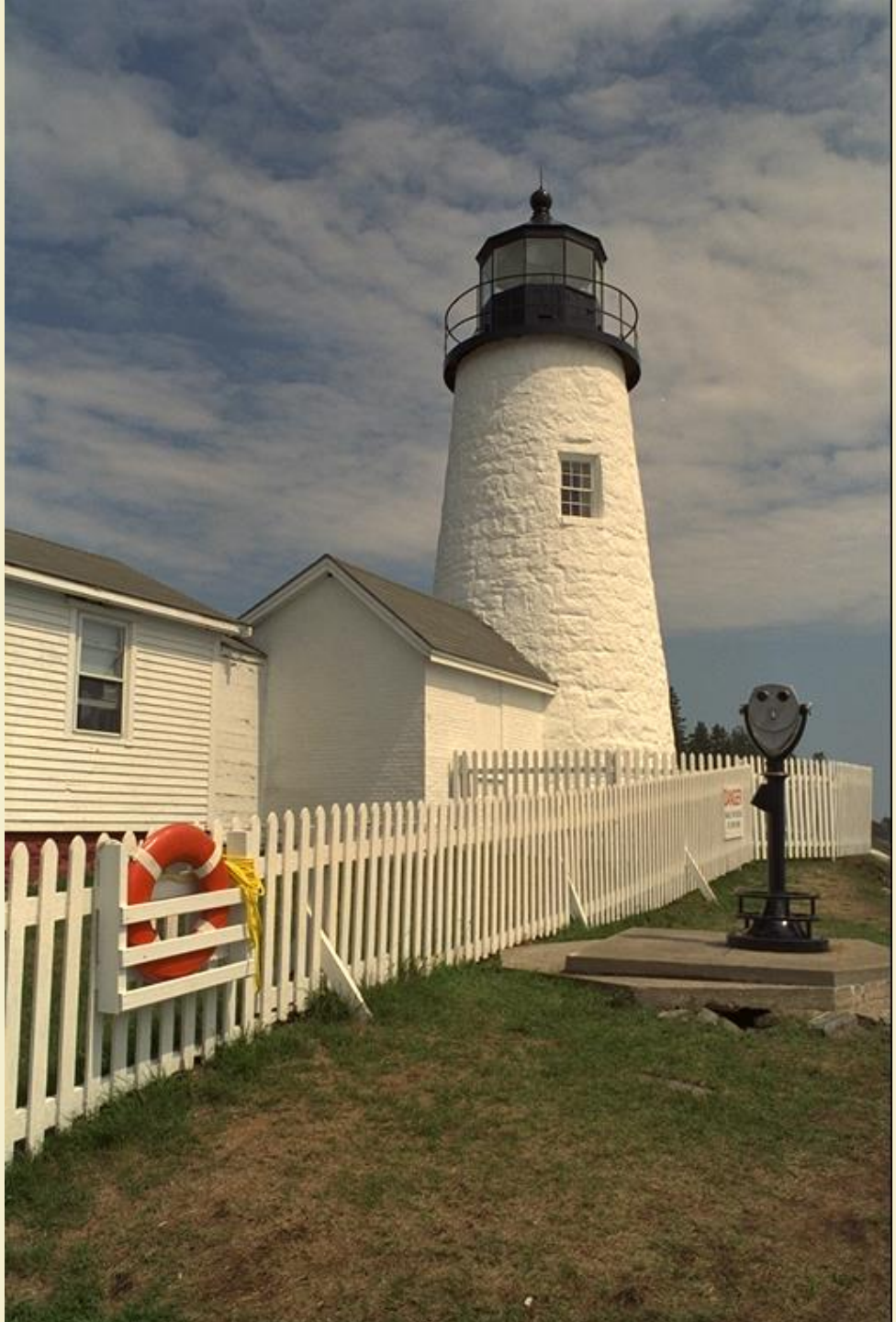
- ***Problem***: Most digital color cameras capture only one color component at each spatial location. The remaining components must be reconstructed by interpolation from the captured samples. Cameras provide hardware or software to do this, but the quality may be inadequate.



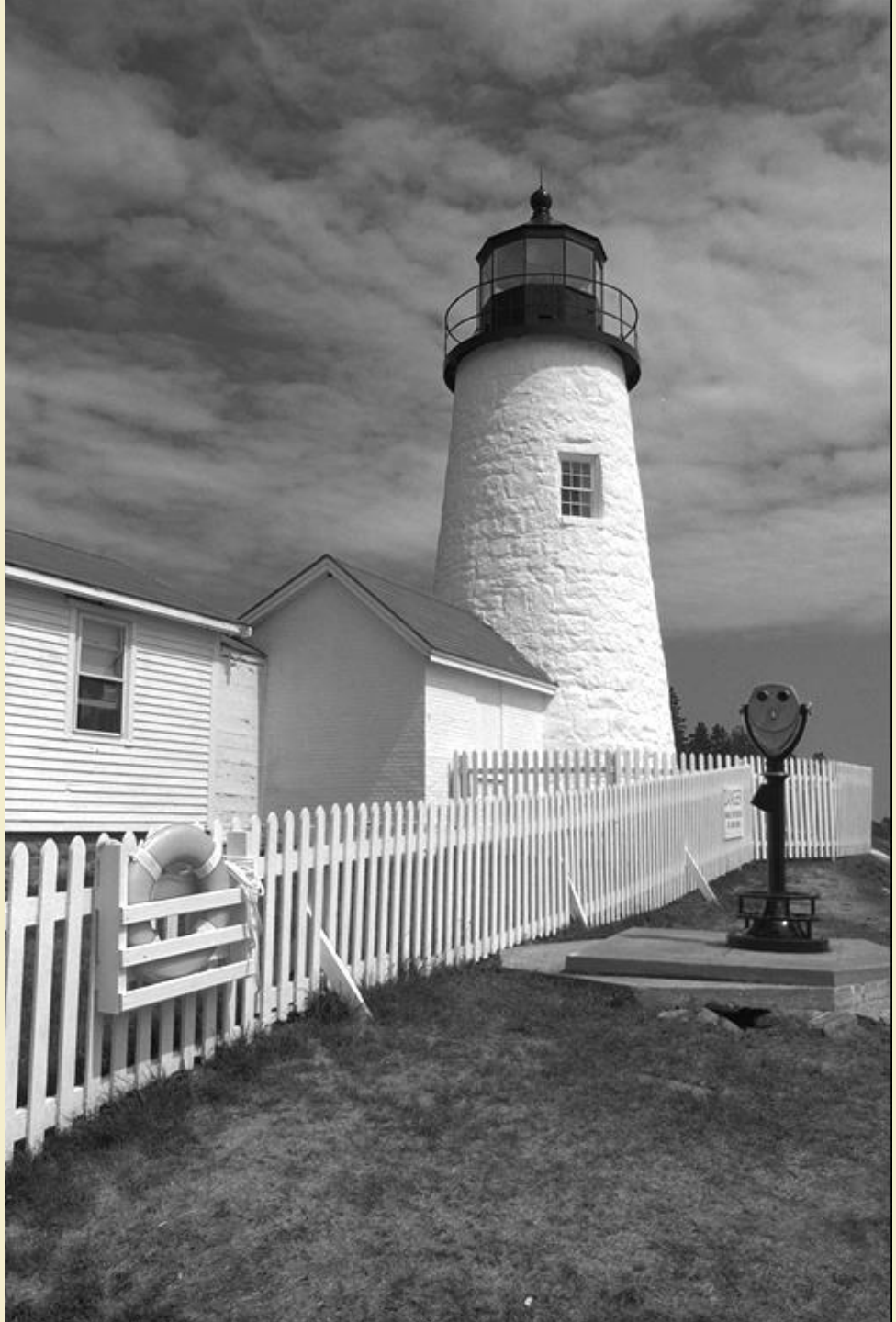
- ***Objective***: Develop new algorithms to interpolate each color plane (called demosaicking) with better quality reconstruction, and with minimal computational complexity.

# Construction of color image from color planes

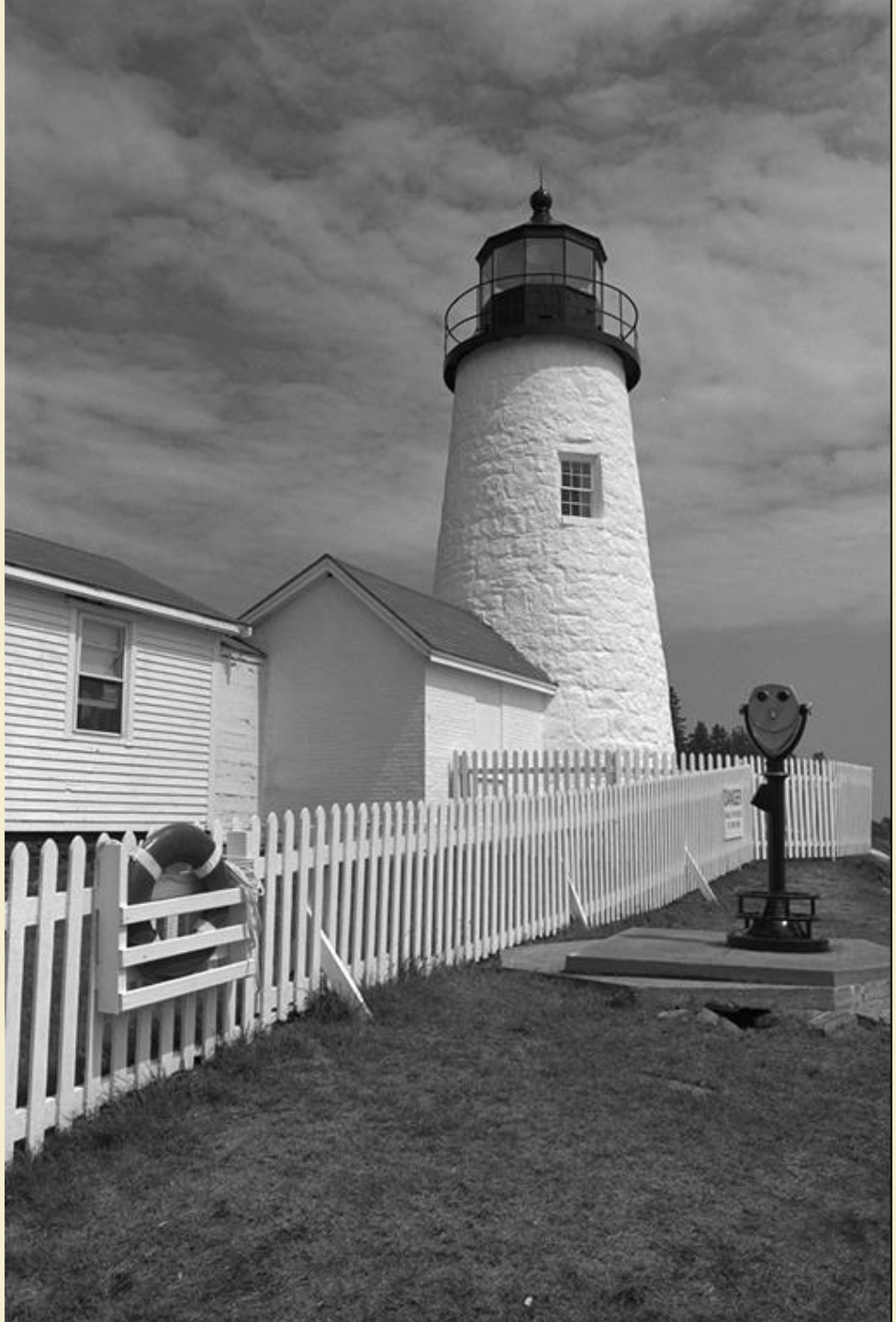




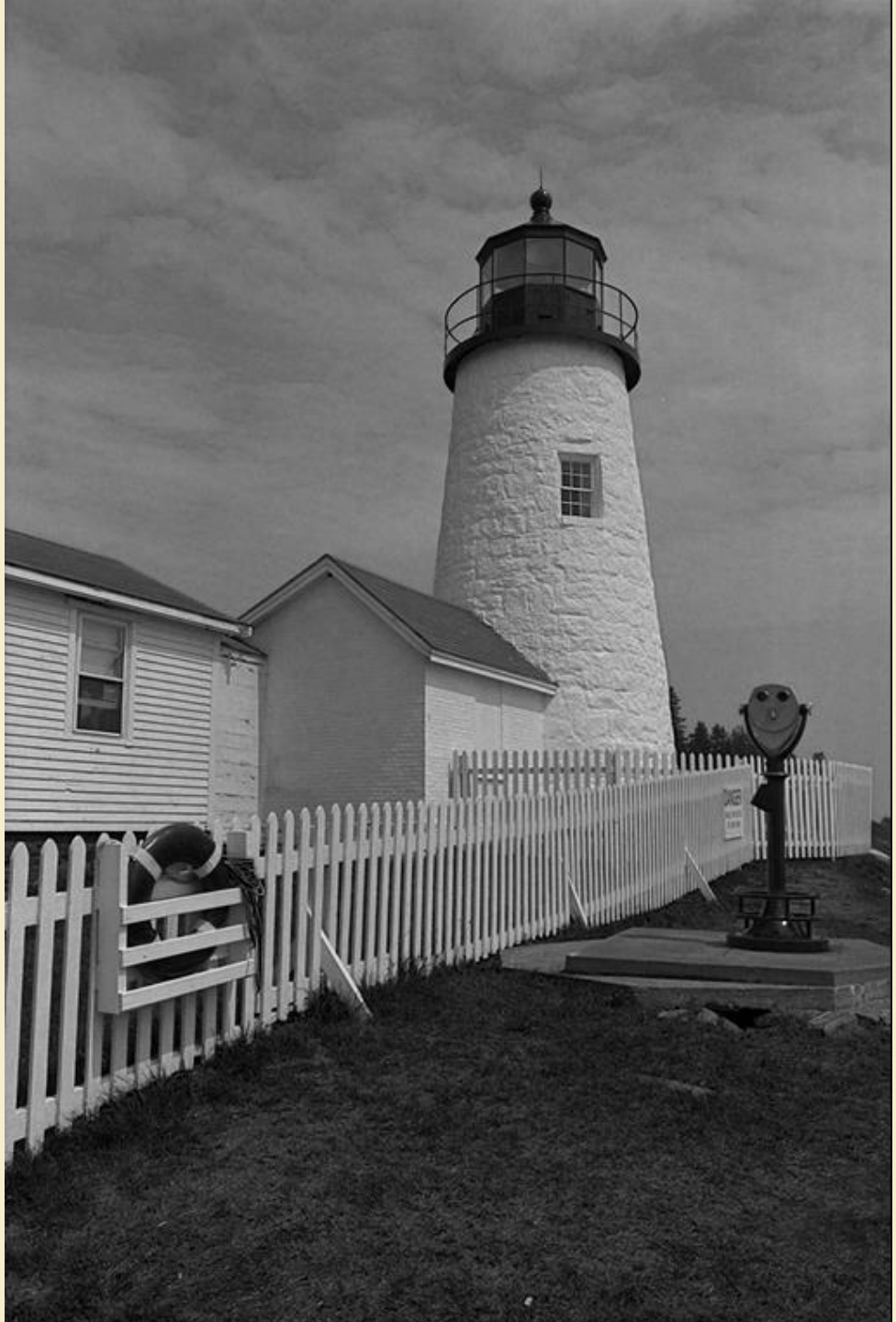
**Lighthouse original**



**Lighthouse**
**red original**

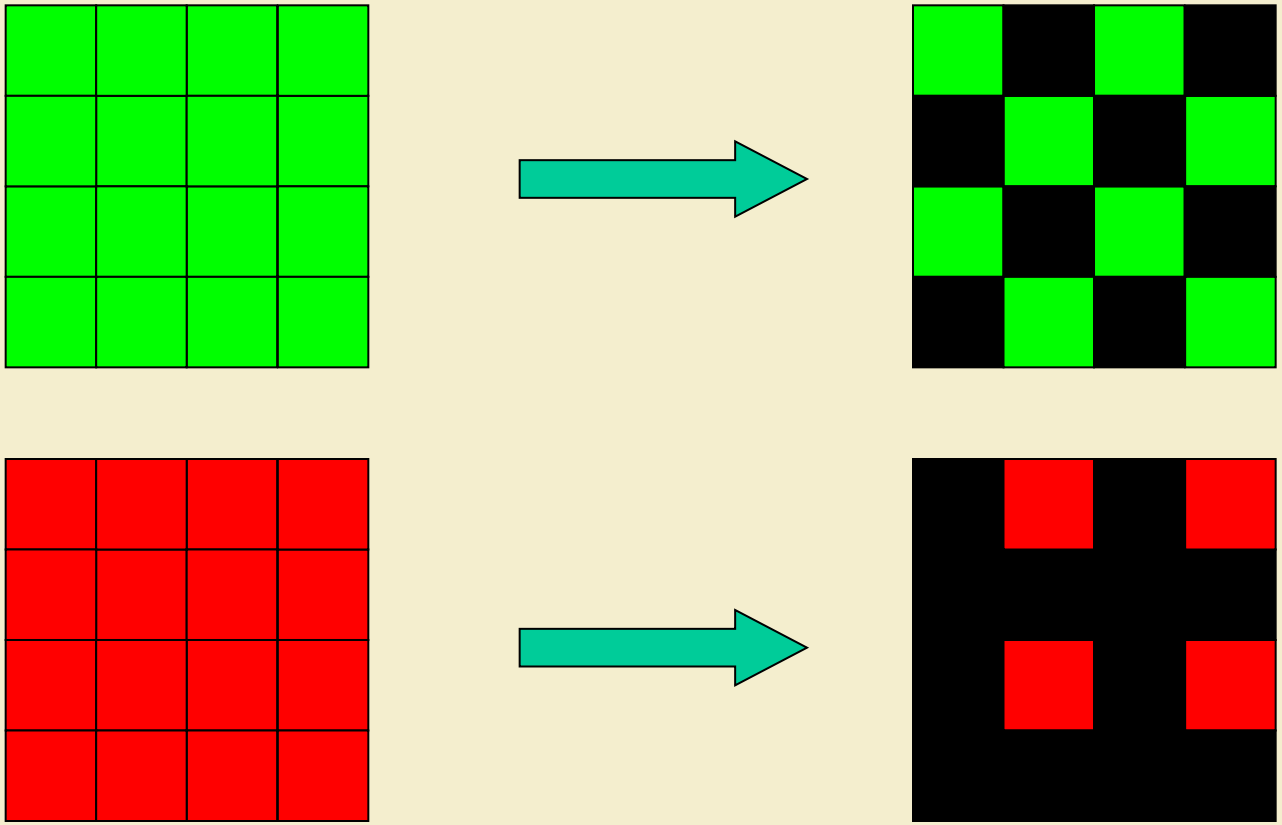


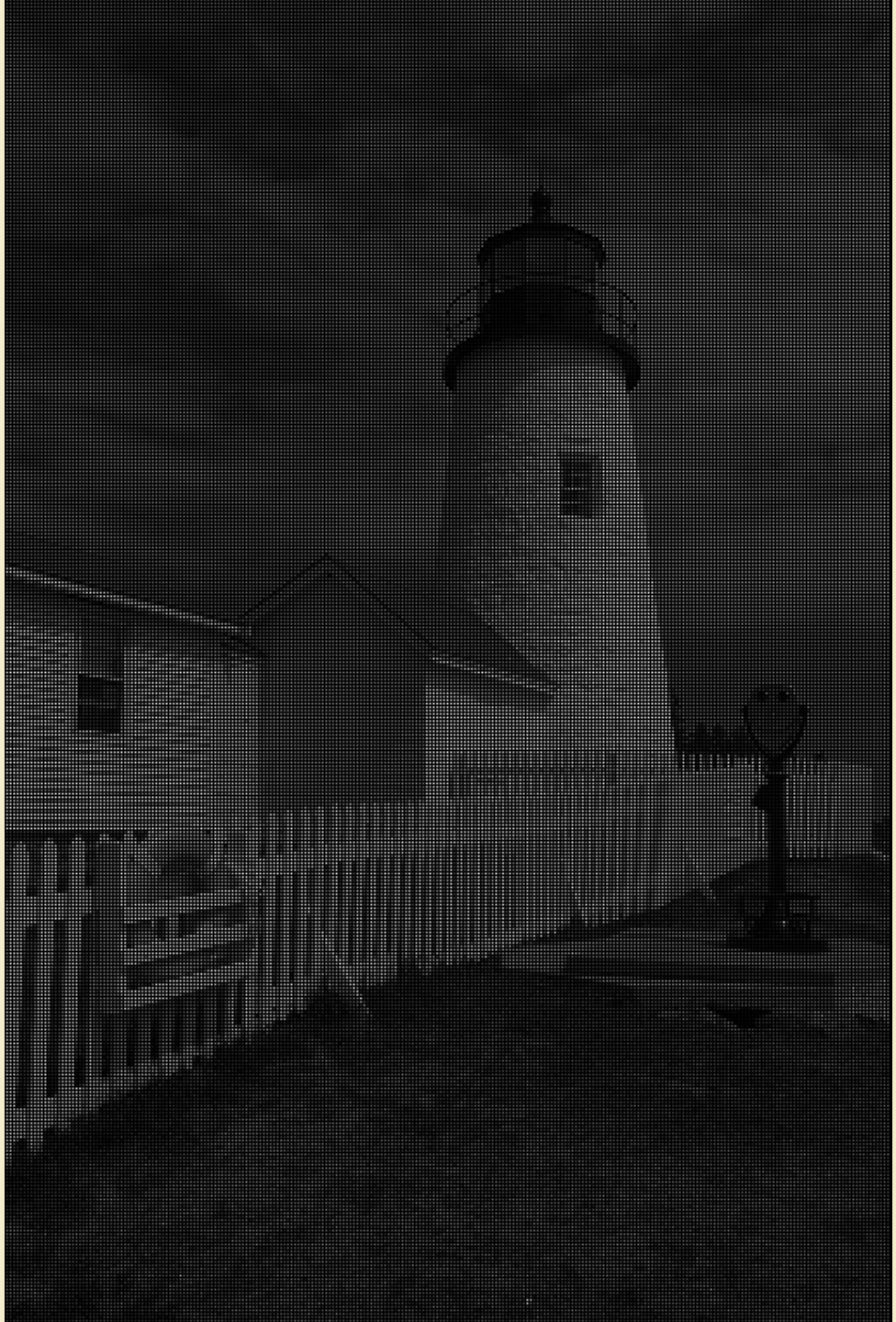
**Lighthouse green original**



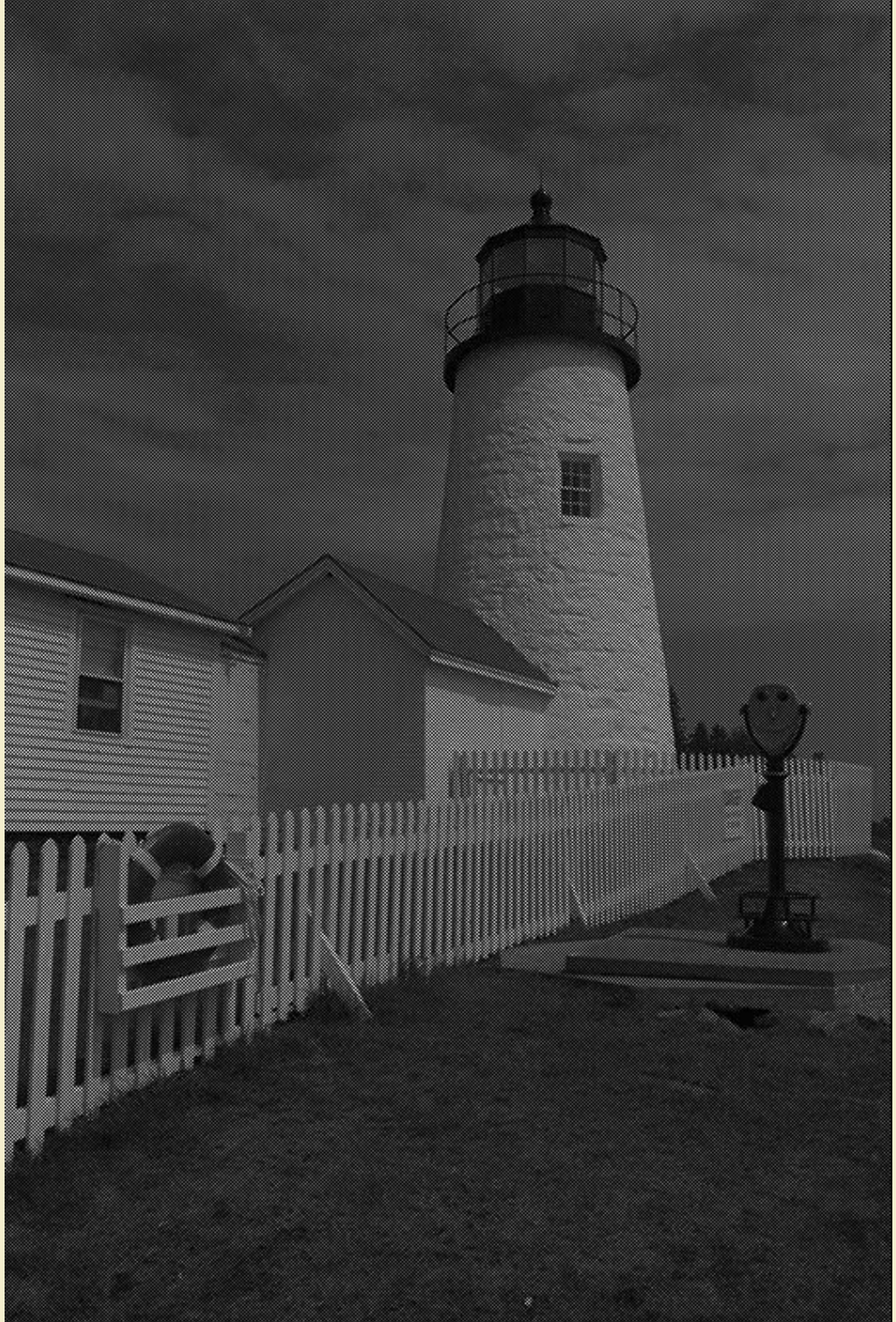
**Lighthouse**
**blue original**

# Formation of Color planes

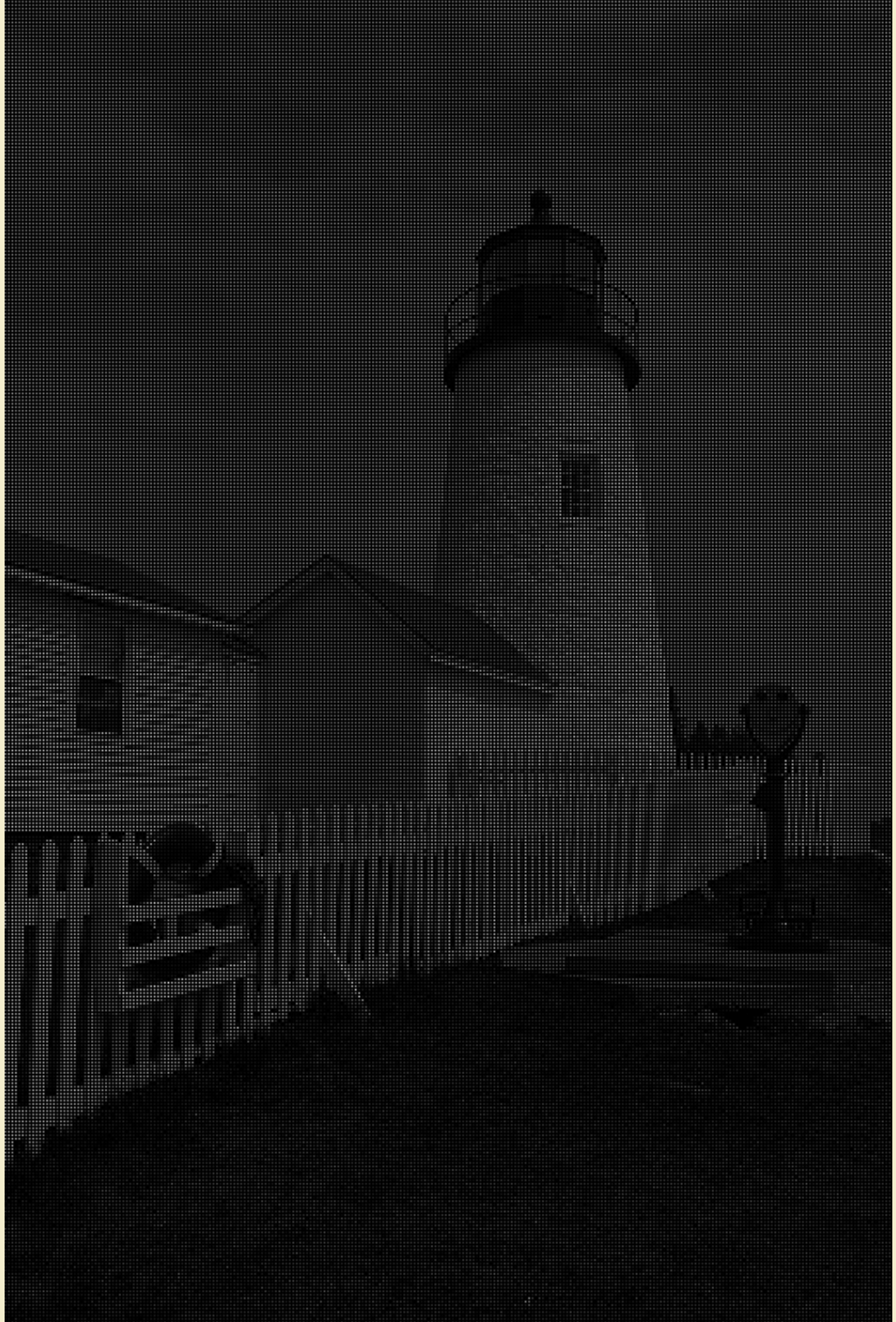




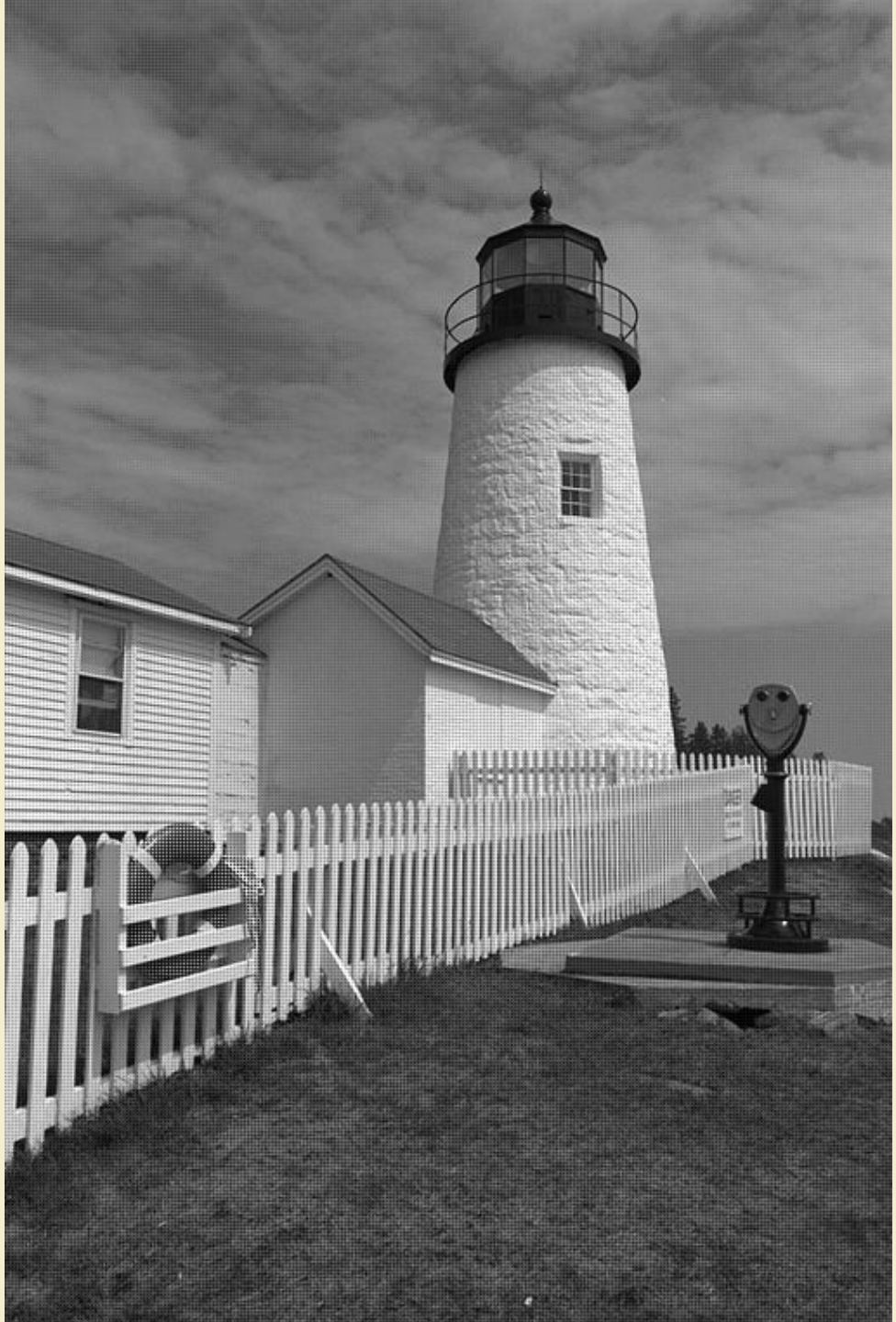
**Lighthouse**
**red subsampled**



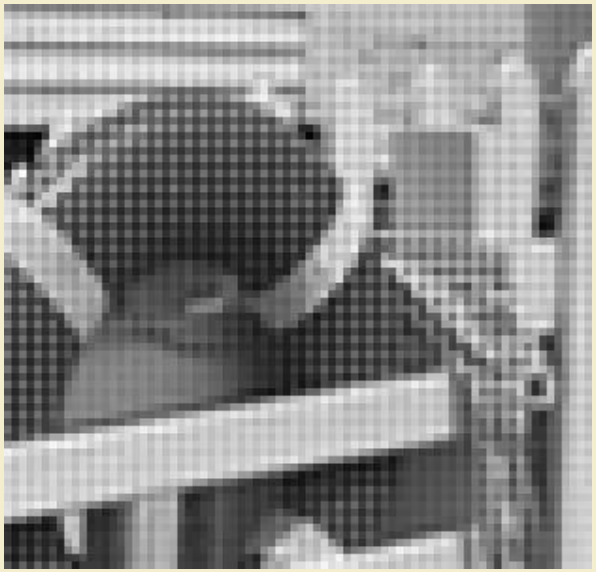
**Lighthouse**
**green subsampled**



**Lighthouse**
**blue subsampled**

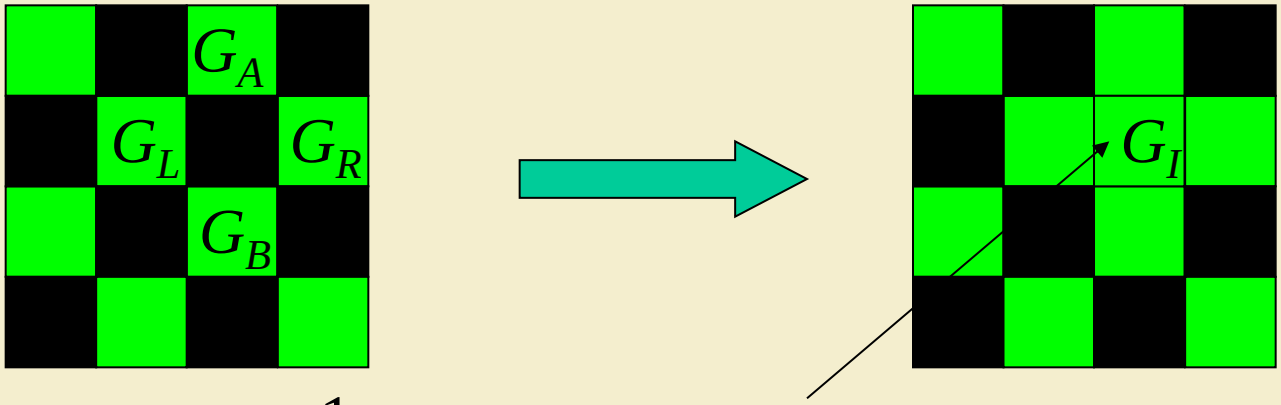


**Lighthouse**
**Bayer CFA image**



# Color plane interpolation

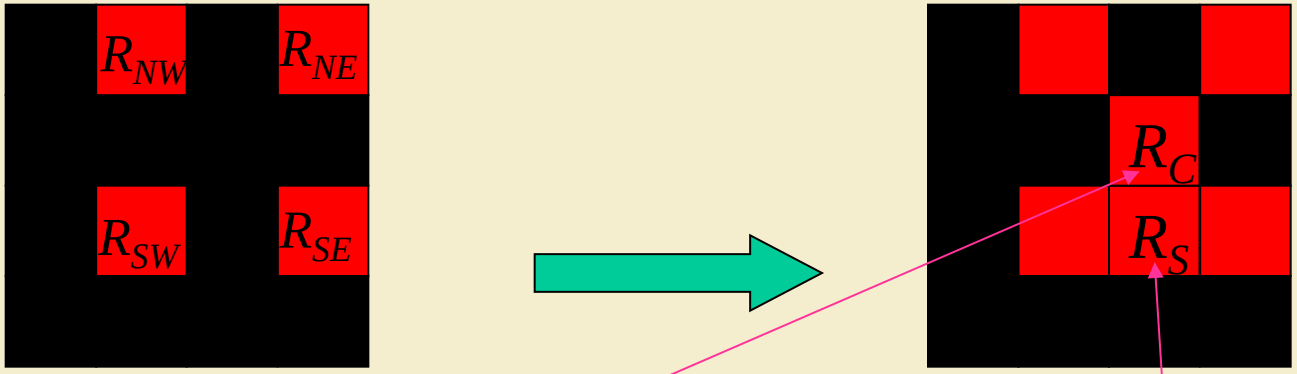
**Green channel: bilinear interpolation**




$$G_I = \frac{1}{4}(G_L + G_R + G_B + G_A)$$

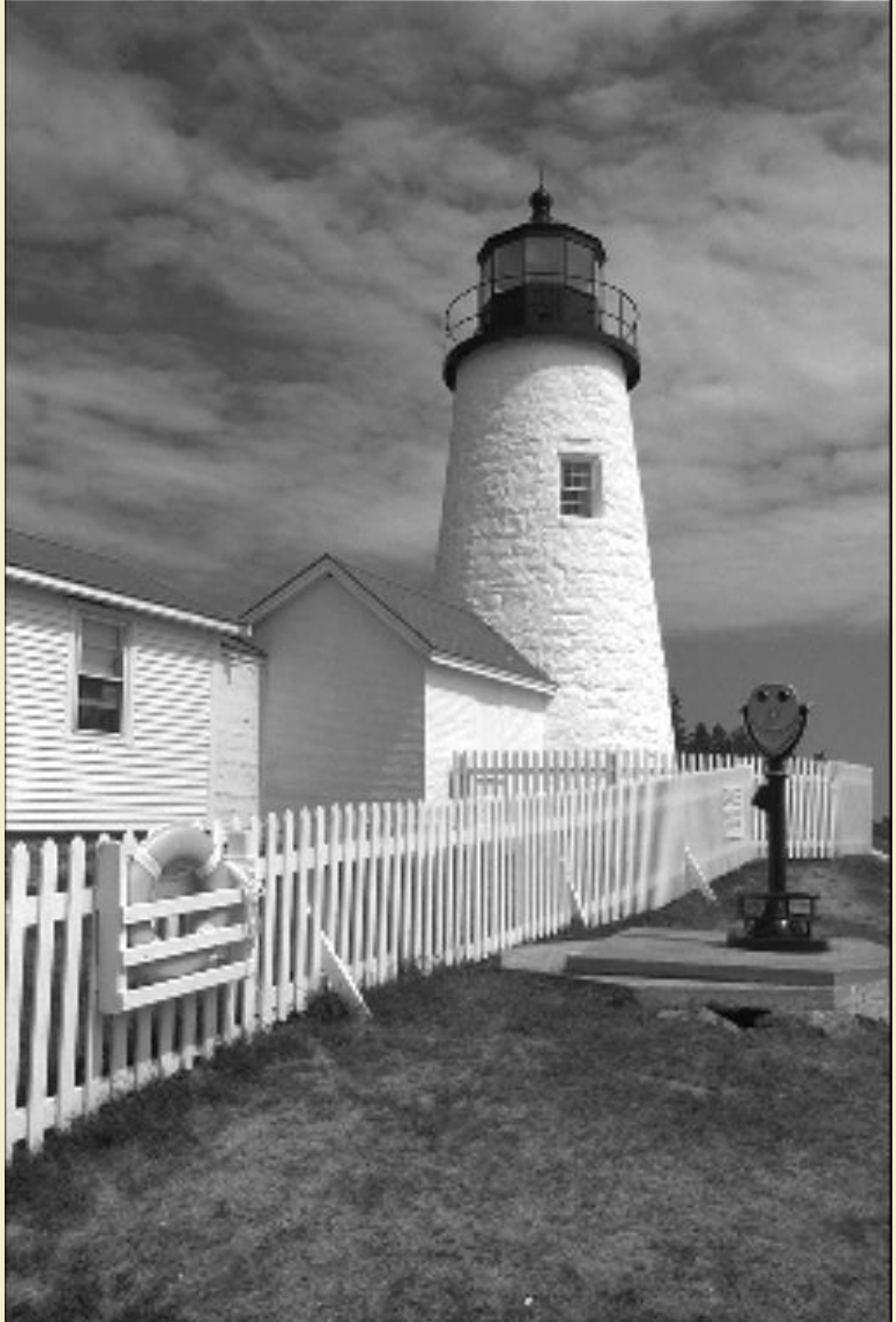
# Color plane interpolation

**Red channel: bilinear interpolation**

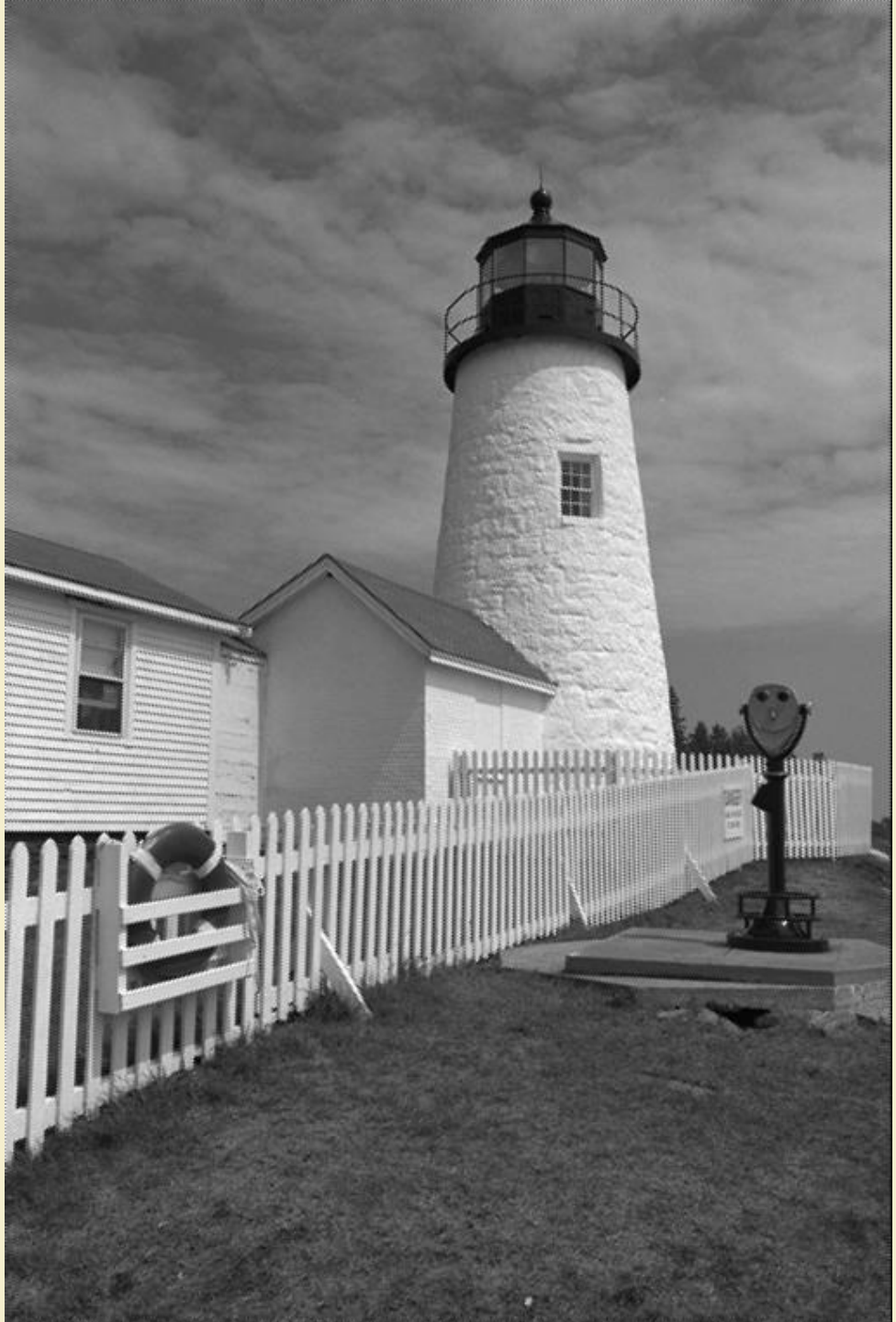



$$R_C = \frac{1}{4}(R_{NW} + R_{NE} + R_{SW} + R_{SE})$$

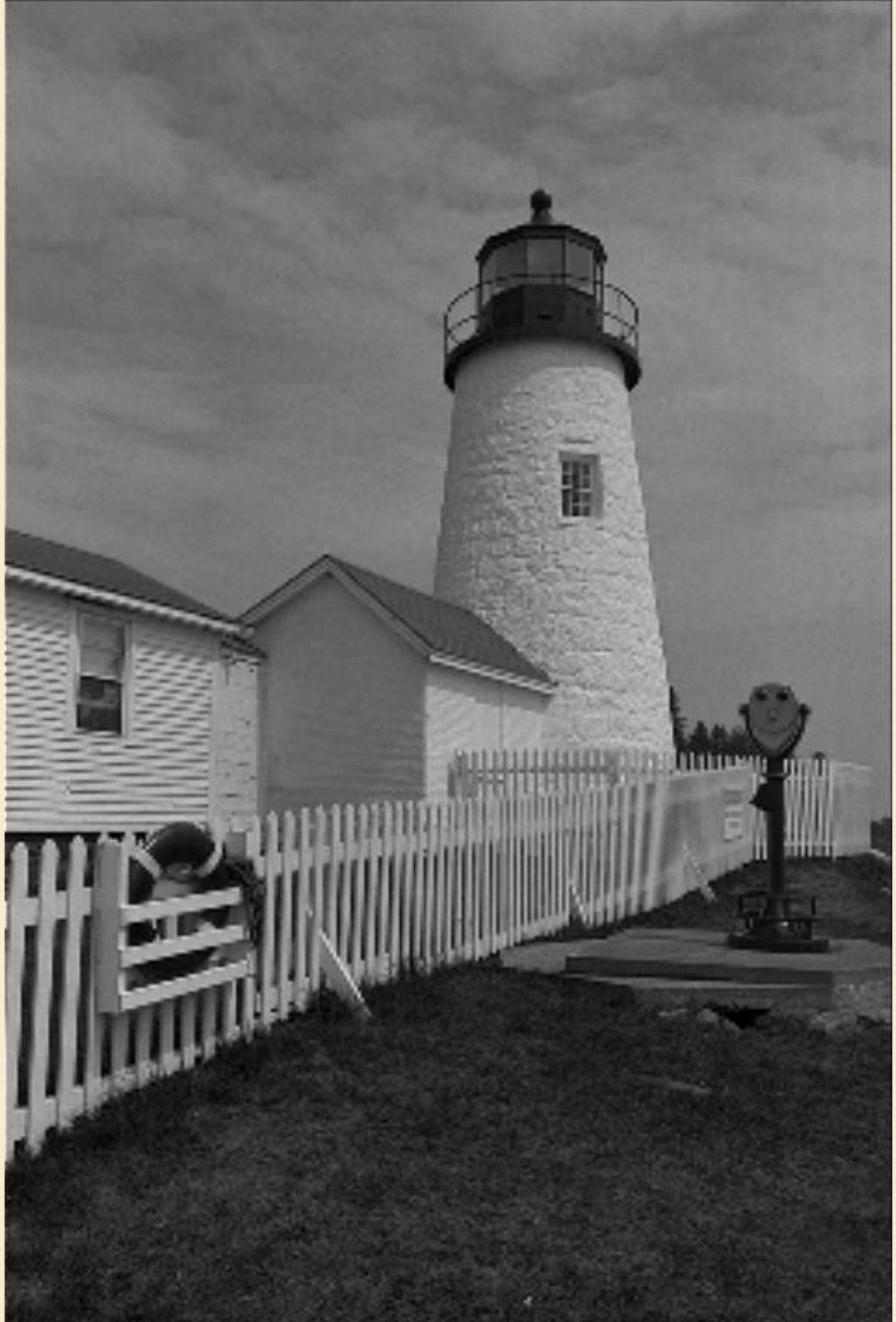
$$R_S = \frac{1}{2}(R_{SW} + R_{SE})$$



**Lighthouse**
**red interpolated**

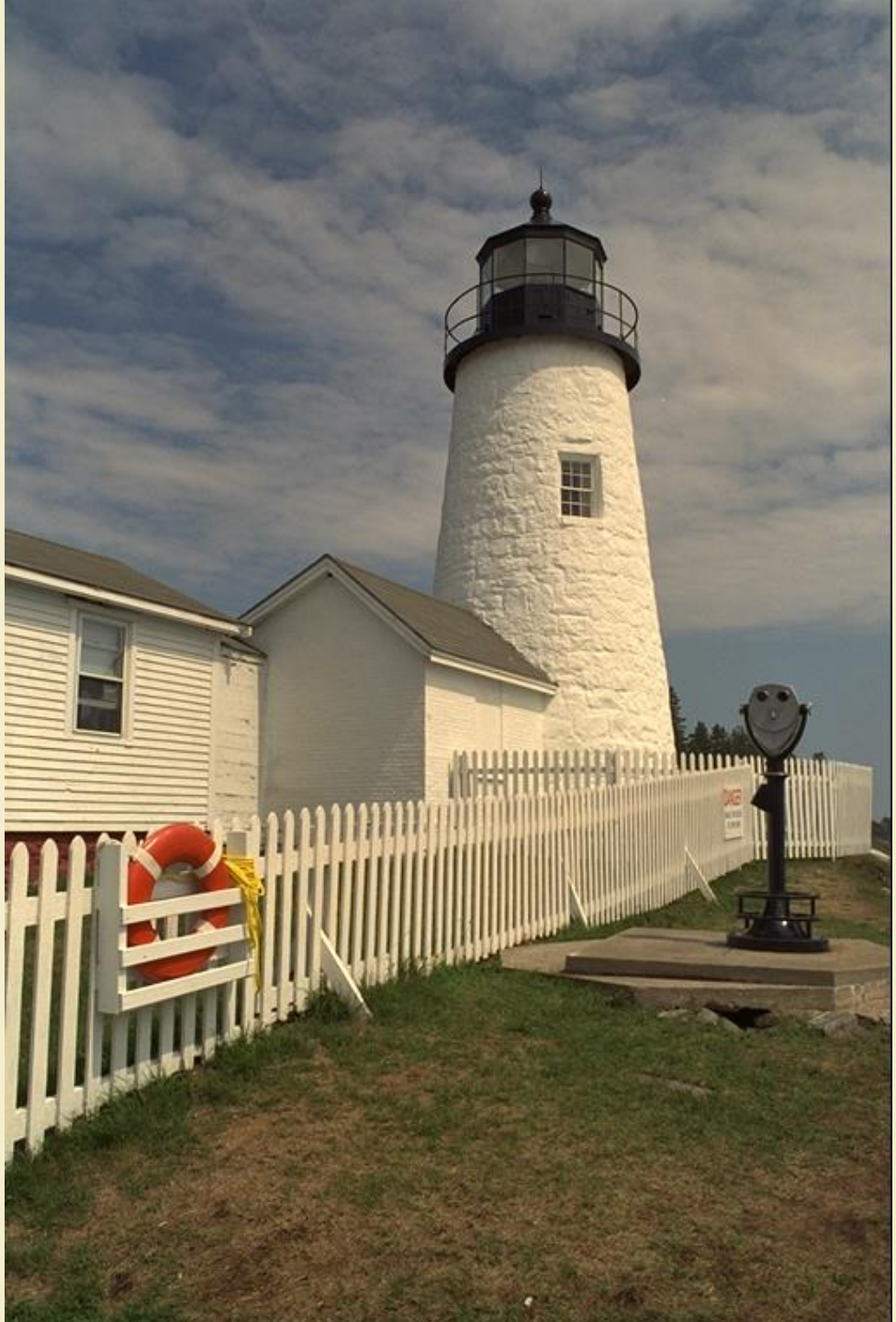


**Lighthouse**
**green interpolated**



**Lighthouse**
**blue interpolated**

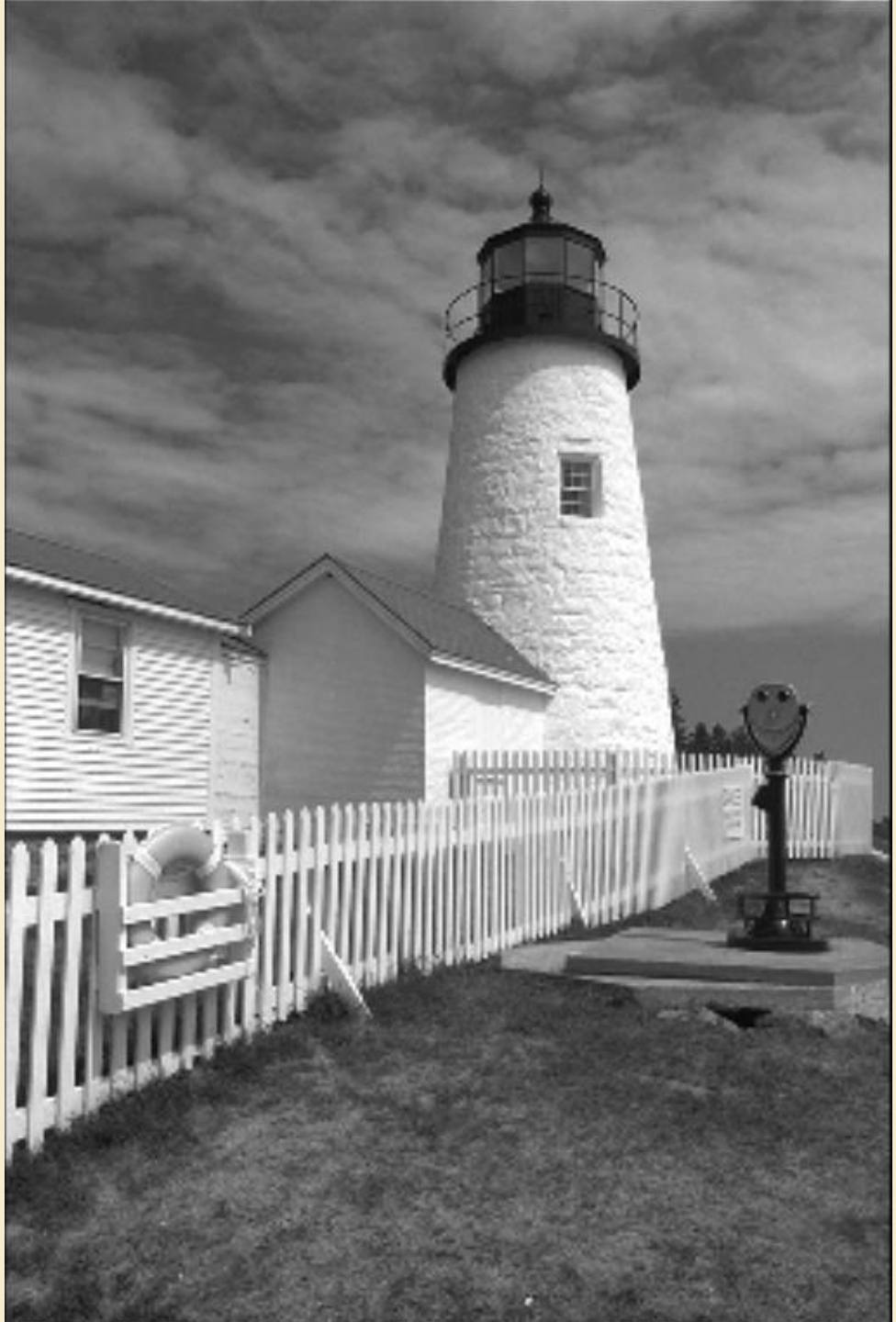
**Lighthouse**
**Interpolated color image**



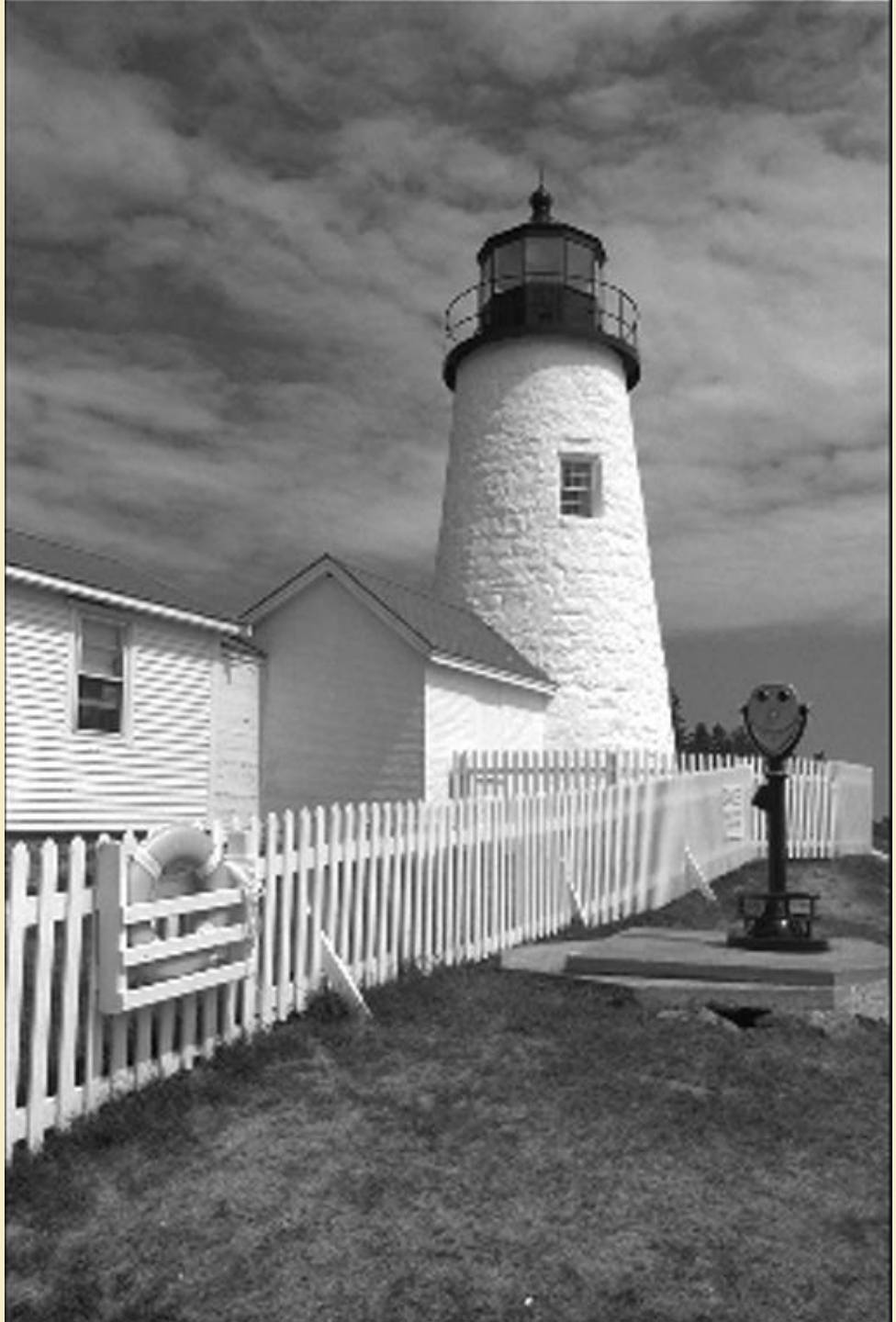
**Lighthouse original**

# Can we do better?

- Color planes have severe aliasing. Better interpolation of the individual planes has little effect.



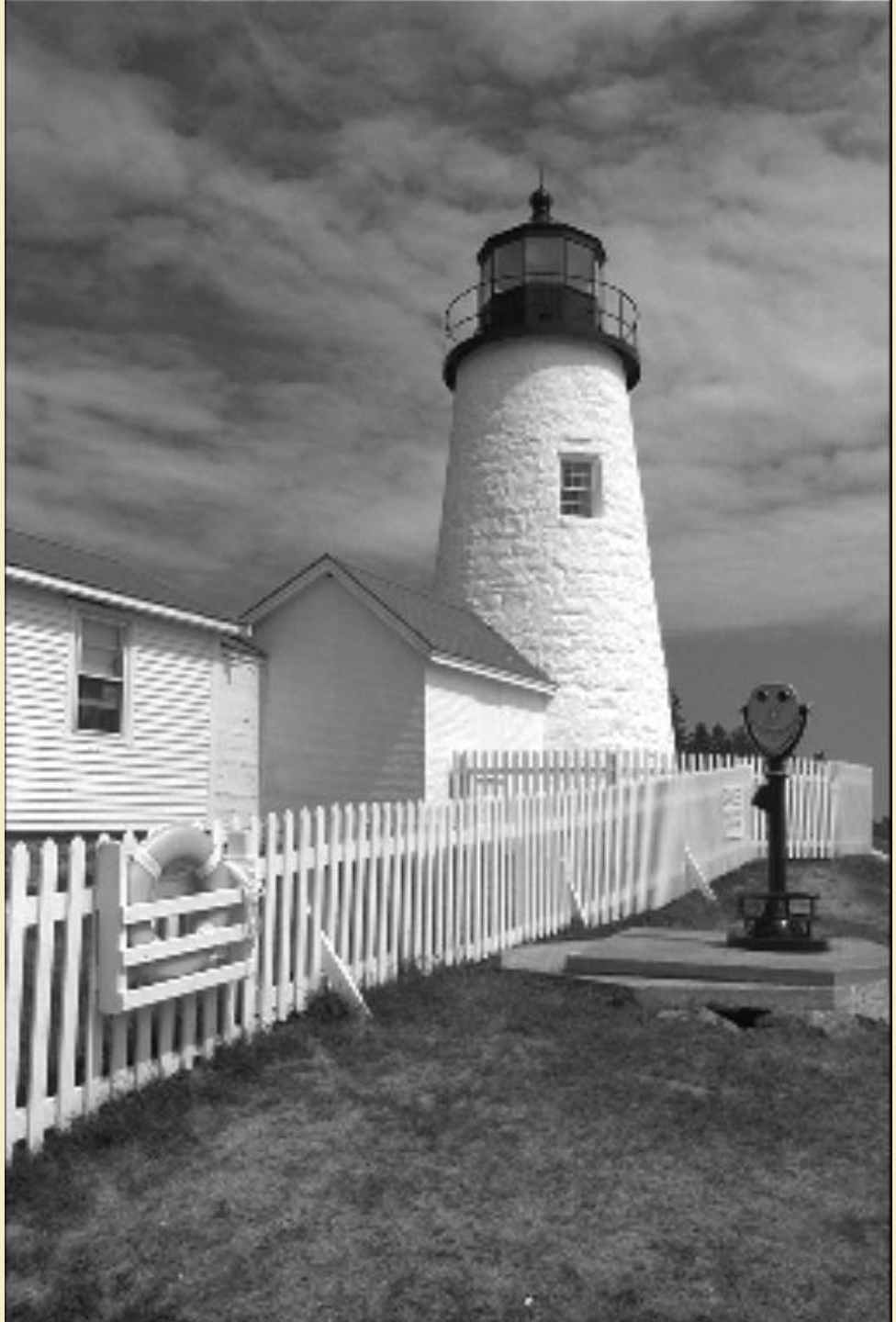
**Lighthouse red interpolated with bilinear interpolator**



**Lighthouse red interpolated with bicubic interpolator**

# Can we do better?

- Color planes have severe aliasing. Better interpolation of the individual planes has little effect.
- We could optically prefilter the image (blur it) so that aliasing is less severe.

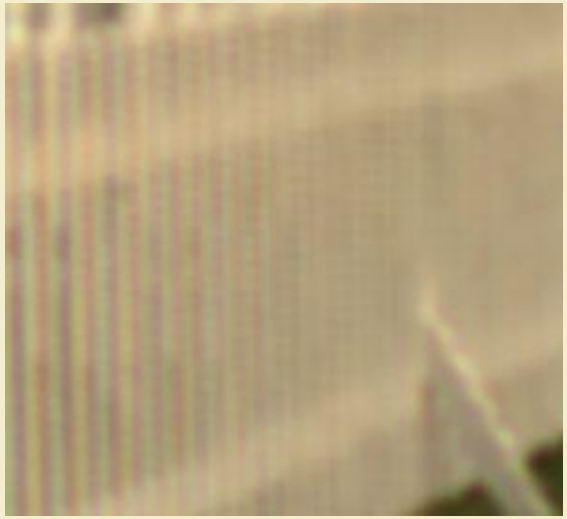


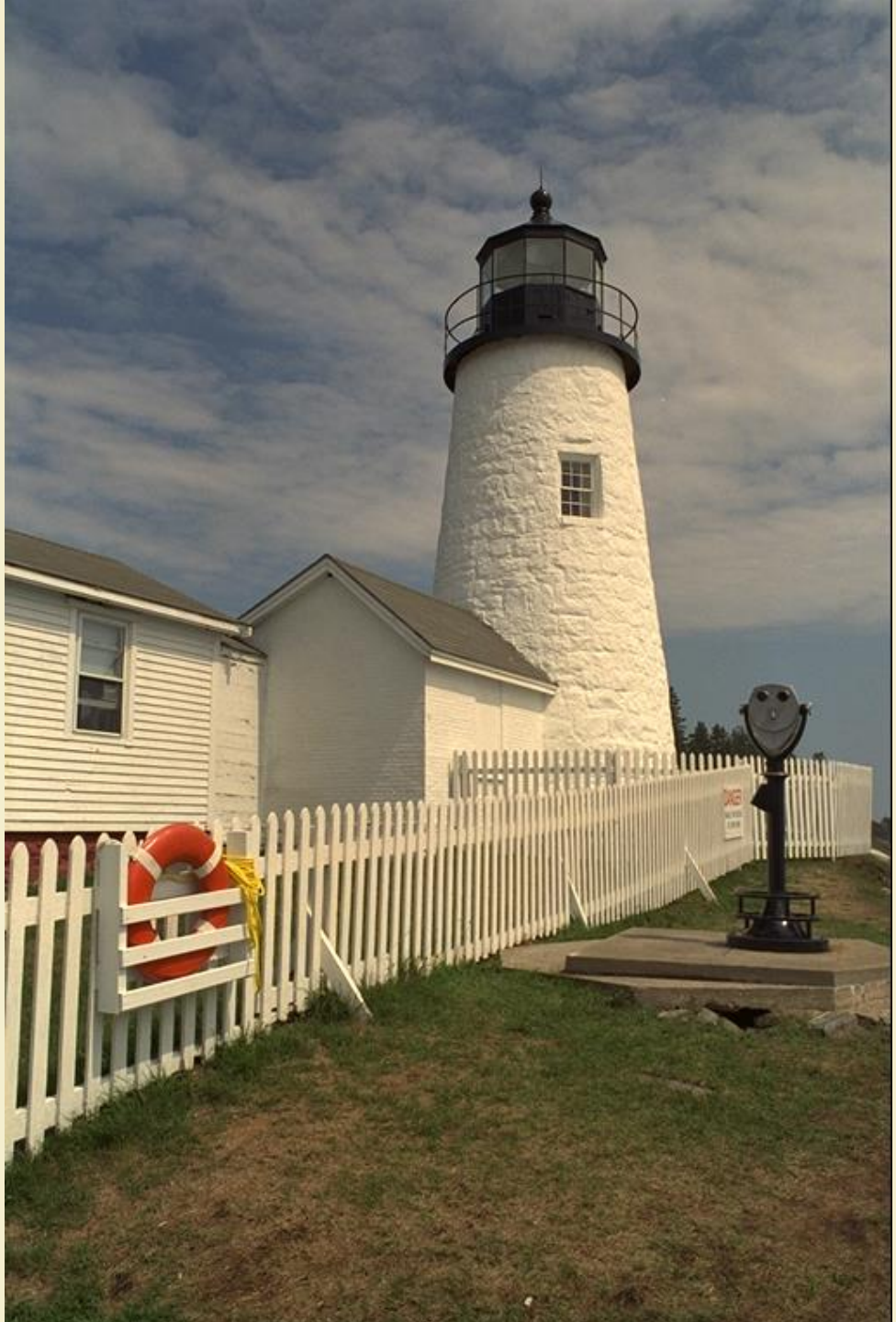
**Lighthouse red interpolated with bilinear interpolator**

**Lighthouse
prefiltered red
interpolated
with bilinear interpolator**

**Lighthouse Interpolated color image**

# Lighthouse Prefiltered & Interpolated color image





# Lighthouse original