MULTIMEDIA IMAGE PROCESSING APP

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WHAT THE PROGRAM DOES

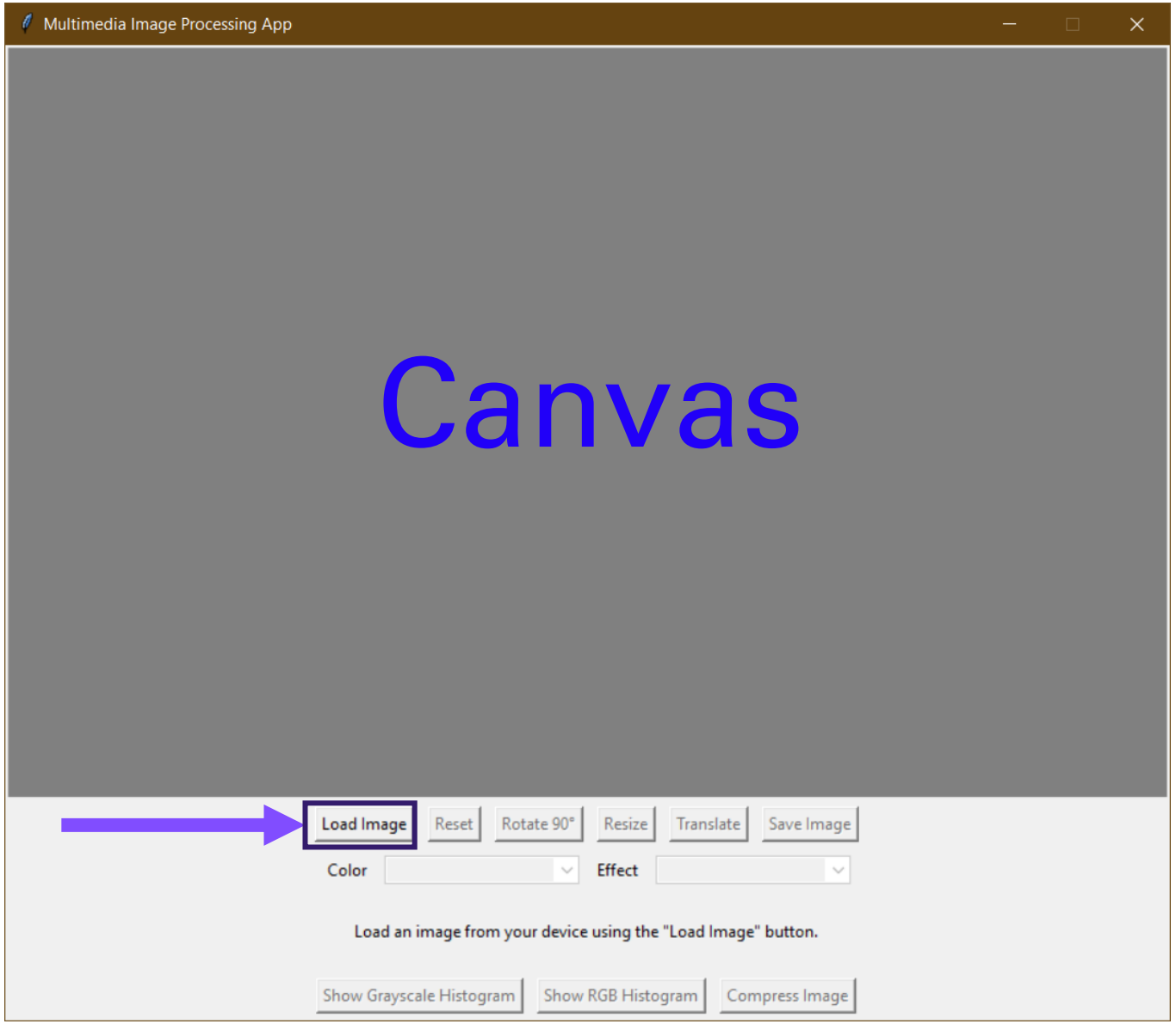
- Converting images from RGB to many color modes, including negative (CMY), grayscale, binary, HSV, and LAB.
- Applying rotation, translation, and resizing.
- Applying different effects, including quantization, dithering, and median cut.
- Displaying RGB and grayscale histogram.
- Compression of images, with different techniques, including DCT, DWT, Haar DWT, and Wavedec.

LOAD IMAGE

LOAD AN IMAGE

To load an image, click the “Load Image” button, and choose an image from your computer.

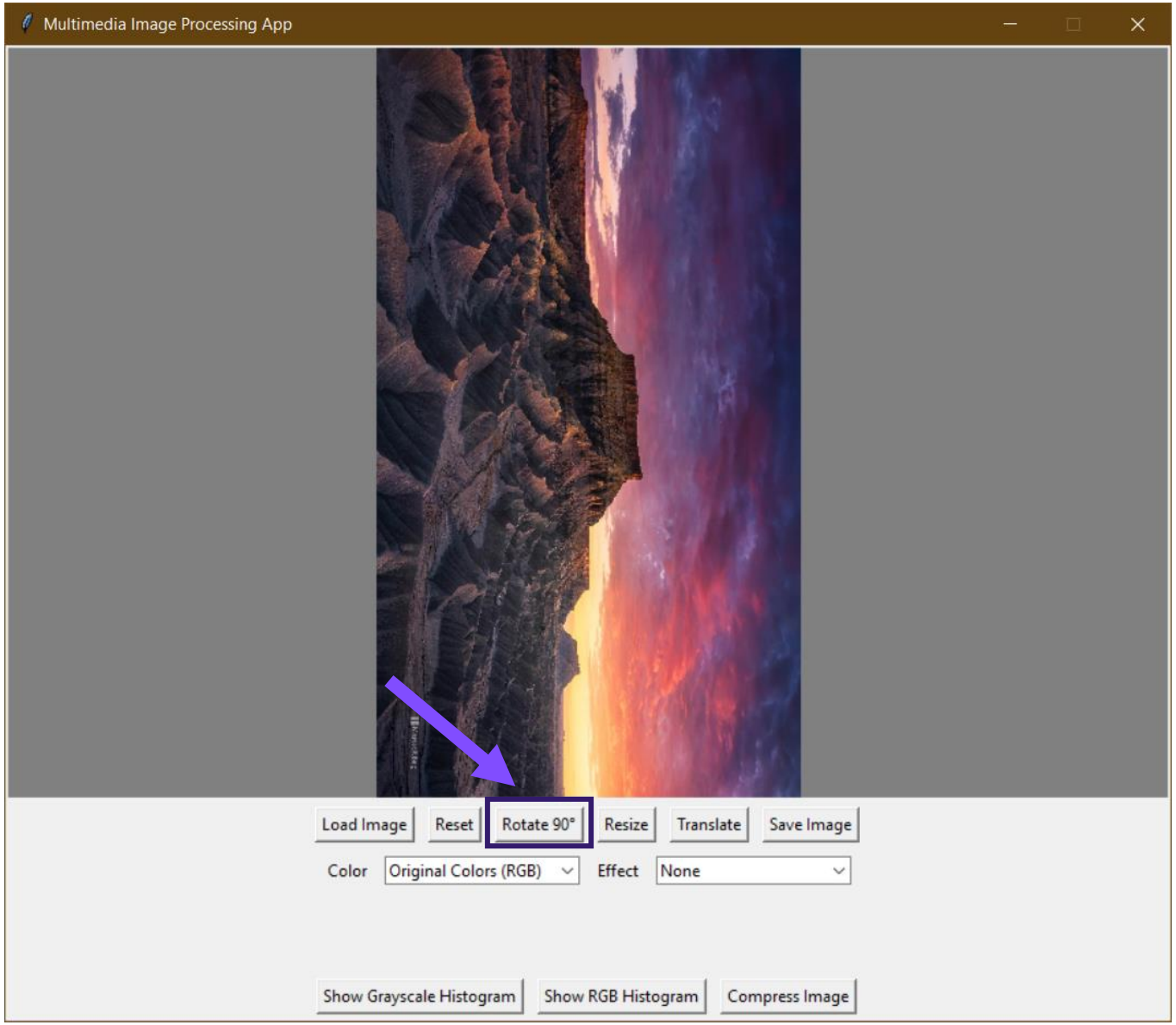
If an image is chosen, it will be displayed in the canvas.



ROTATE, RESIZE & TRANSLATE

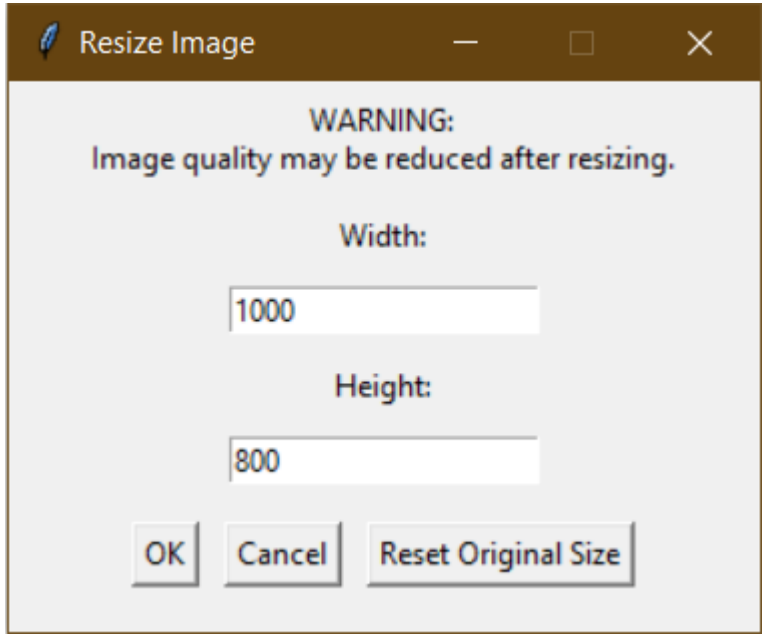
ROTATE IMAGE

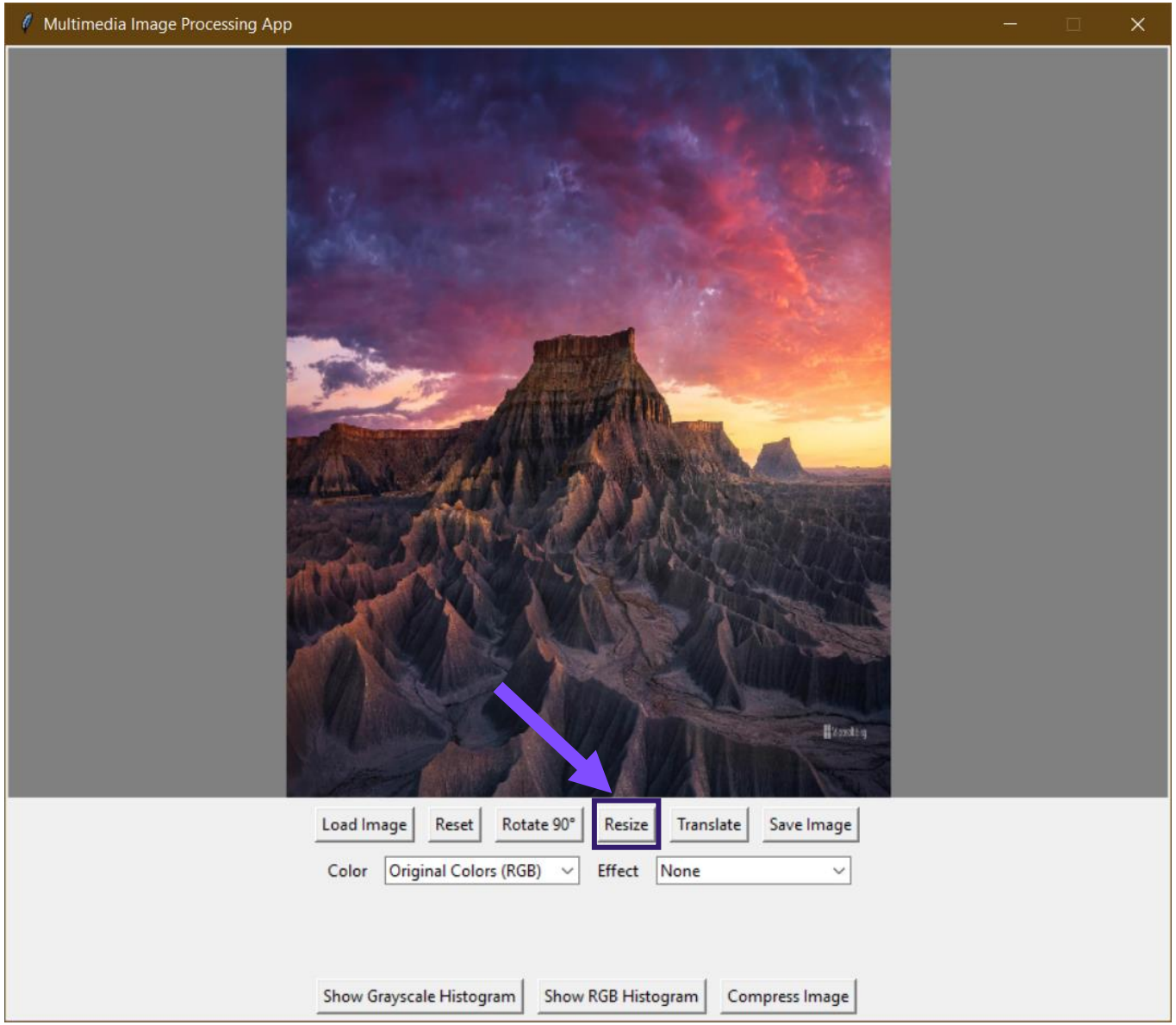
The “Rotate 90°”button rotates the image ninety degrees clockwise.



RESIZE IMAGE

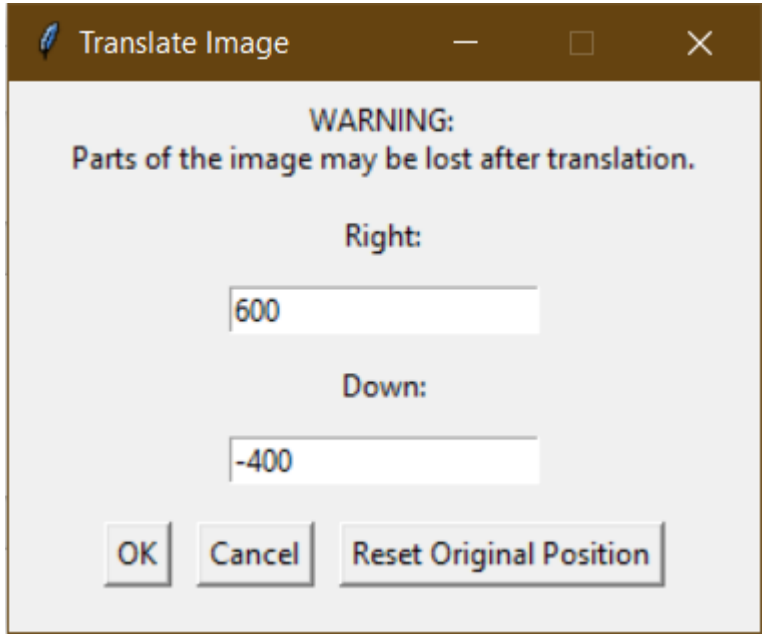
The “Resize” button opens a small window for resizing options.

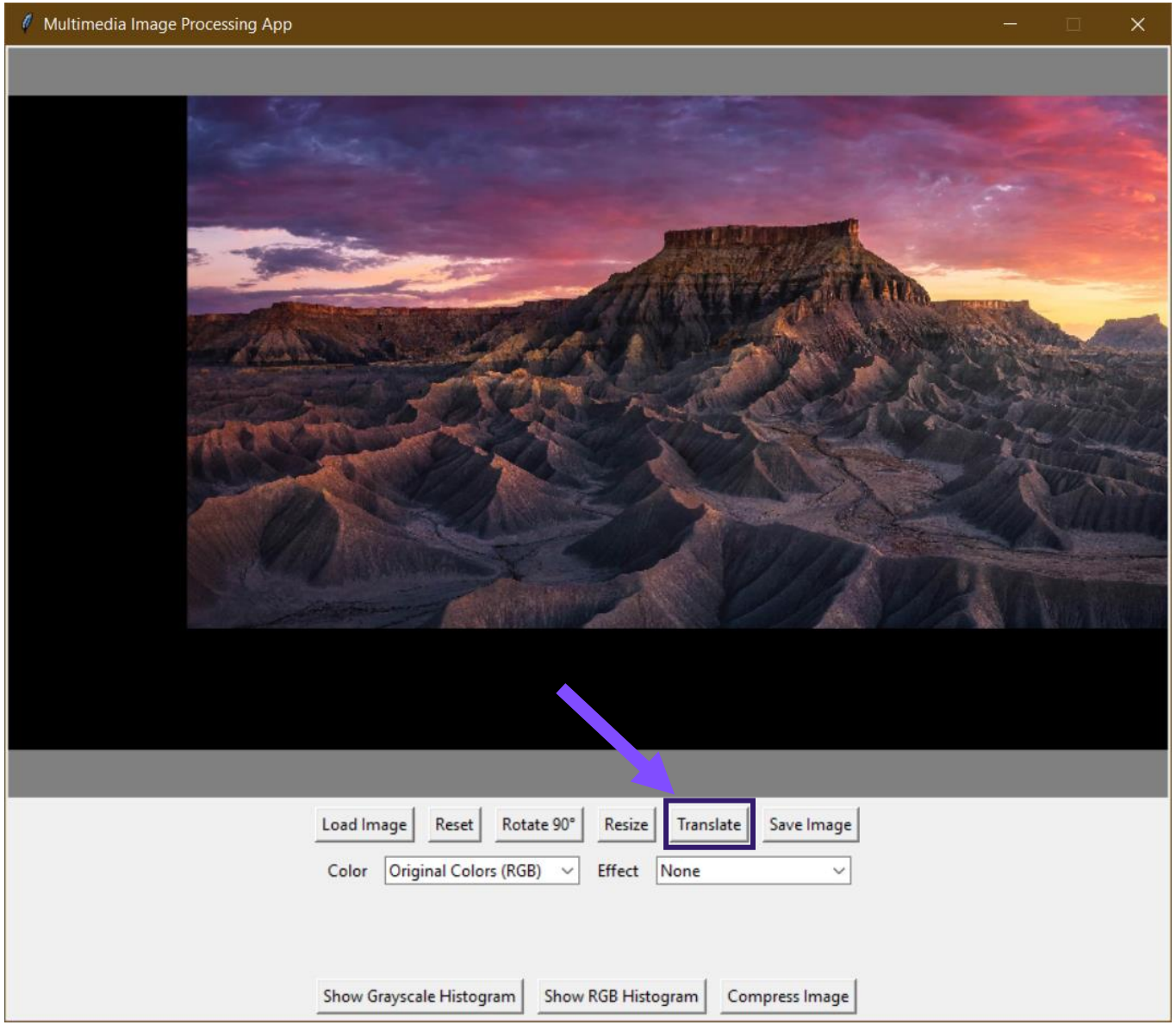




TRANSLATE IMAGE

The “Translate” button opens a small window for translation options.





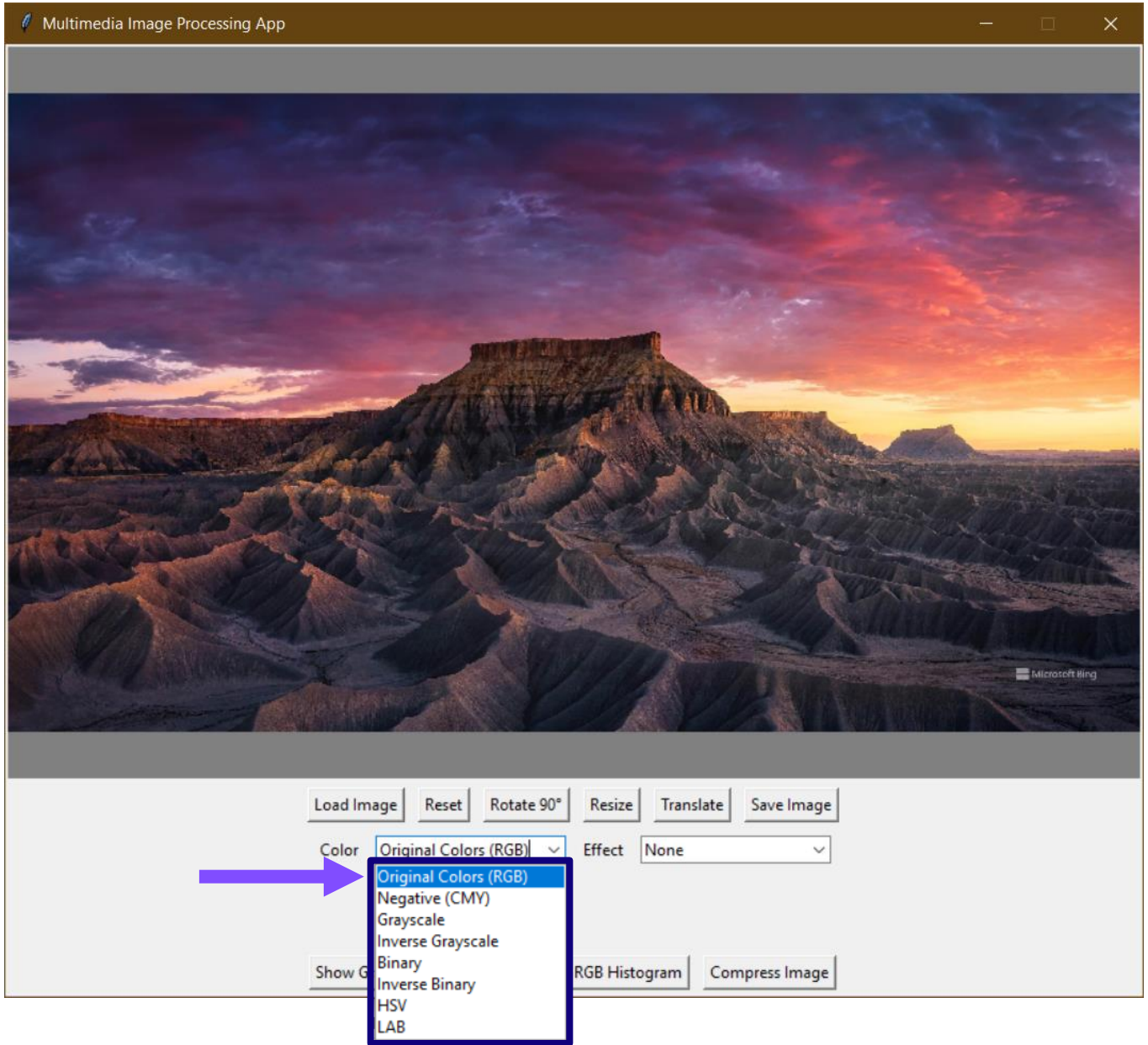
COLOR MODELS

COLOR MODELS - RGB

The image can be viewed in different color models:

- Original Colors (RGB)
- Negative Colors (CMY)
- Grayscale
- Inverse Grayscale
- Binary
- Inverse Binary
- HSV
- LAB

The default color model is Red, Green, Blue (RGB).

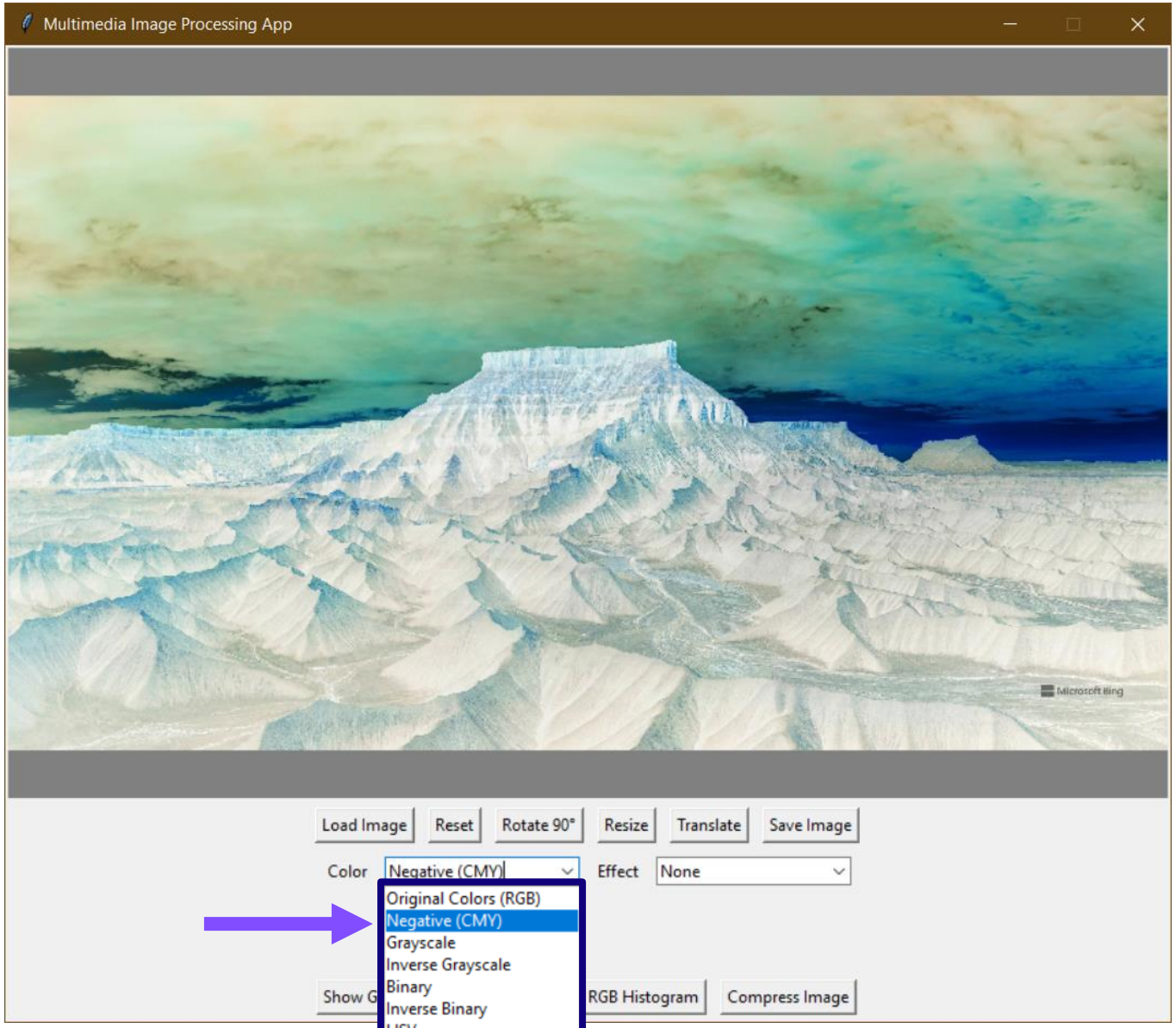


COLOR MODELS – NEGATIVE (CMY)

The negative color model is also called CMY.

The CMY color model is a result of subtracting each of the normalized R, G, and B values from one.

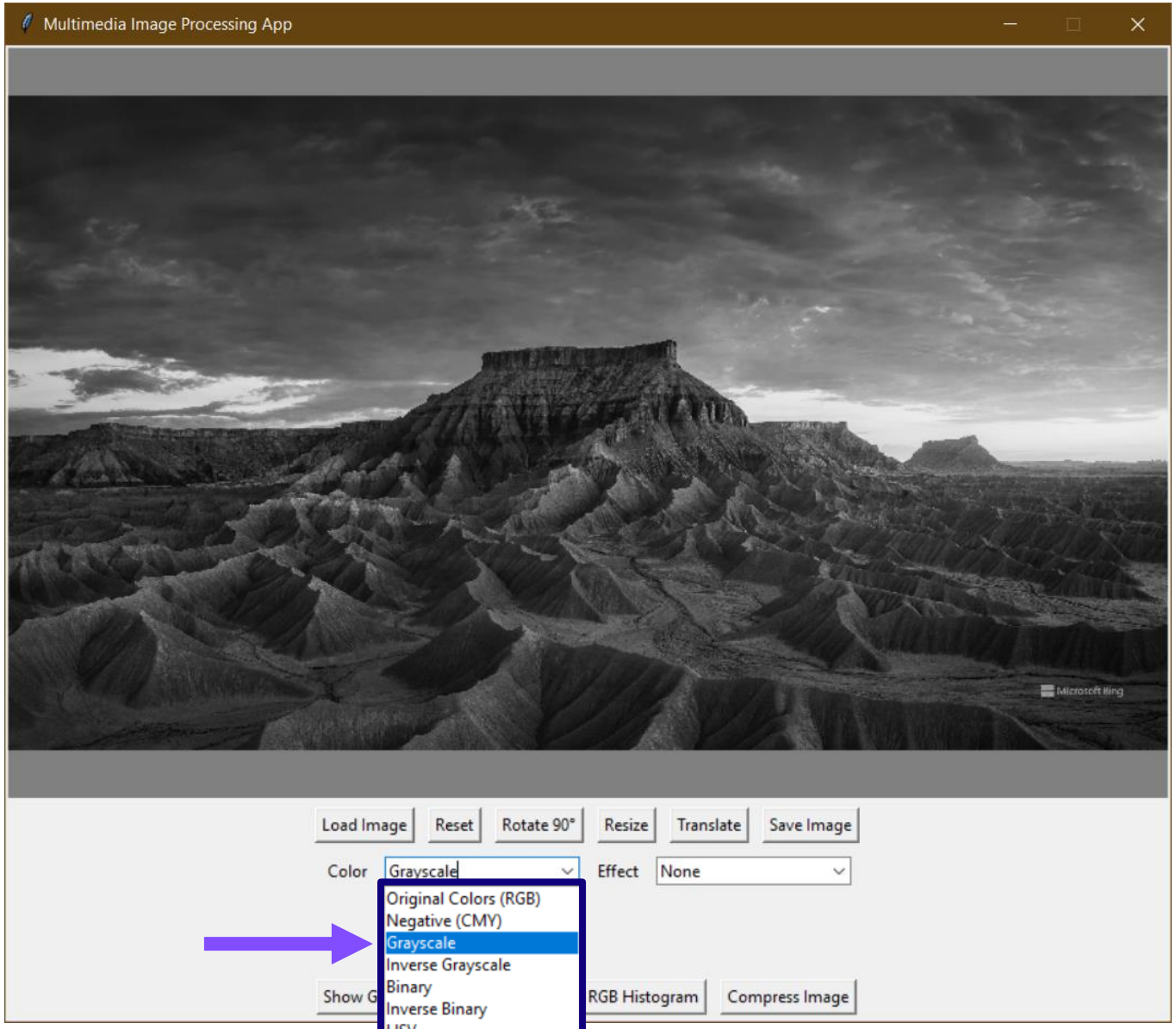
$$\begin{bmatrix}1\\1\\1\end{bmatrix} - \begin{bmatrix}R'\\G'\\B'\end{bmatrix} = \begin{bmatrix}C\\M\\Y\end{bmatrix}$$



COLOR MODELS – GRAYSCALE

The grayscale image is an image that has only has gray level colors.

It has 256 gray levels, starting from 0 (black) to 255 (white).

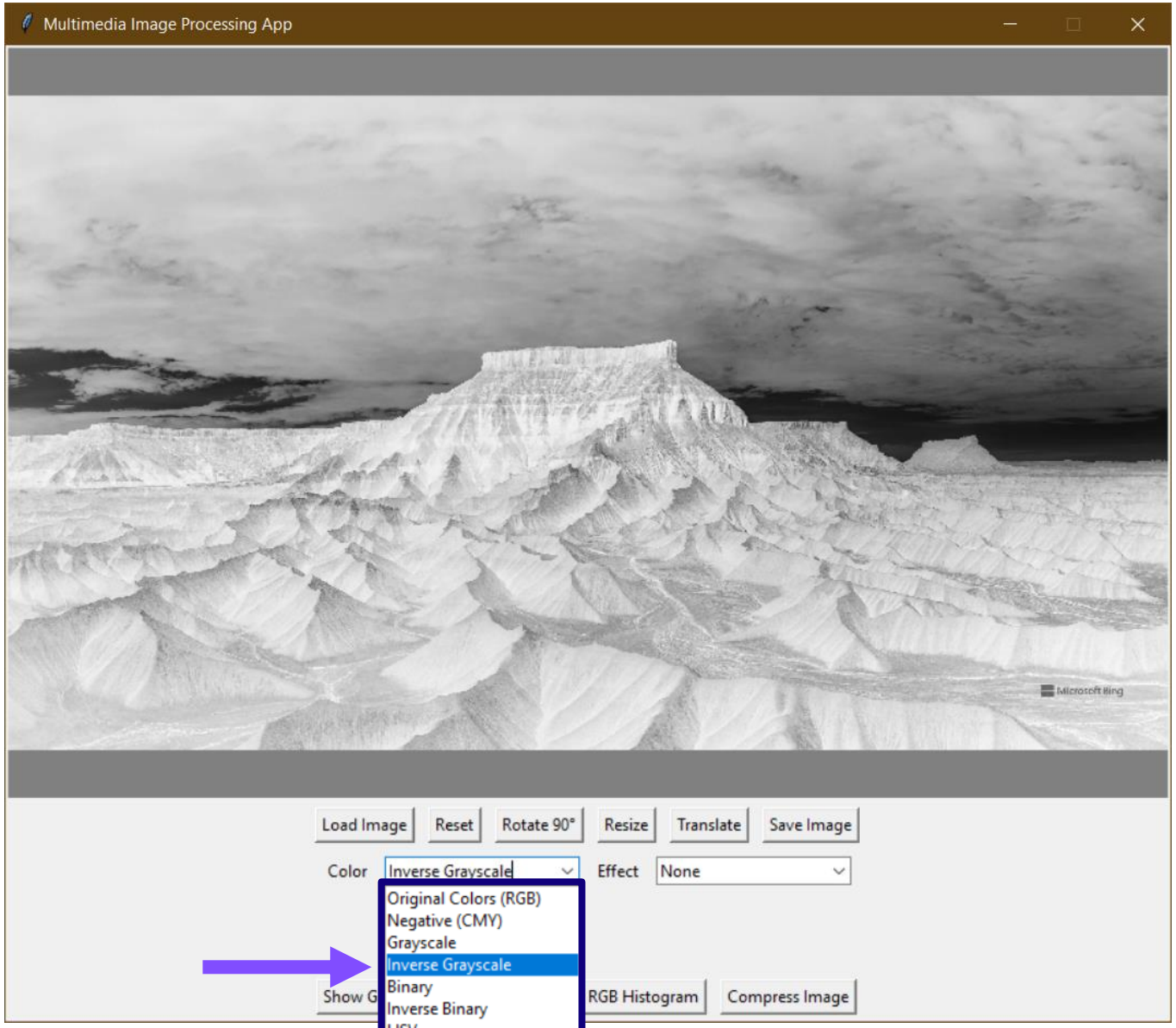


COLOR MODELS – INVERSE GRAYSCALE

The inverse grayscale is simply swapping the subtracting the pixel intensity value from 255.

Black becomes white, and white becomes black.

It's like applying negative filter to a grayscale image.



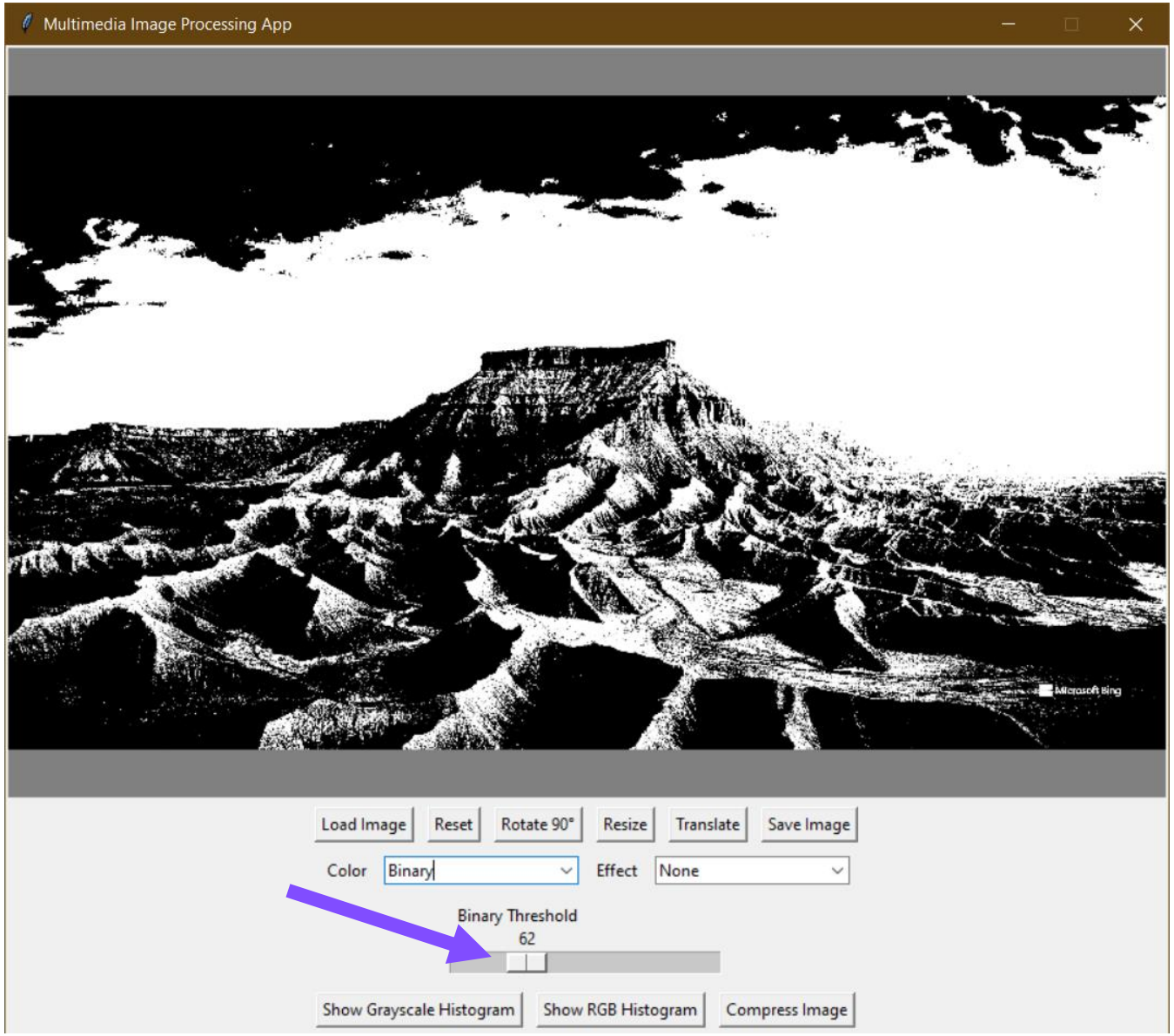
COLOR MODELS – BINARY

The binary image is an image that only contains two values for each pixel: 0 (black) and 1 (white).

Image is automatically converted to grayscale before thresholding.

The indicated slider controls the threshold value.

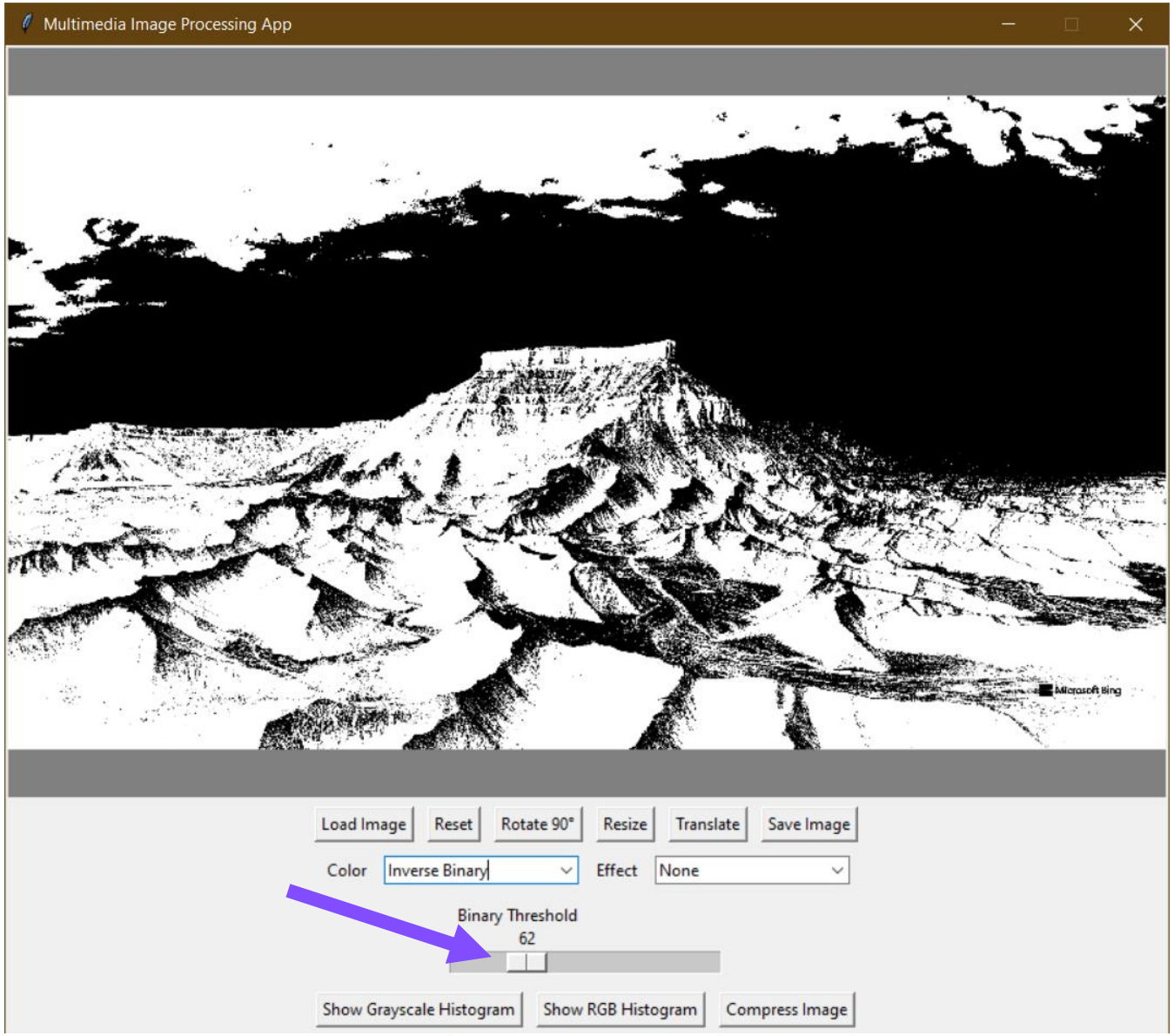
Pixel Value < Threshold ? → Black
Pixel Value ≥ Threshold ? → White



COLOR MODELS – INVERSE BINARY

Similar to inverse grayscale.

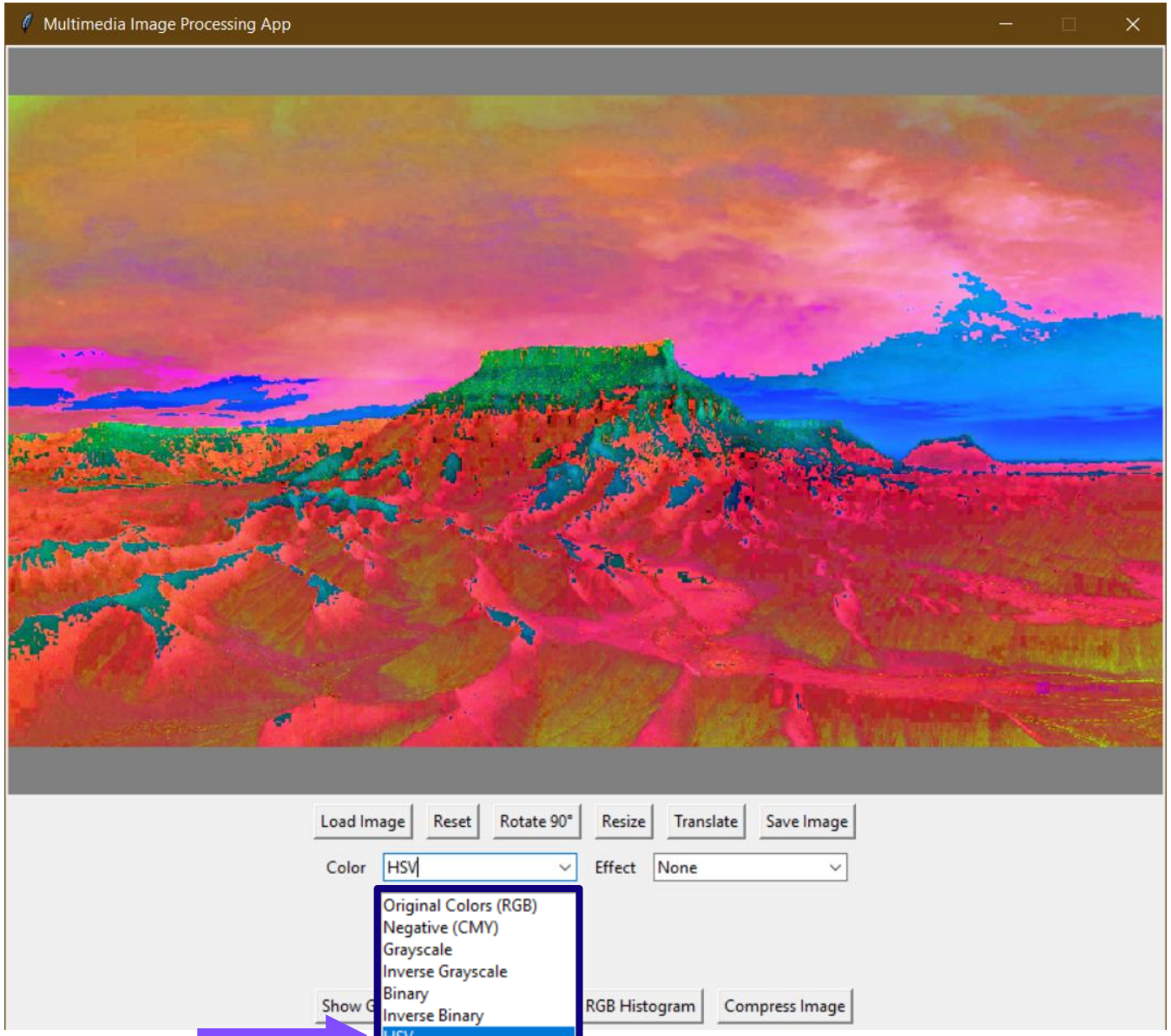
Pixel Value < Threshold ? → White
Pixel Value ≥ Threshold ? → Black



COLOR MODELS – HSV

The HSV color model represents hue, saturation, and value/intensity.

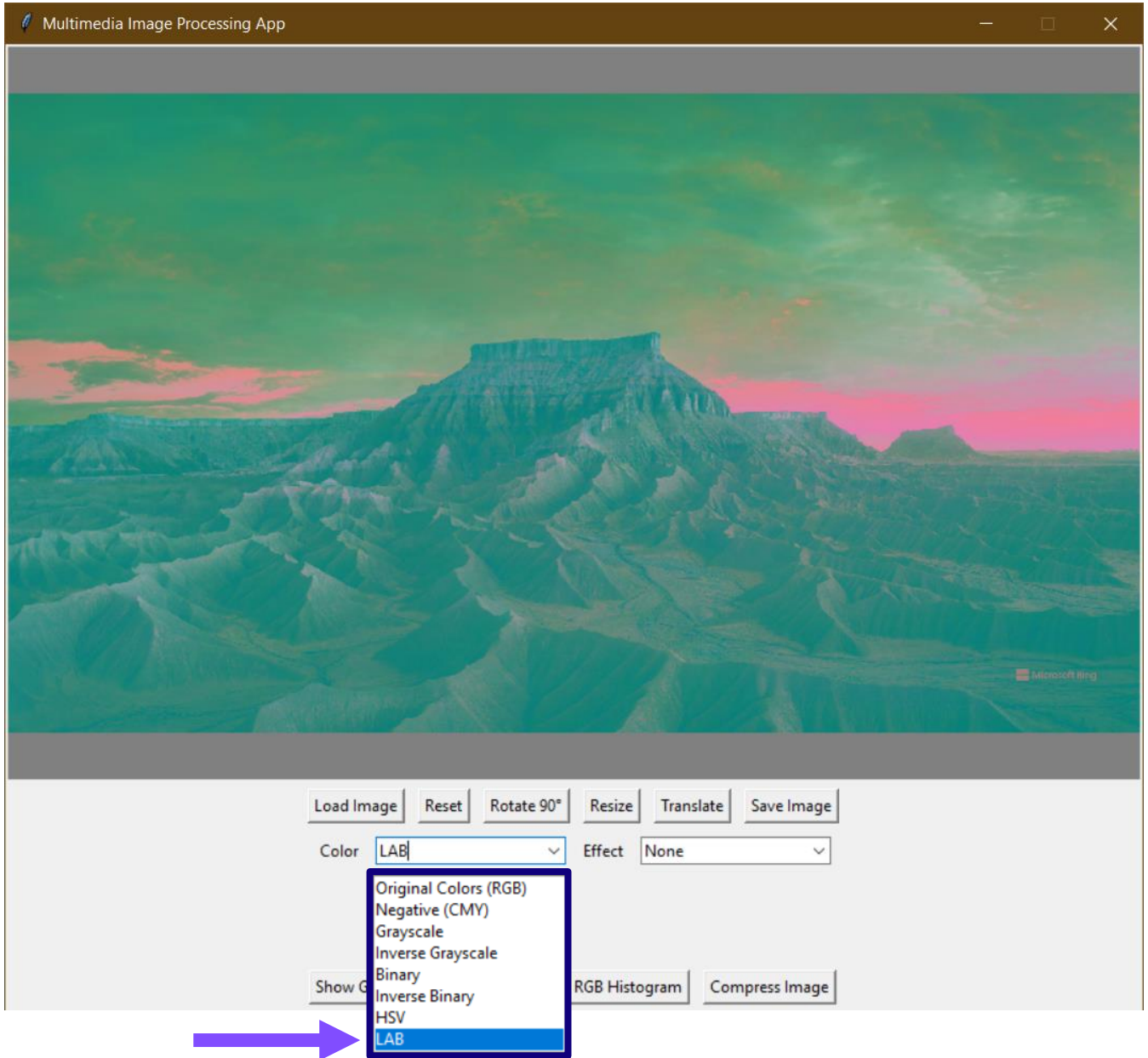
Useful for tasks like color filtering, segmentation, and object detection.



COLOR MODELS – LAB

The LAB color model represents lightness/luminance, green-red opponent color axis, and blue-yellow opponent color axis.

Used in advanced image editing software for precise color adjustments and corrections.



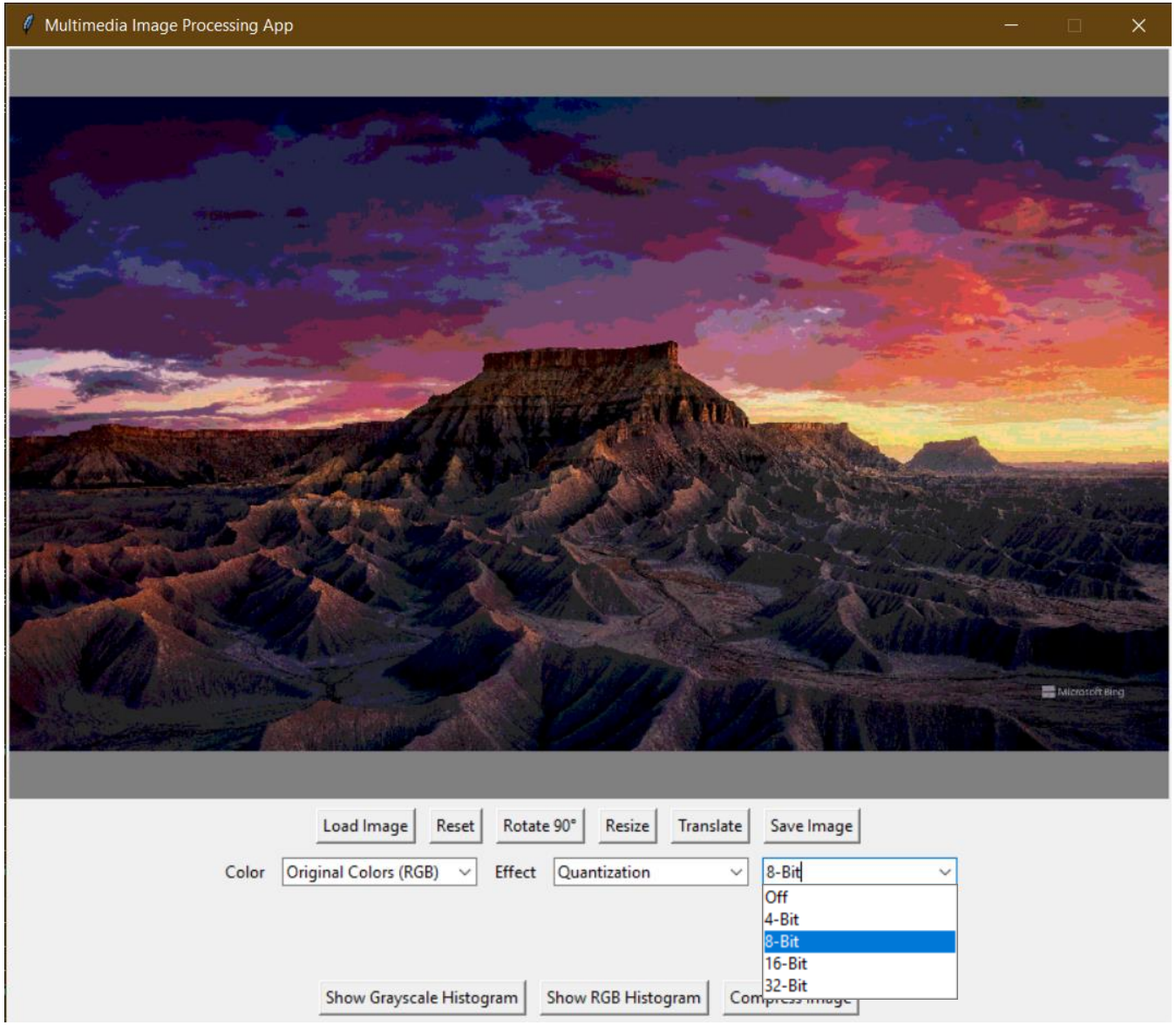
EFFECTS

QUANTIZATION

Image quantization is a technique used to reduce the number of colors or gray levels in an image.

In this program, there you reduce the number of bits per pixel to 4, 8, 16, or 32 bits.

Can be applied on both color and grayscale images.



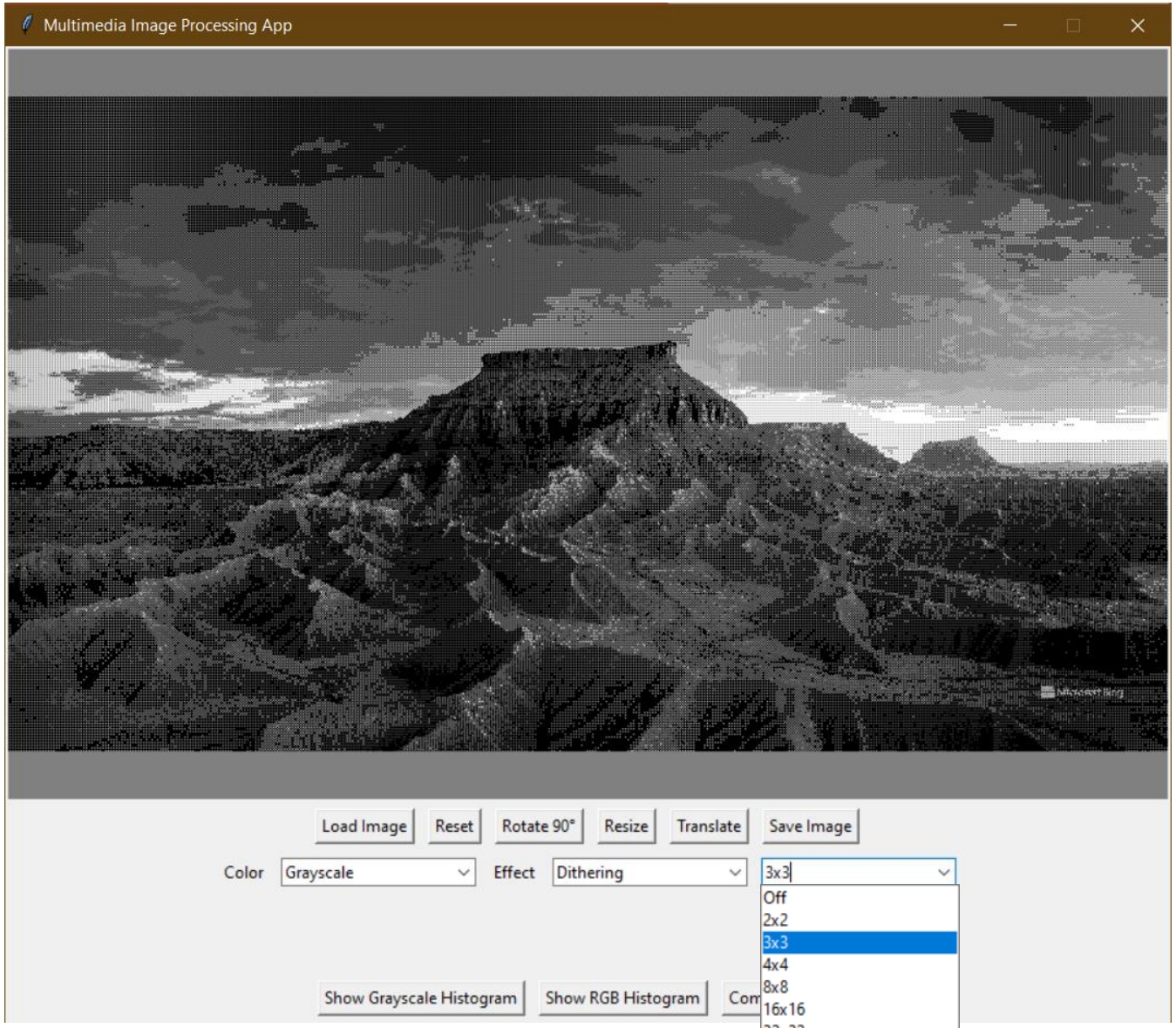
DITHERING

It is used to create an illusion of more color when displaying an image that has low color depth.

In this program, the dithering matrix size can be 2x2, 3x3, 4x4, 8x8, and more…

Only applied on grayscale images.

Cannot be applied on other color models.



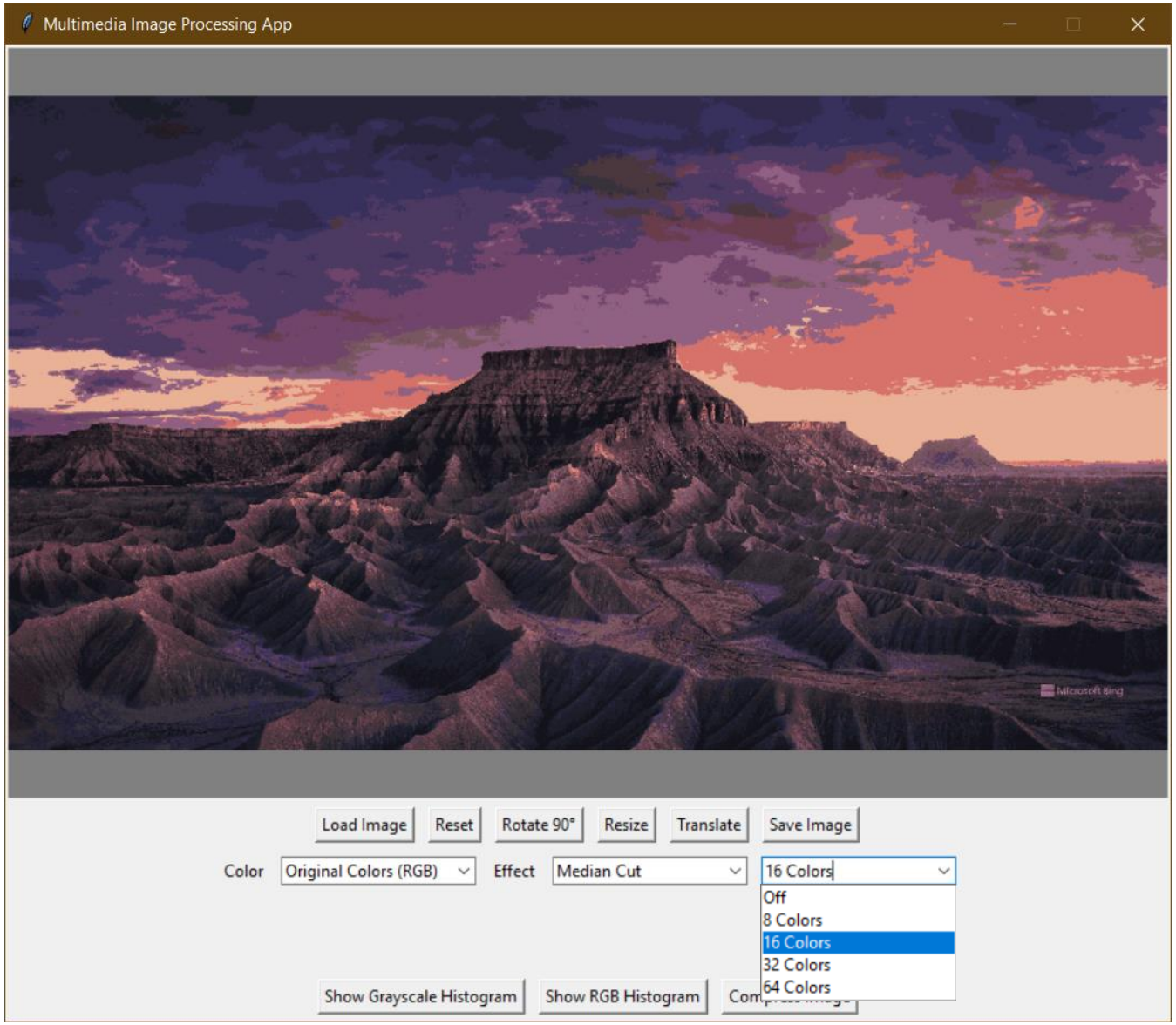
MEDIAN CUT

It’s an adaptive algorithm for color quantization to select the best representative subset of colors. Used for discretizing a continuous color space.

In this program, you can choose to discretize to 8, 16, 32, 64 colors.

Cannot be applied on grayscale or binary images.

Only applied on color images.



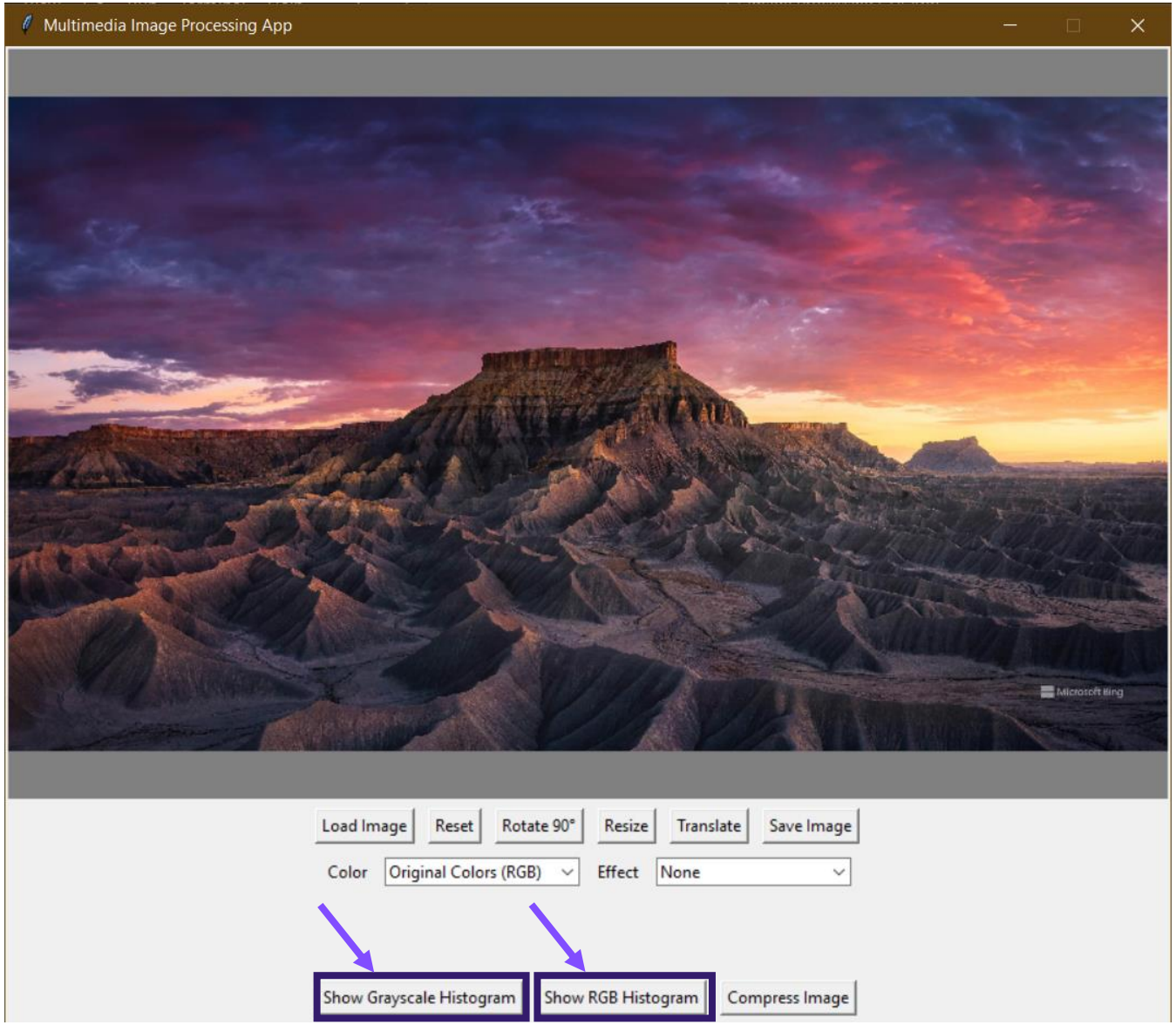
HISTOGRAM

HISTOGRAM

The histogram visualizes the frequency of each pixel intensity value.

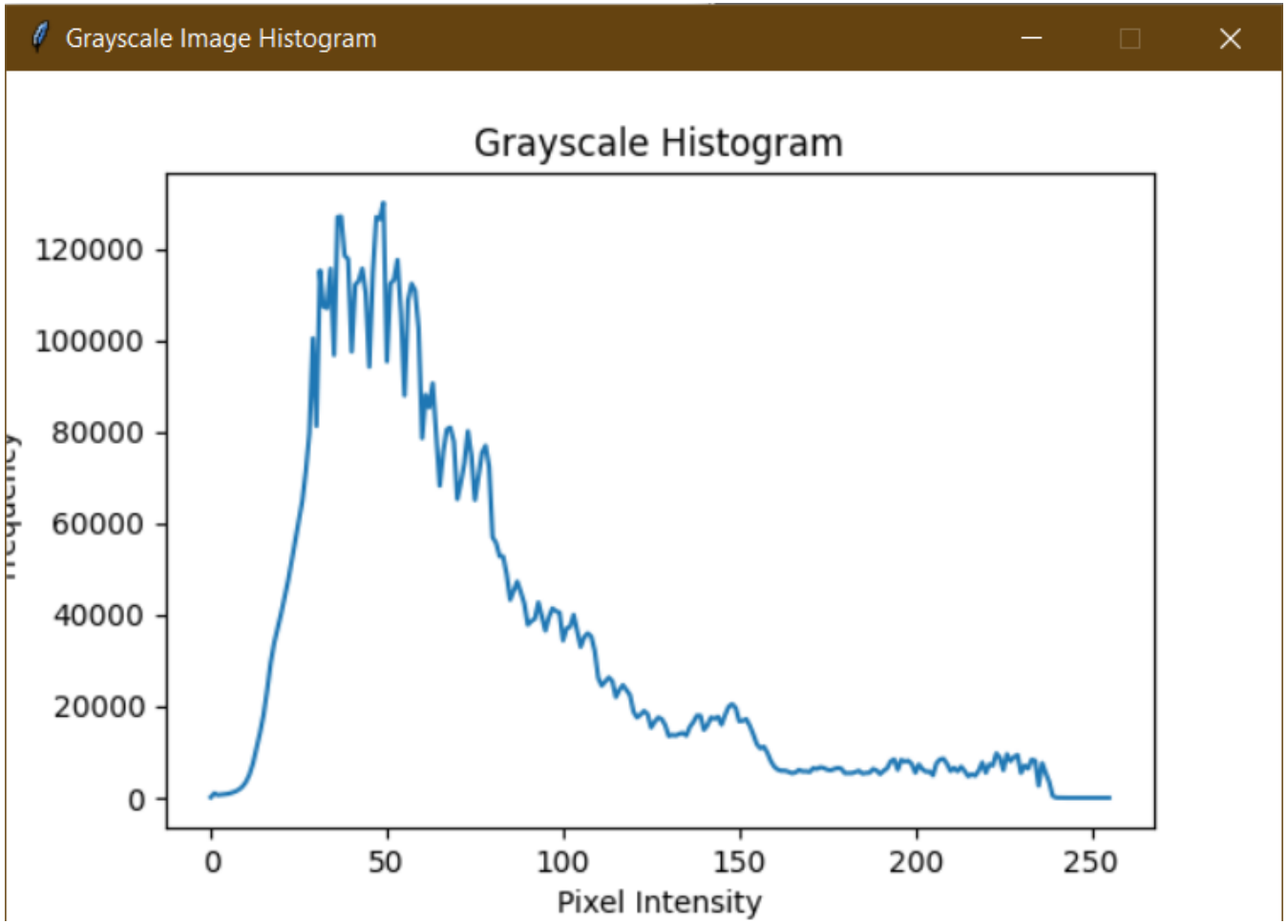
There’s a histogram for gray levels and a histogram for RGB levels.

They can be viewed by clicking the indicated buttons.



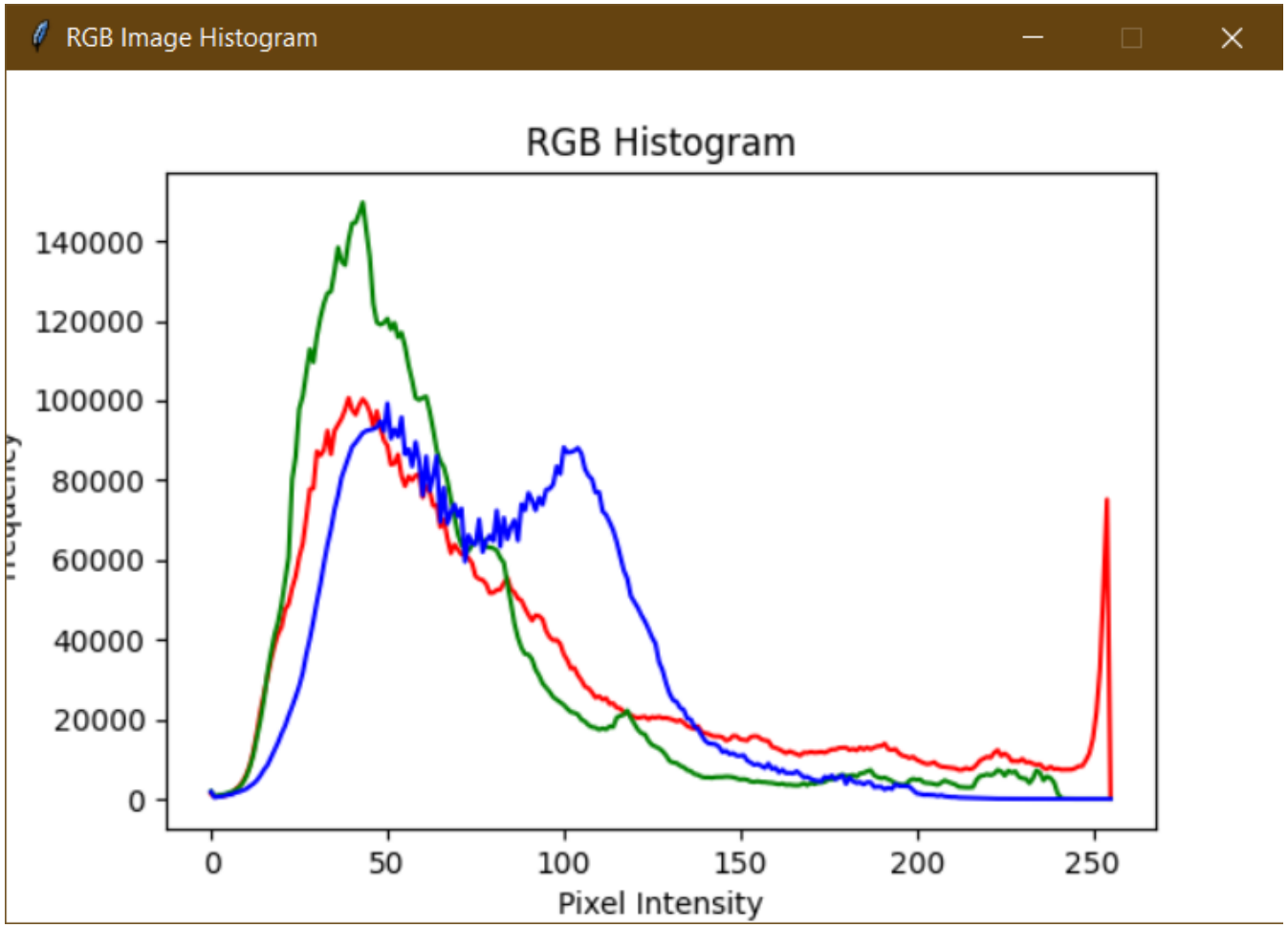
HISTOGRAM - GRAYSCALE

The grayscale histogram visualizes the frequency of each pixel's gray level intensity value.



HISTOGRAM - RGB

The RGB histogram visualizes the frequency of each intensity value in each of the red, green, and blue colors in the image.



COMPRESSION

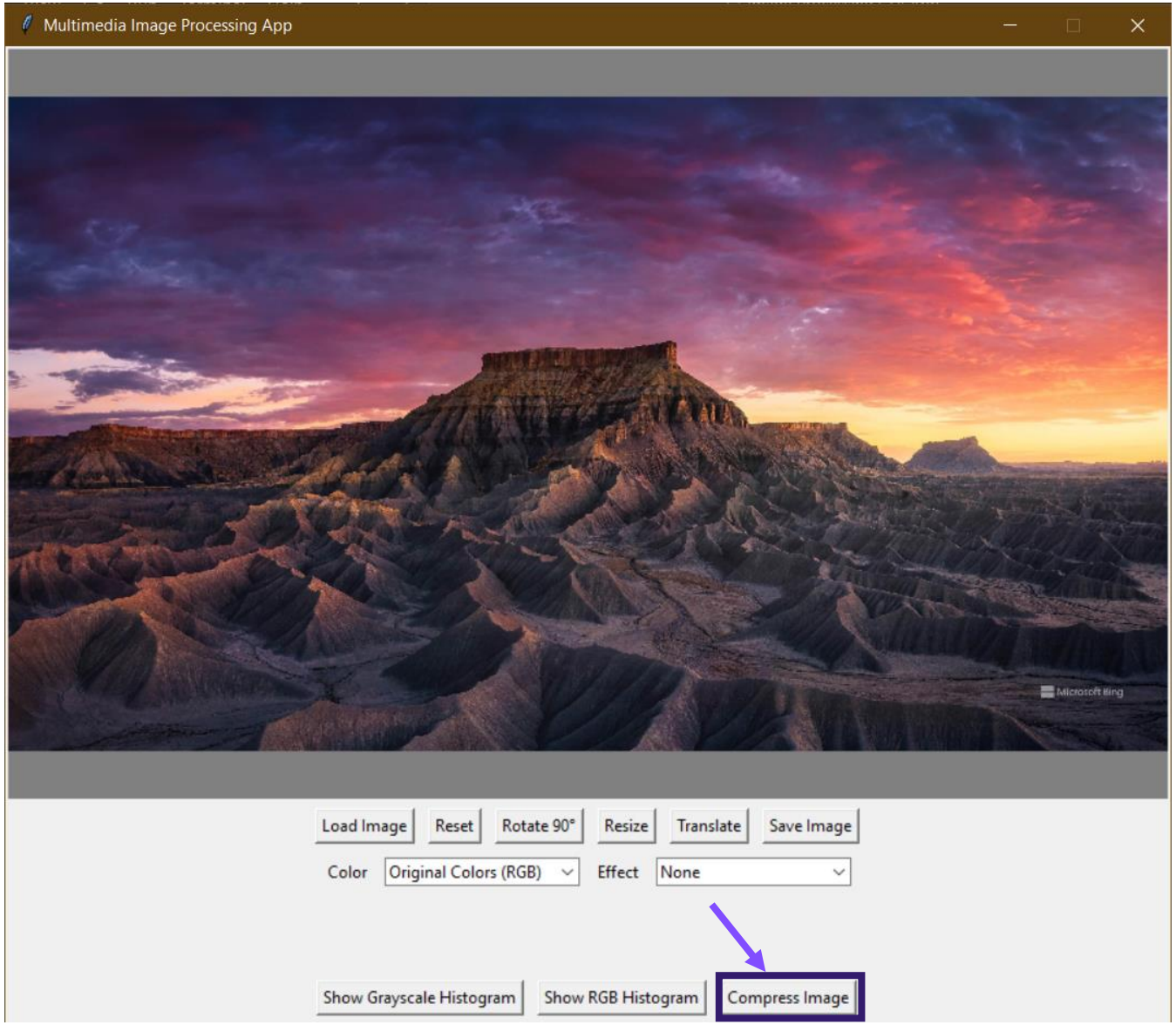
COMPRESSION

Compression is used to reduce the image's storage space; by reducing the number of bits the image can consume from the memory.

Compression has multiple techniques:

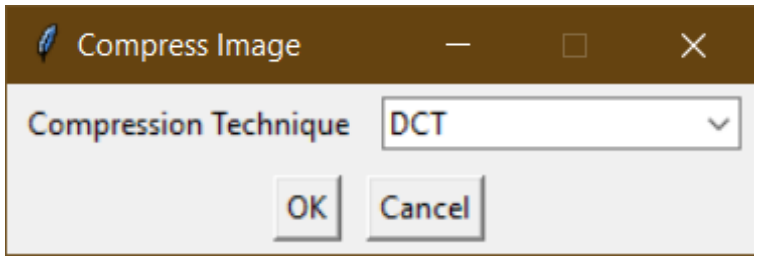
- DCT
- DWT
- Haar DWT
- Wavedec

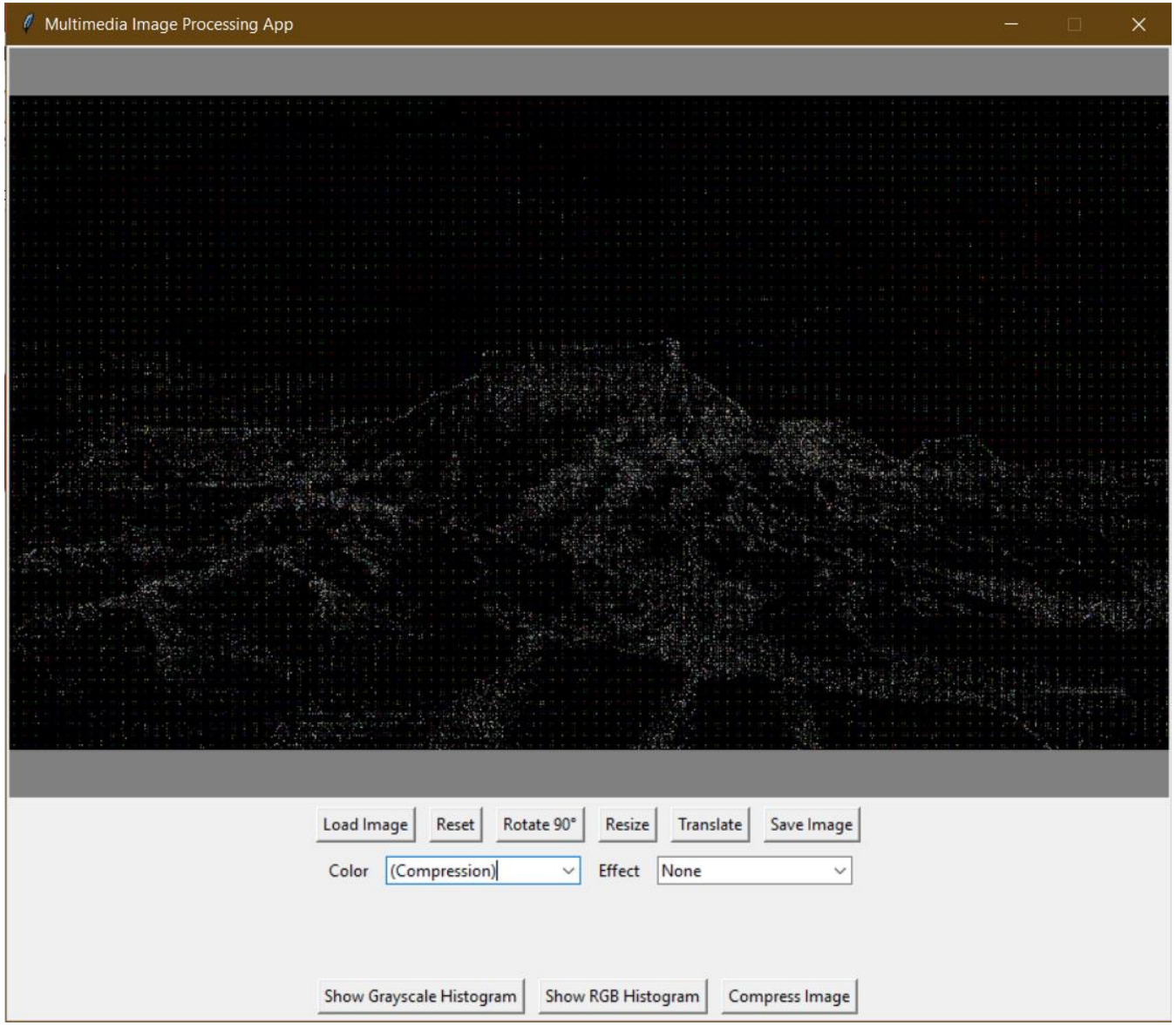
Click the indicated button to apply compression.



COMPRESSION - DCT

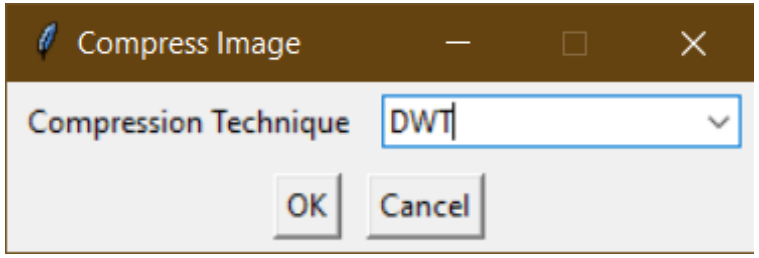
Discrete Cosine Transform (DCT) can be applied on color or grayscale images.

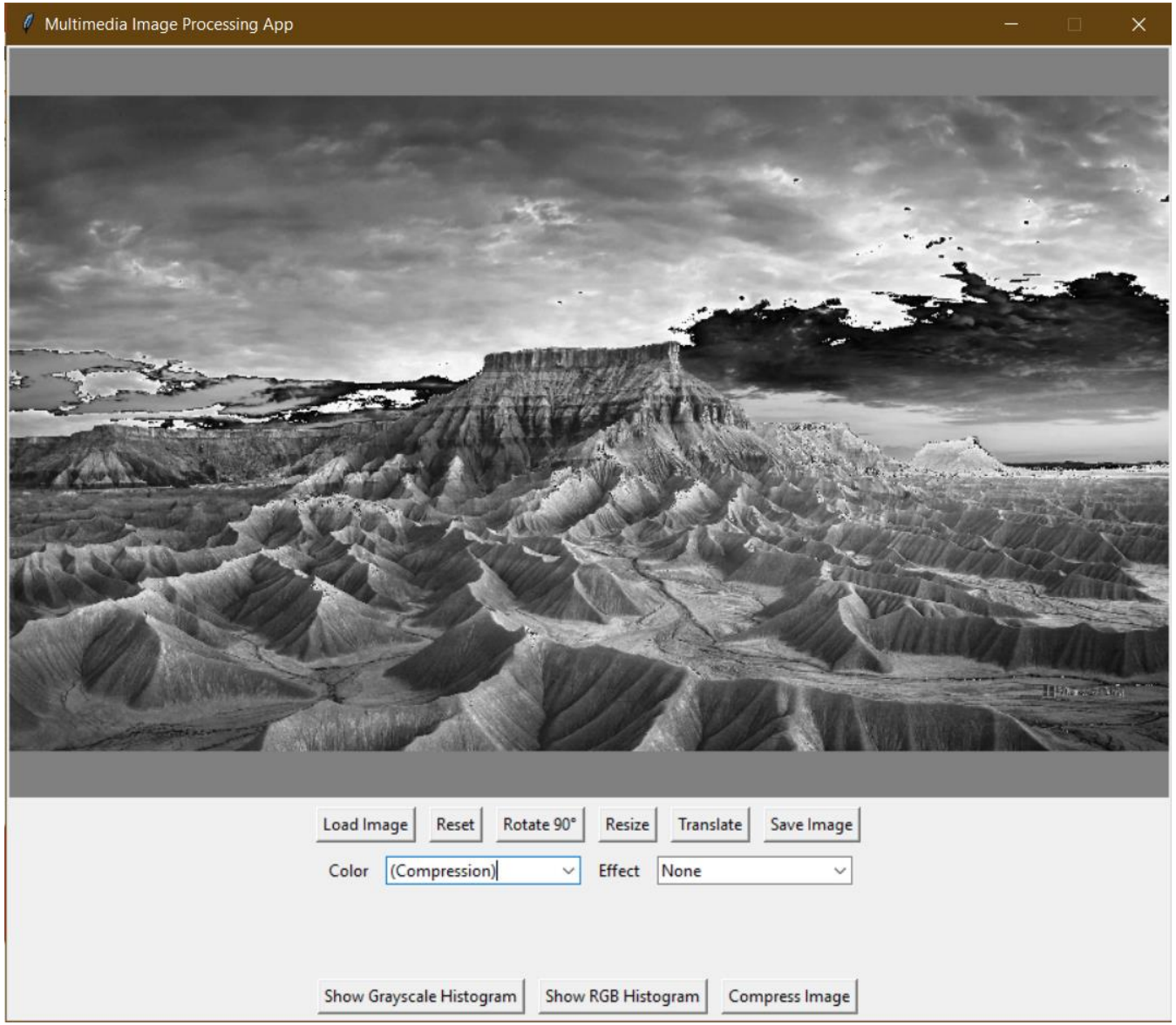




COMPRESSION - DWT

Discrete Wavelet Transform (DWT) can be only applied on grayscale images.

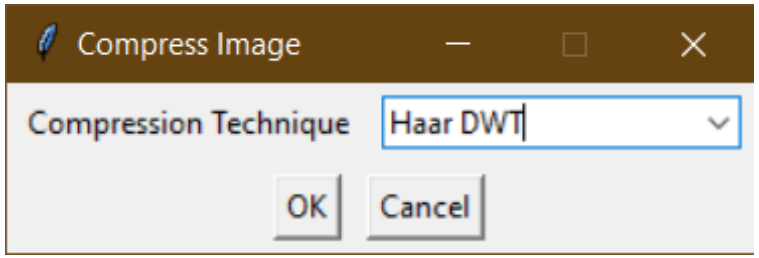


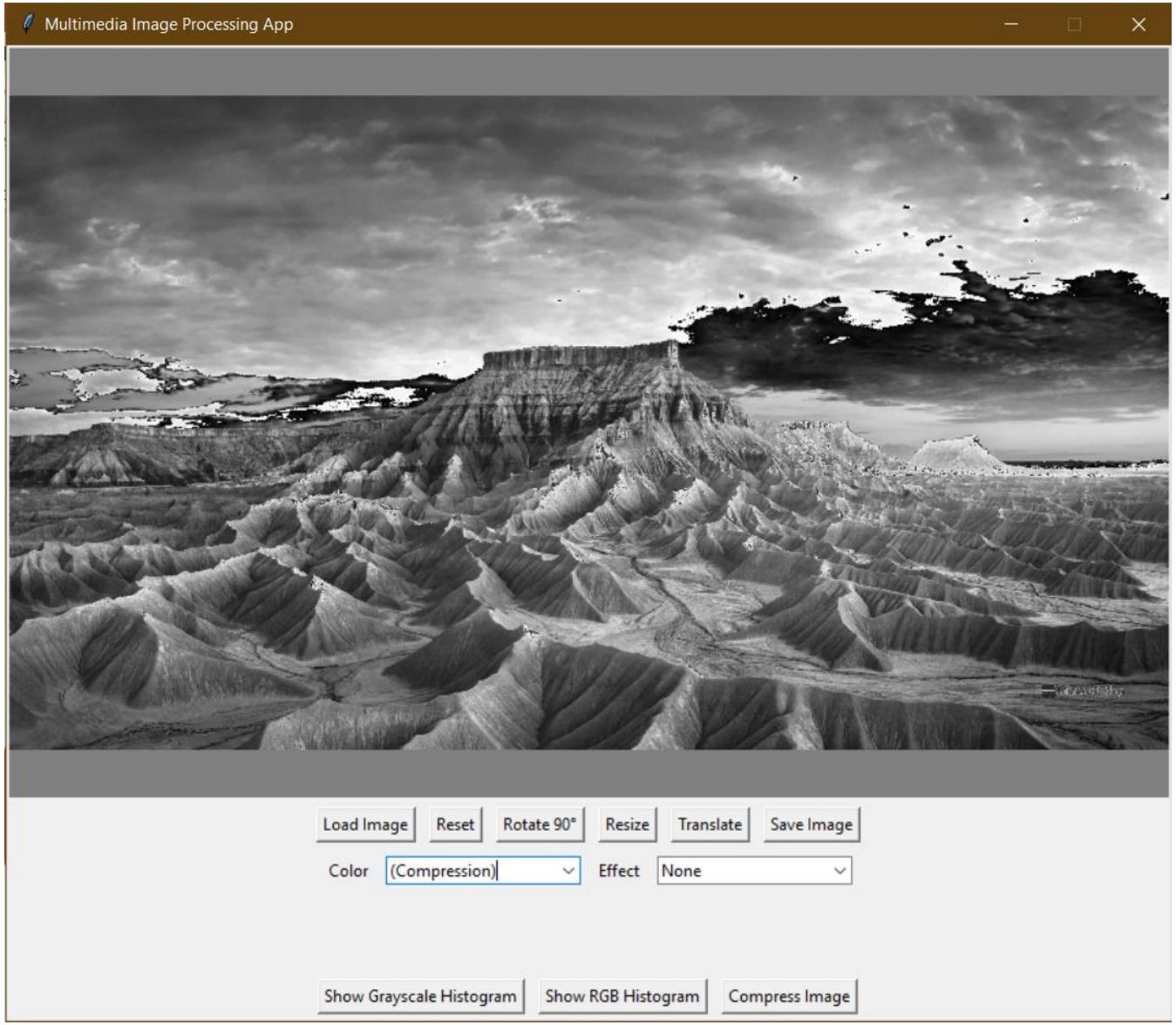


COMPRESSION – HAAR DWT

There’s no noticeable difference between DWT and Haar 1D DWT

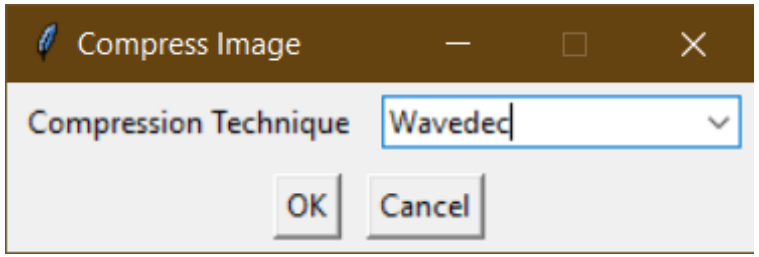
Haar 1D Discrete Wavelet Transform (DWT) is also applied on grayscale images only.

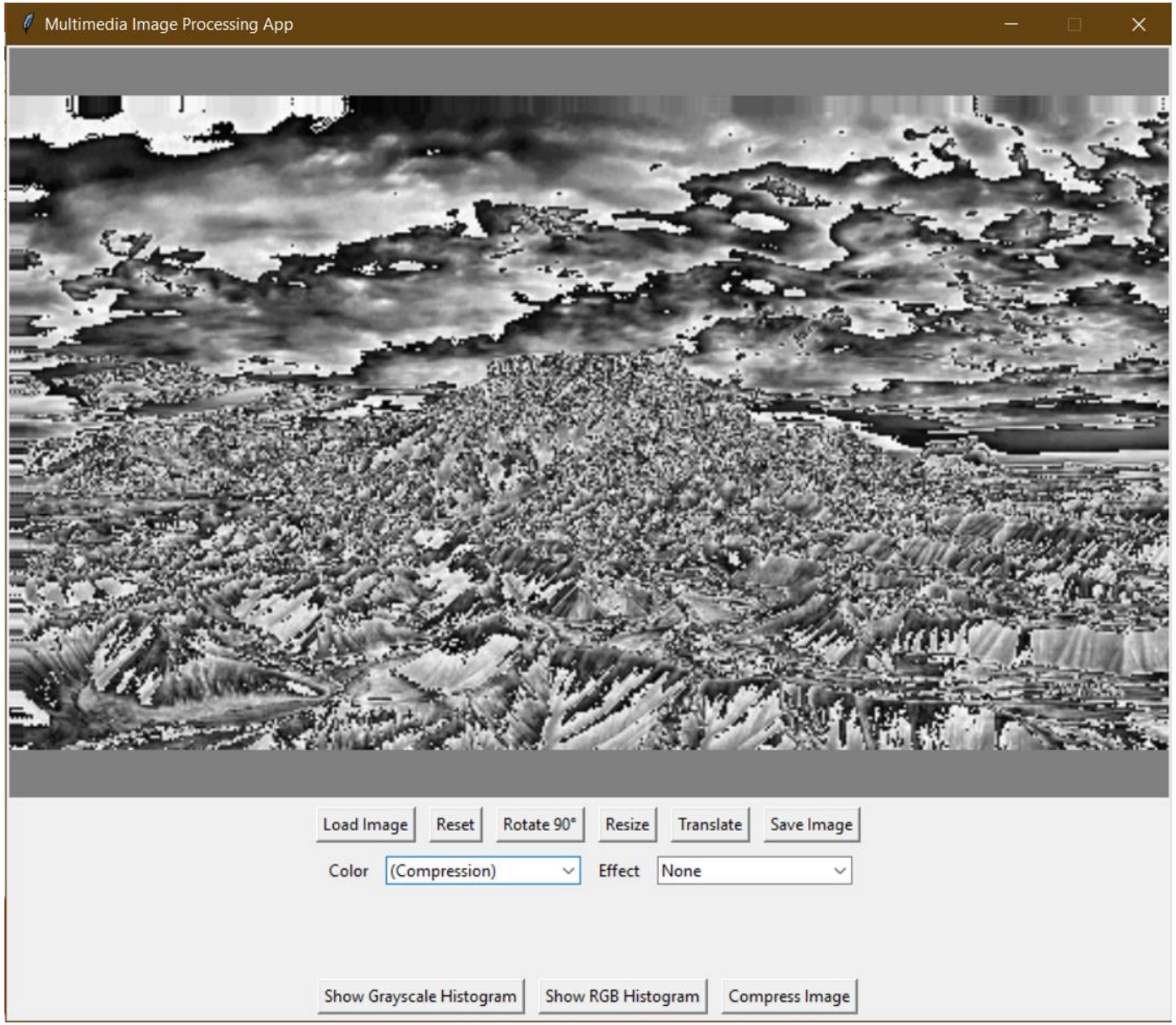




COMPRESSION – WAVEDEC

Wavedec is also applied on grayscale images only.



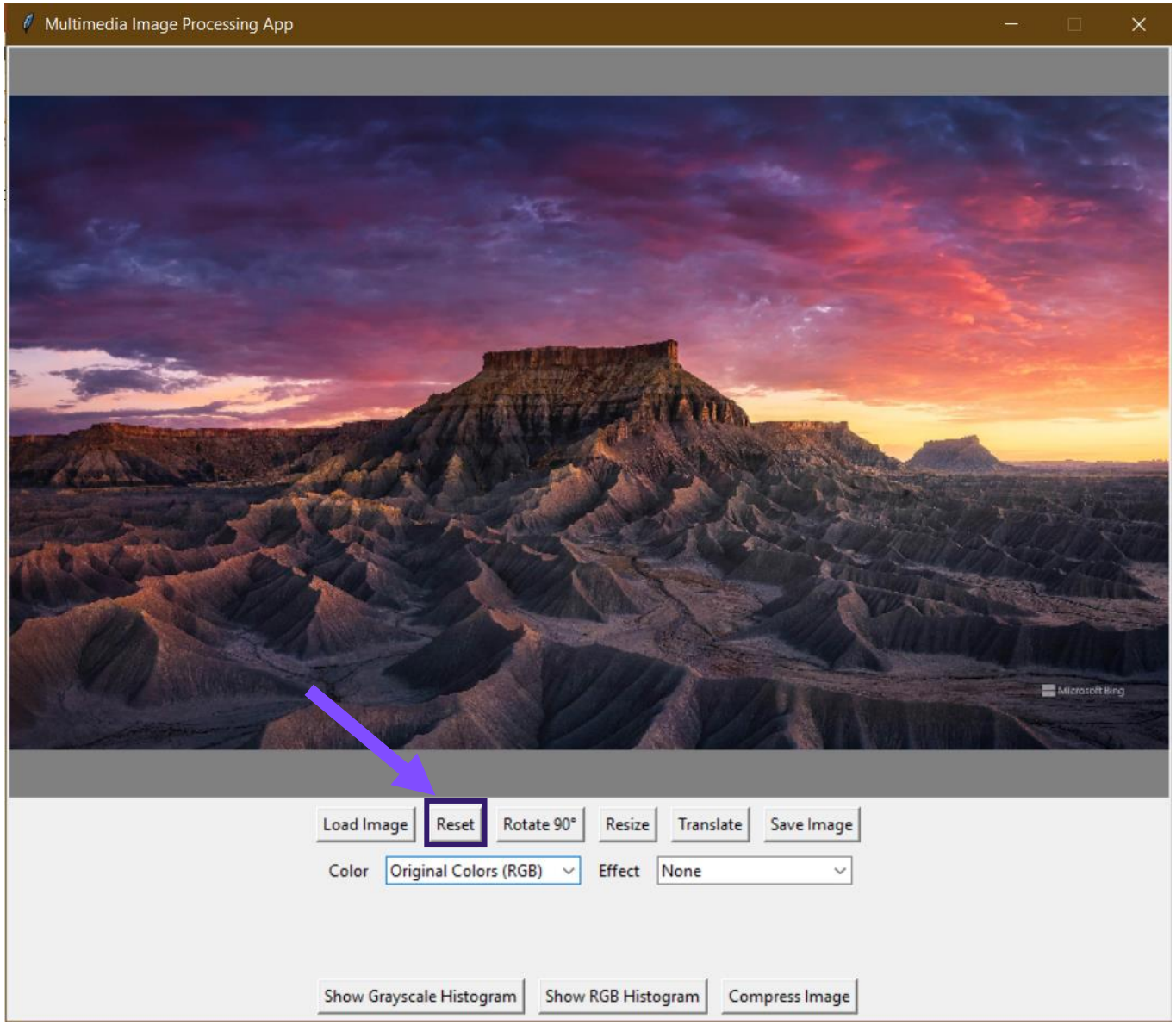


RESET & SAVE

RESET IMAGE

The “Reset” button restores the original state of the image.

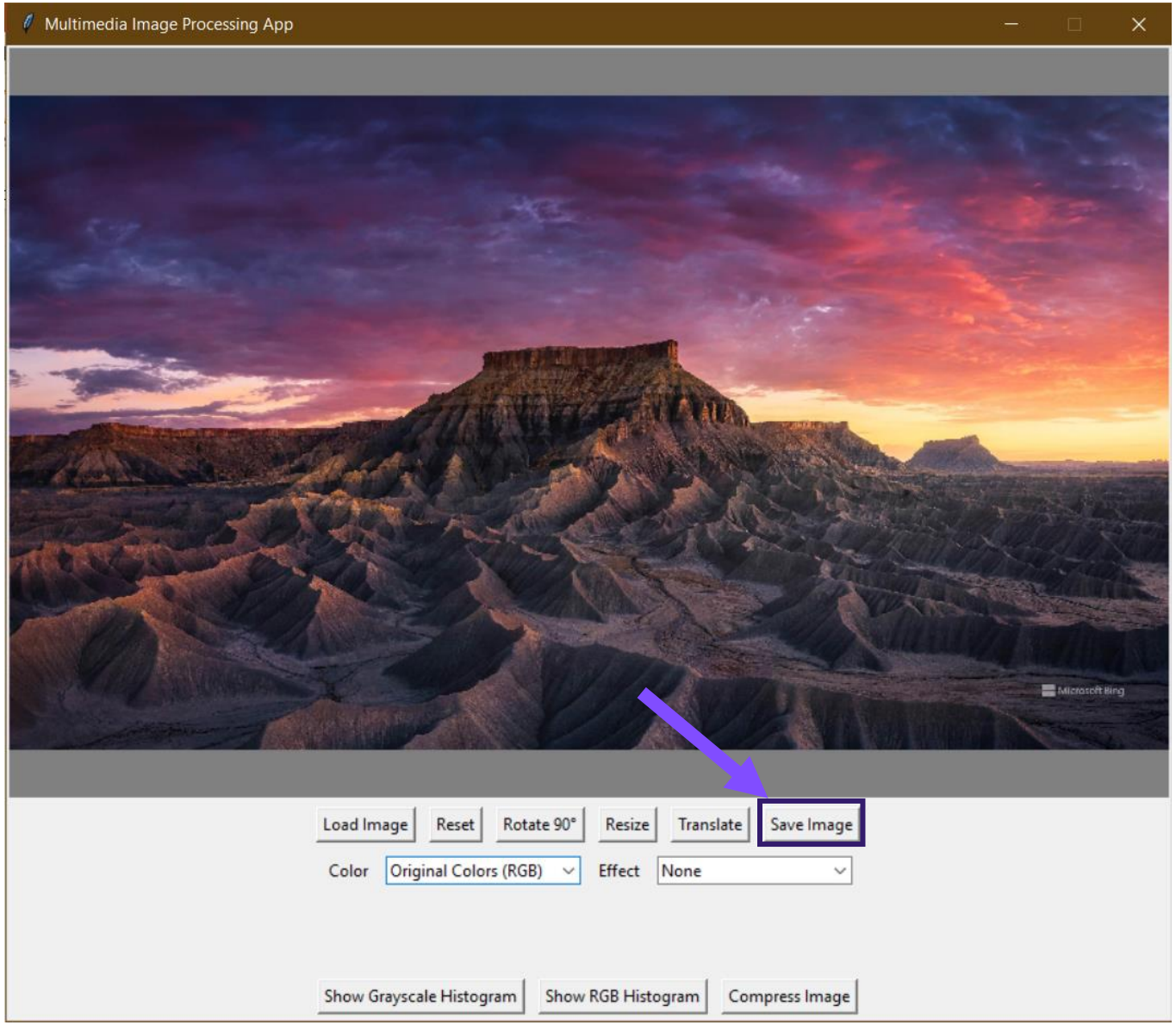
Reverts the image to how it looked like when it was loaded in the beginning.



SAVE IMAGE

Finished processing the image and want to save your work?

Click the “Save Image” button to save your processed image on your computer’s storage.



THANK YOU