COMPUTER VISION

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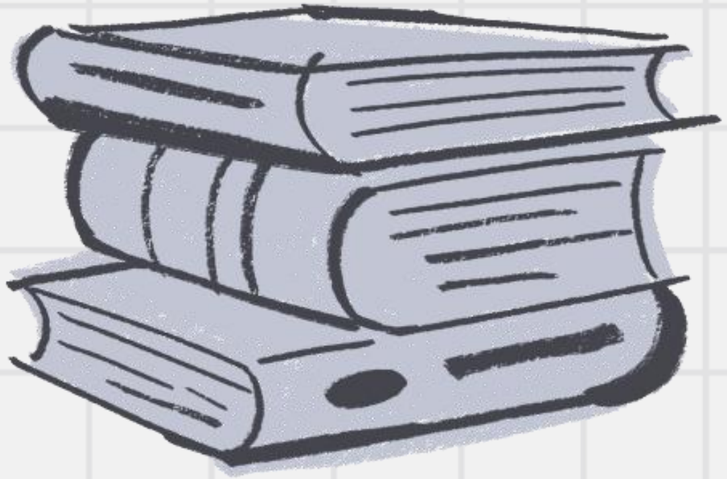
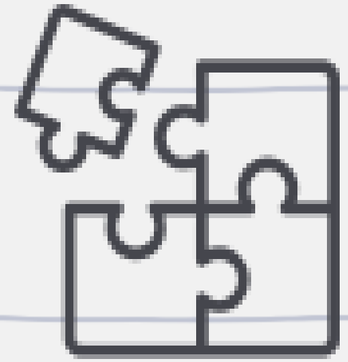
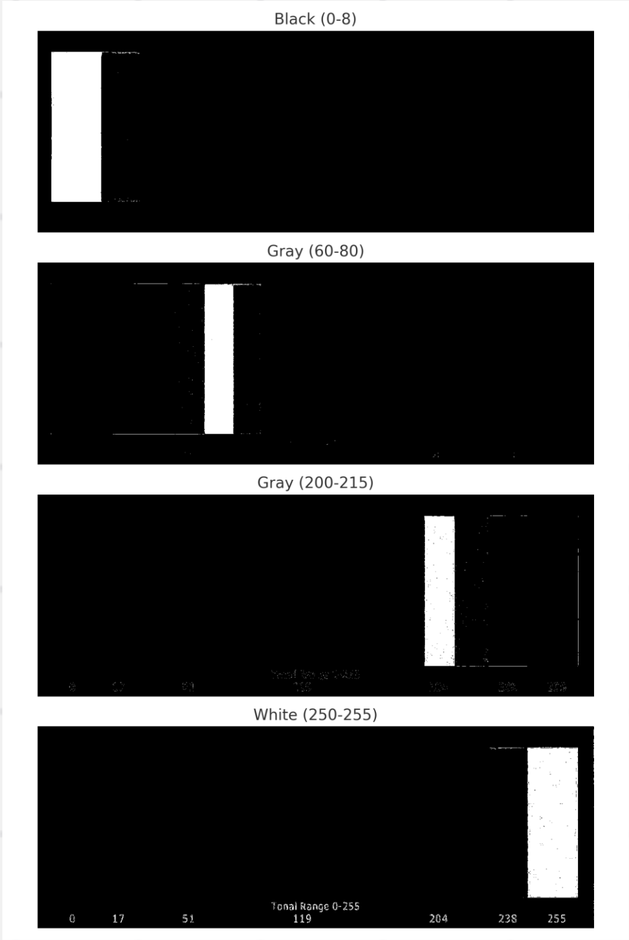


01

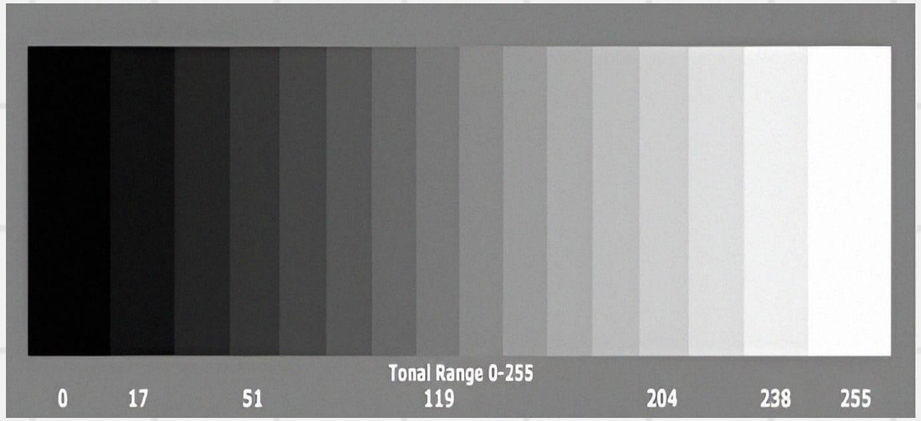


Threshold

What is Threshold



Thresholding is a fundamental technique in computer vision used to detect objects by extracting a specific color range from an image. It works by setting pixel intensity limits to separate the desired object from the background.



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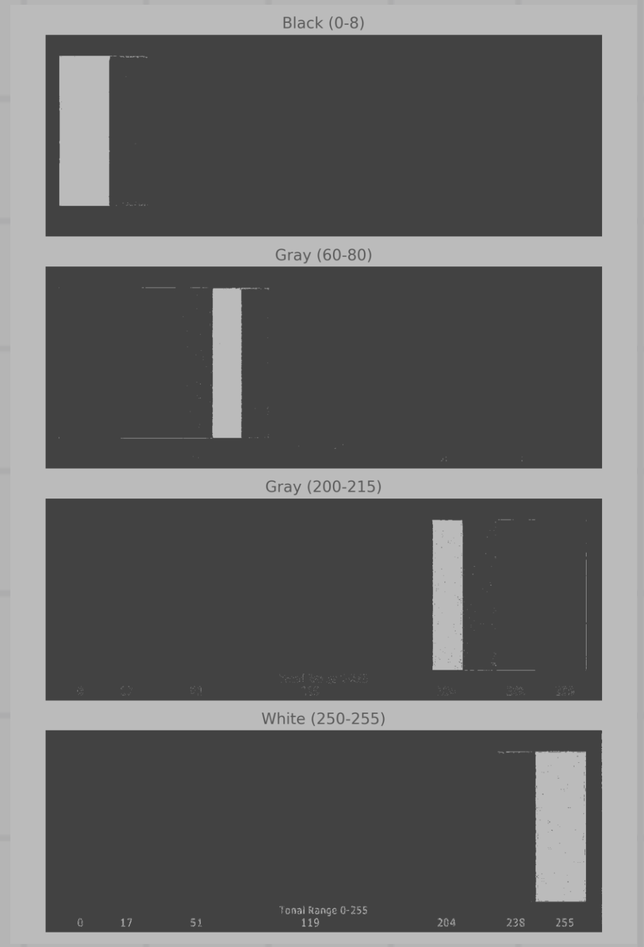

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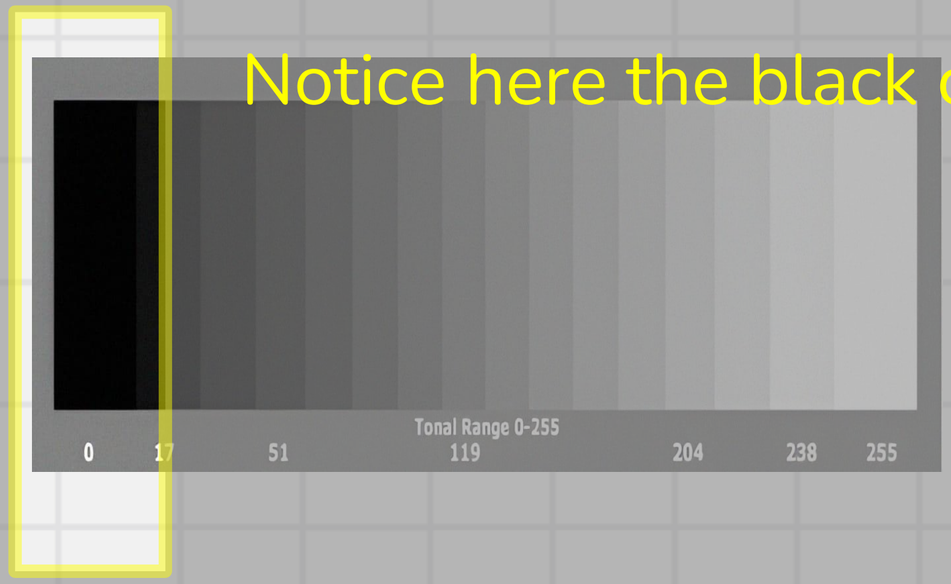

Notice here the black colour range

What is Threshold

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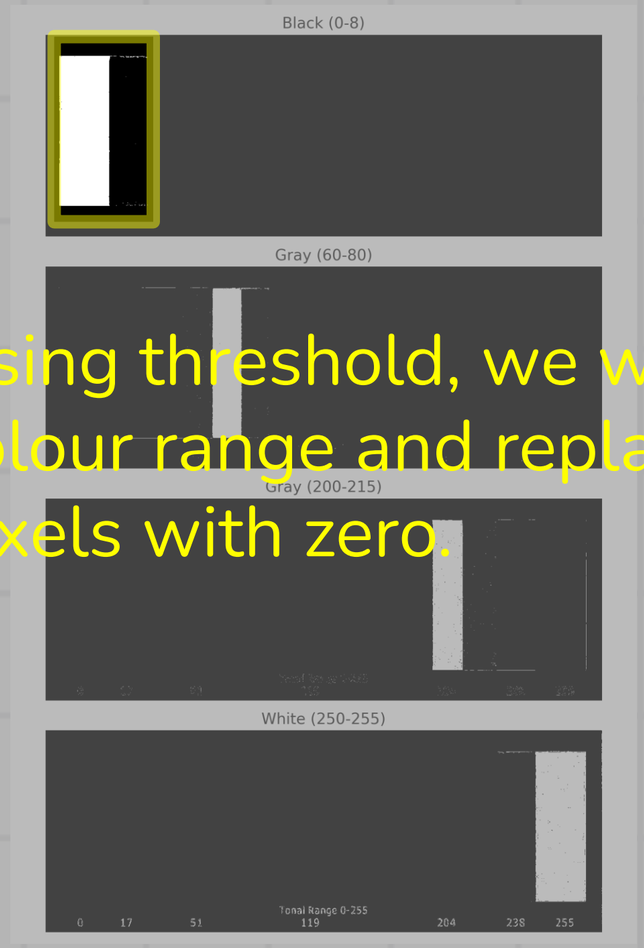
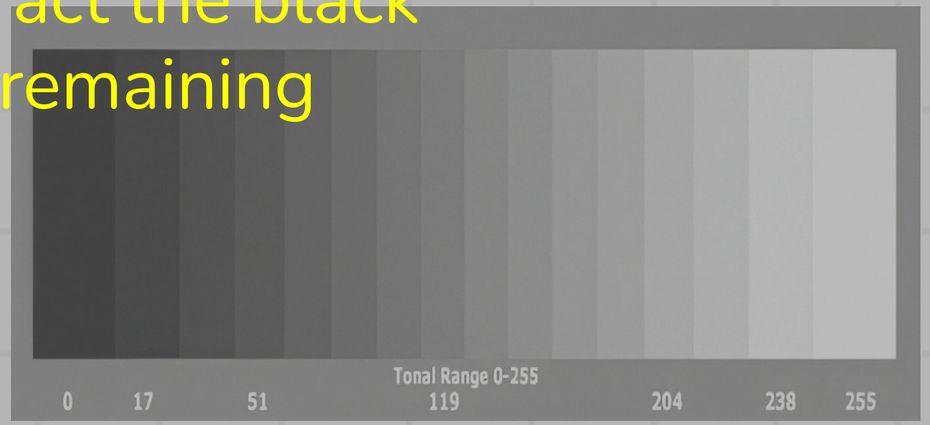
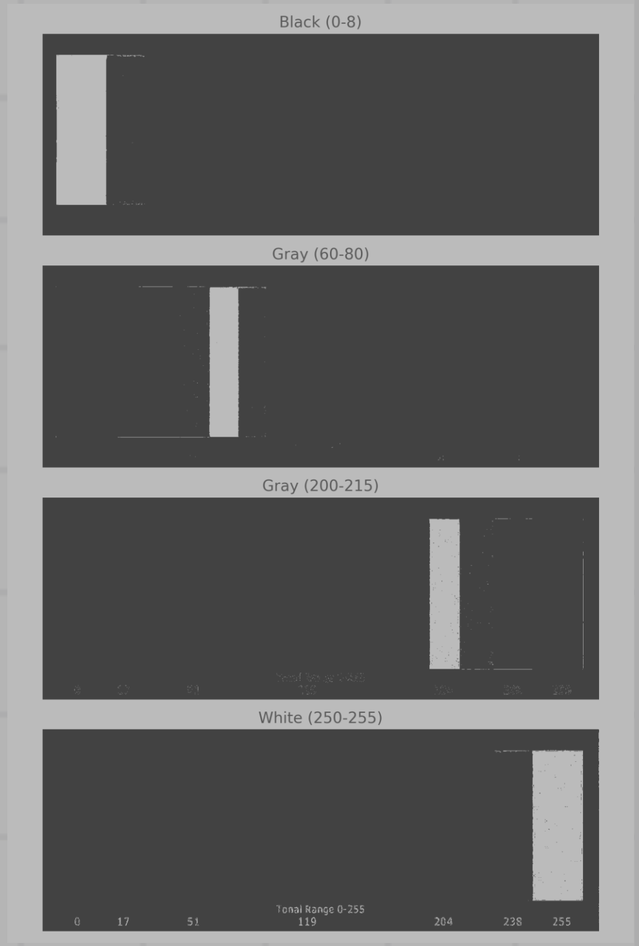


Using threshold, we will extract the black colour range and replace all remaining pixels with zero.



What is Threshold



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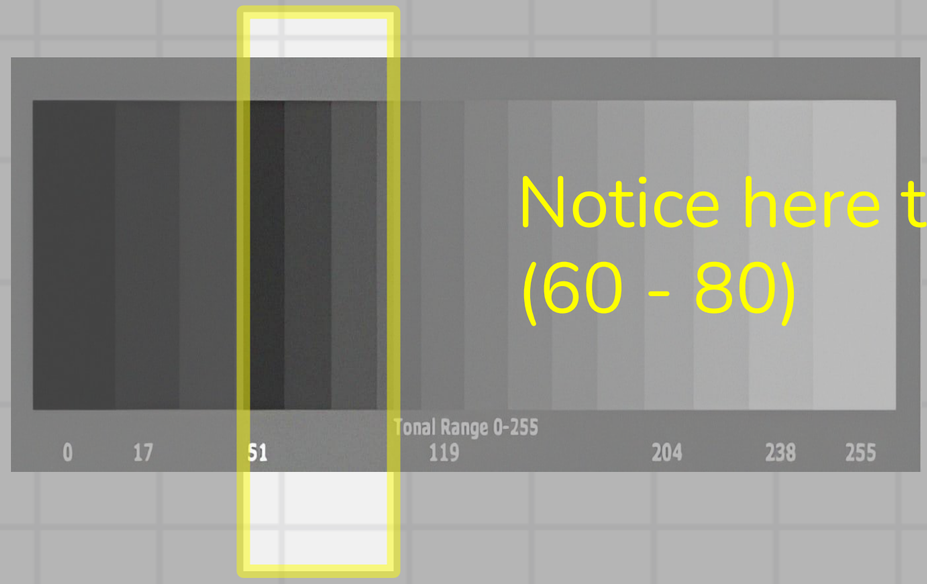
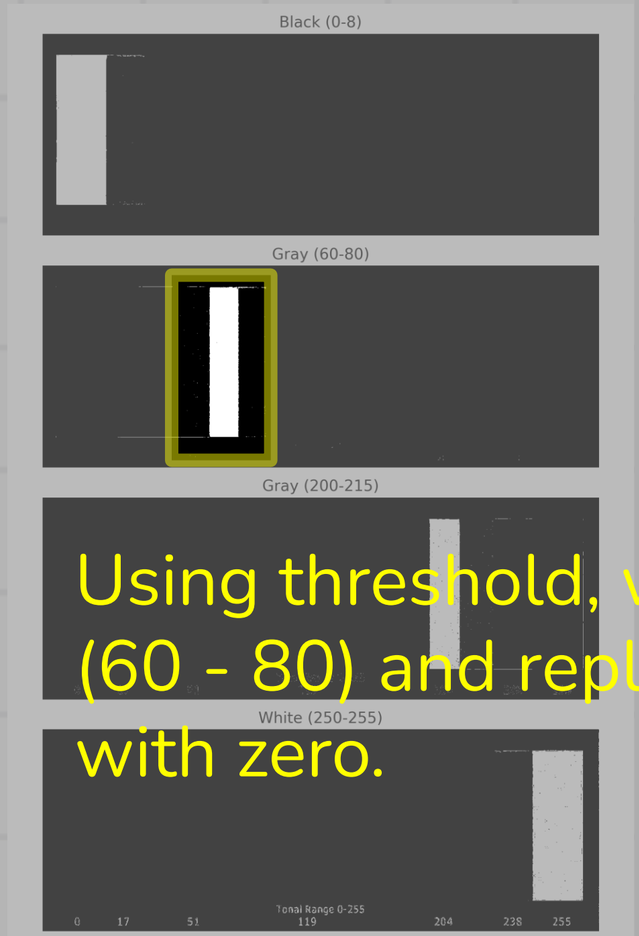


Notice here the range between (60 - 80)

What is Threshold



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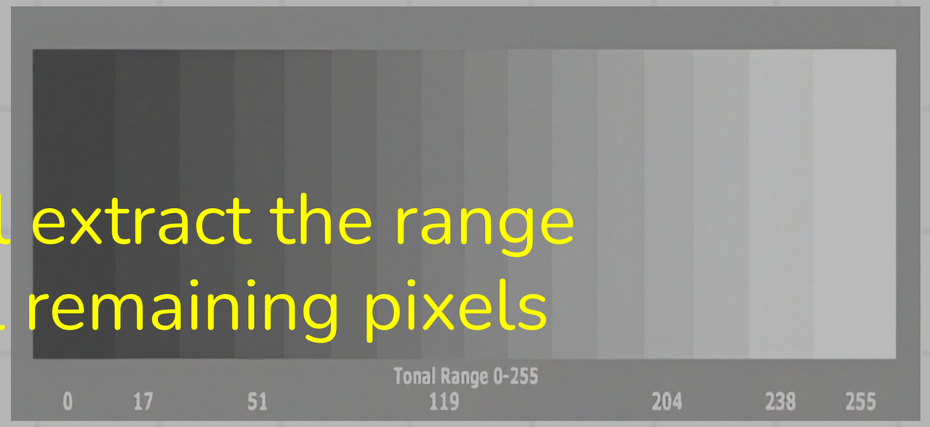
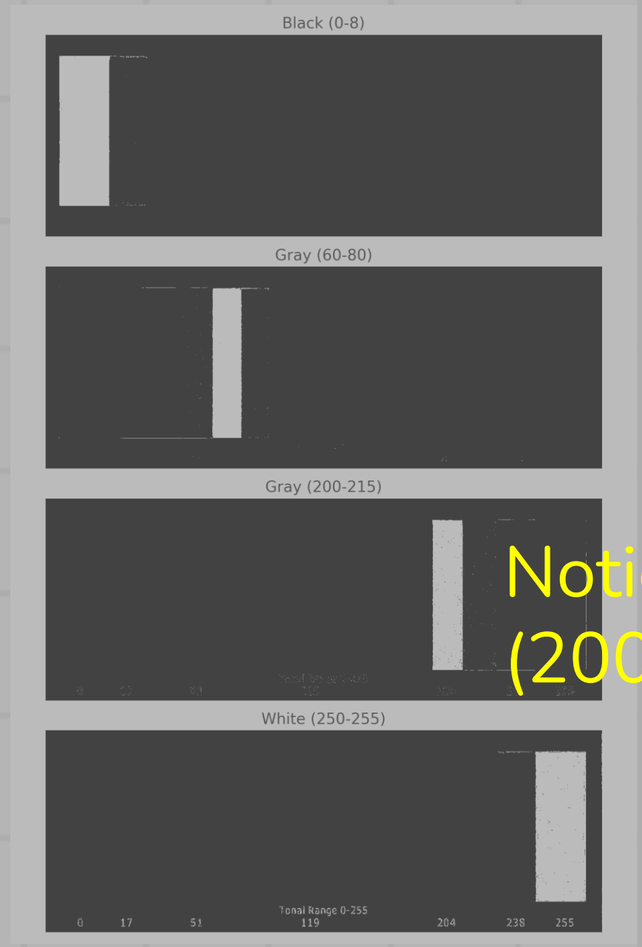


Using threshold, we will extract the range (60 - 80) and replace all remaining pixels with zero.

What is Threshold



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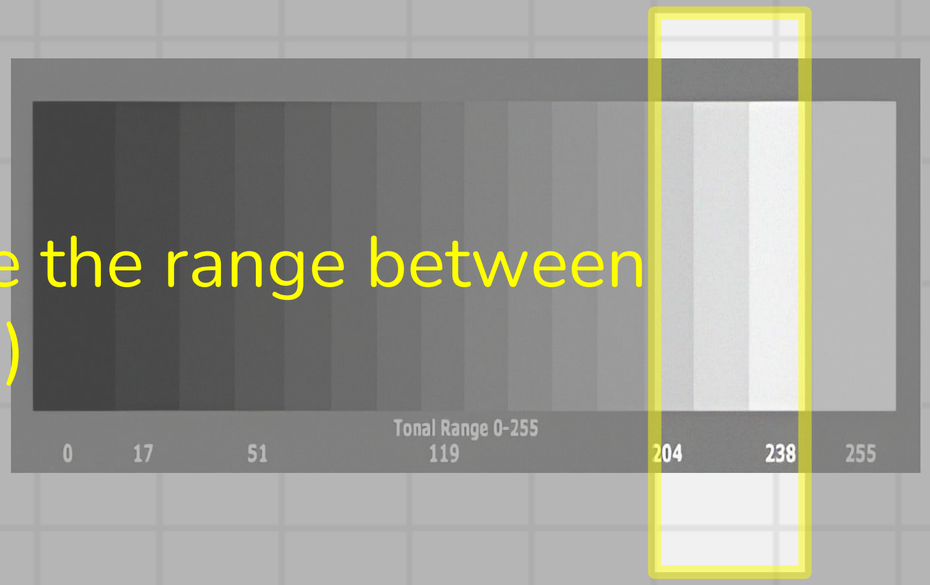
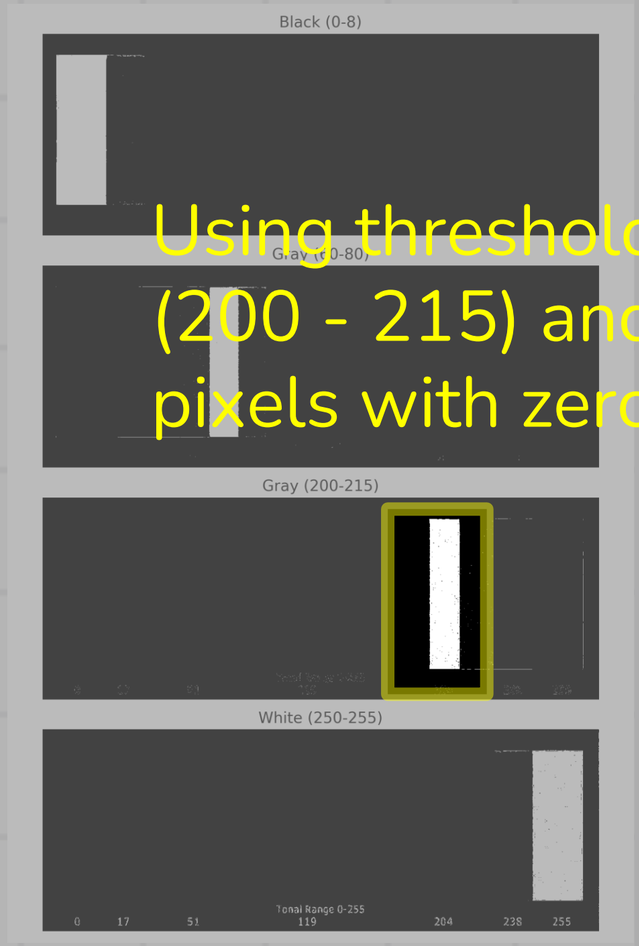


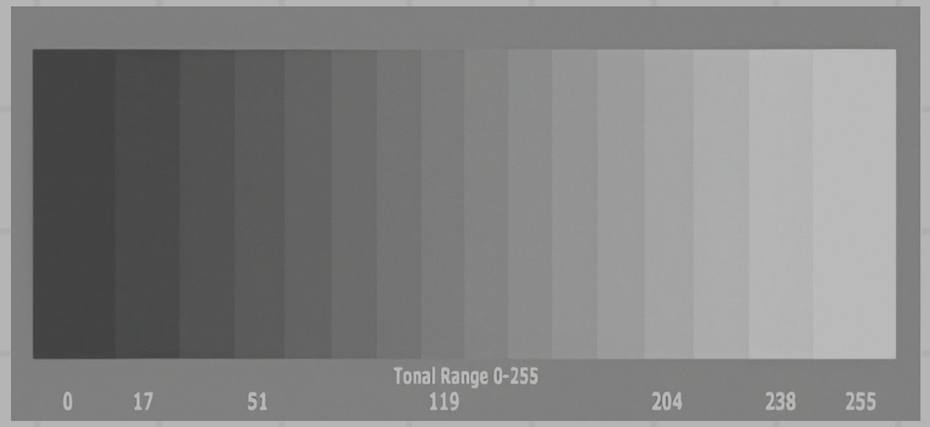
Notice here the range between (200 - 215)

What is Threshold

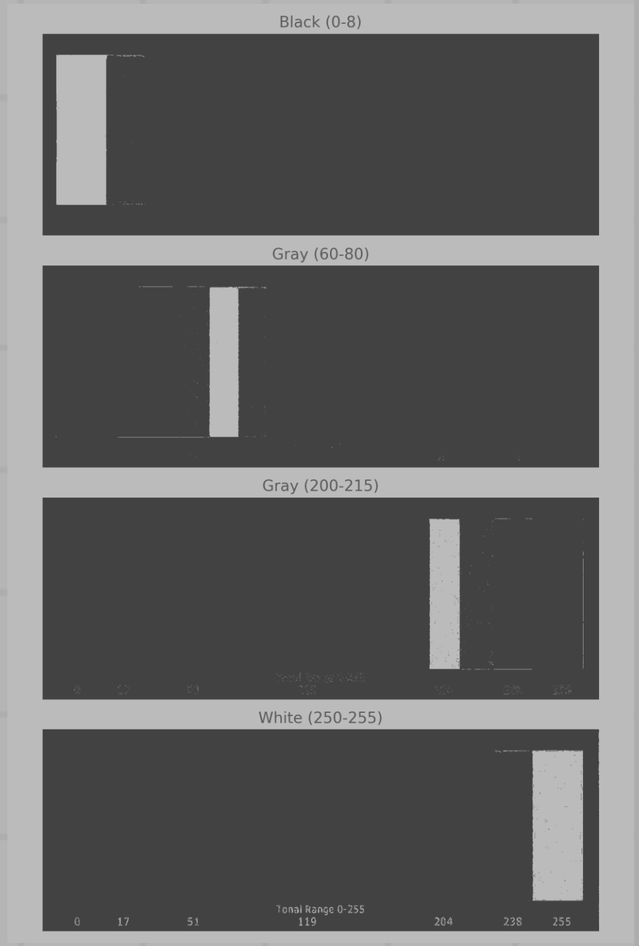
Thresholding is a fundamental technique in computer vision used to detect objects by extracting a specific color range from an image. It works by setting pixel intensity limits to separate the desired object from the background.



Using threshold, we will extract the range (200 - 215) and replace all remaining pixels with zero.



What is Threshold



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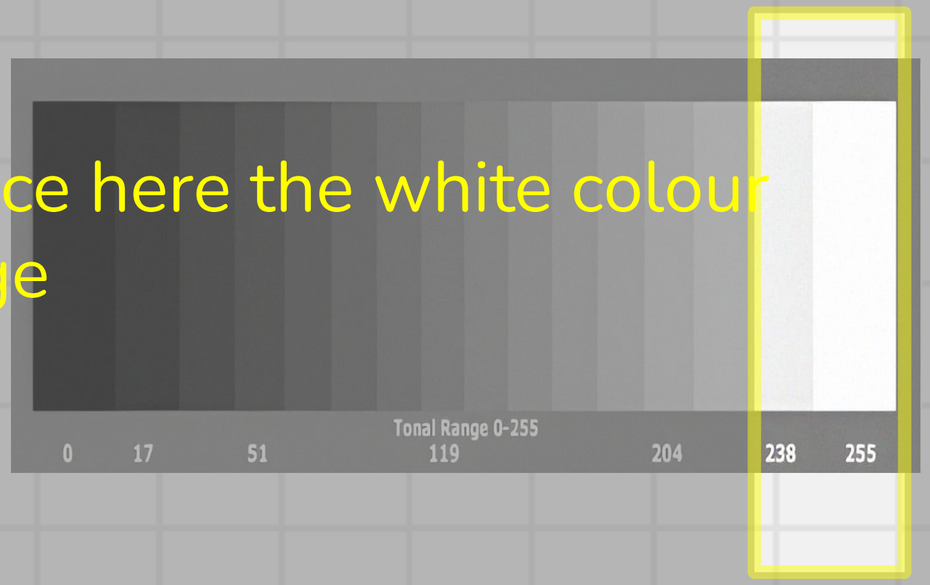

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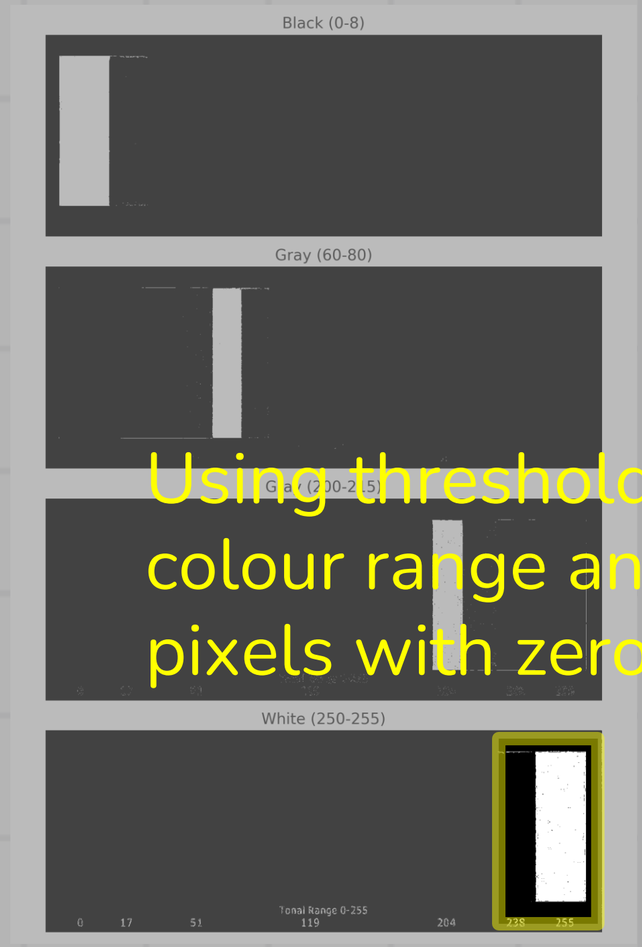

Using threshold, we will extract the white colour range and replace all remaining pixels with zero.

02

Color Threshold

Color Threshold

Color thresholding is one of the most important techniques for object detection. It works by extracting pixels that fall within a specific color range while ignoring all other pixels. This helps in identifying and isolating objects based on their color.

Color Threshold

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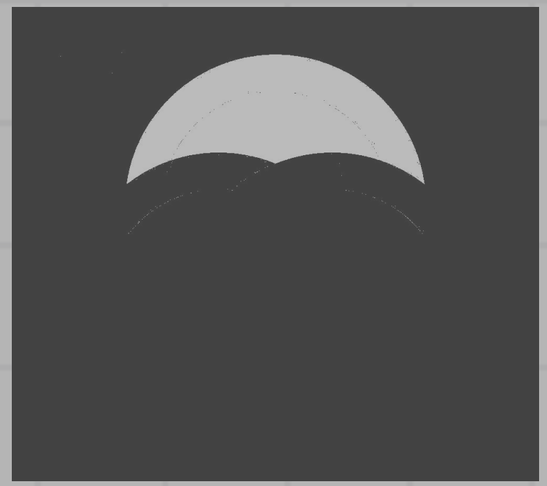
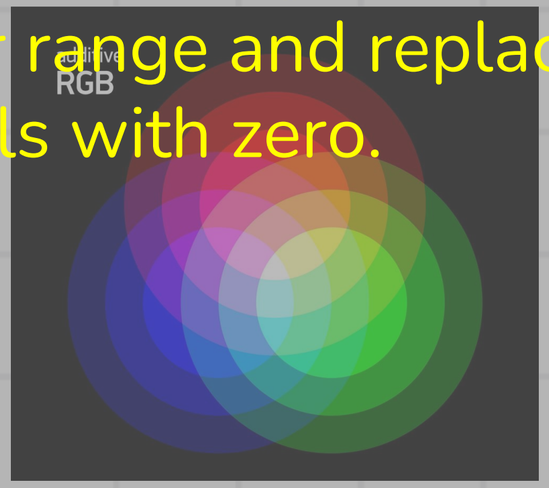
Notice here the RED colour ranges



Color Threshold

Color thresholding is one of the most important techniques for object detection. It works by extracting pixels that fall within a specific color range while ignoring all other pixels. This helps in identifying and isolating objects based on their color.

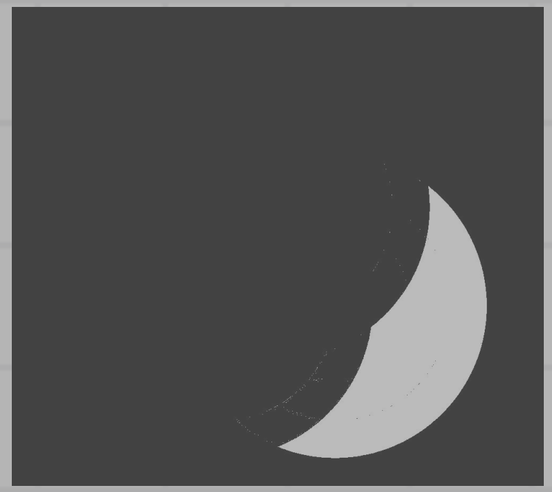
Using color thresholding, we will extract the RED colour range and replace all remaining pixels with zero.



Color Threshold

Color thresholding is one of the most important techniques for object detection. It works by extracting pixels that fall within a specific color range while ignoring all other pixels. This helps in identifying and isolating objects based on their color.

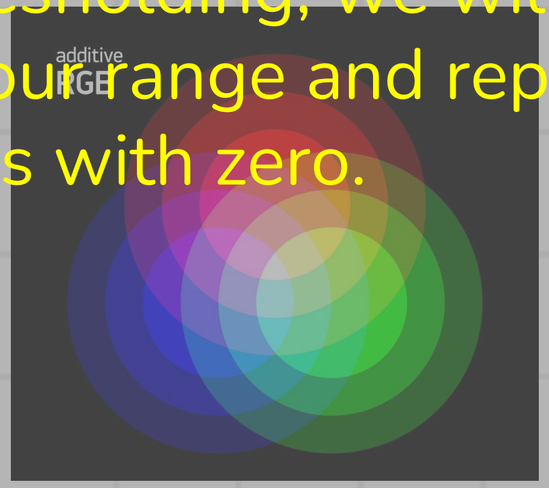
Notice here the GREEN colour ranges



Color Threshold

Color thresholding is one of the most important techniques for object detection. It works by extracting pixels that fall within a specific color range while ignoring all other pixels. This helps in identifying and isolating objects based on their color.

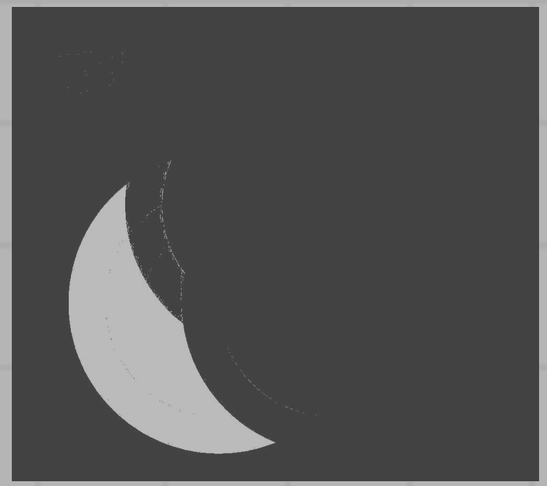
Using color thresholding, we will extract the GREEN colour range and replace all remaining pixels with zero.



Color Threshold

Color thresholding is one of the most important techniques for object detection. It works by extracting pixels that fall within a specific color range while ignoring all other pixels. This helps in identifying and isolating objects based on their color.

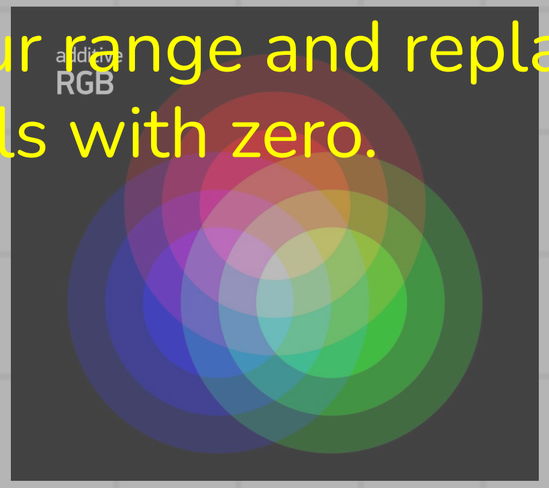
Notice here the BLUE colour ranges

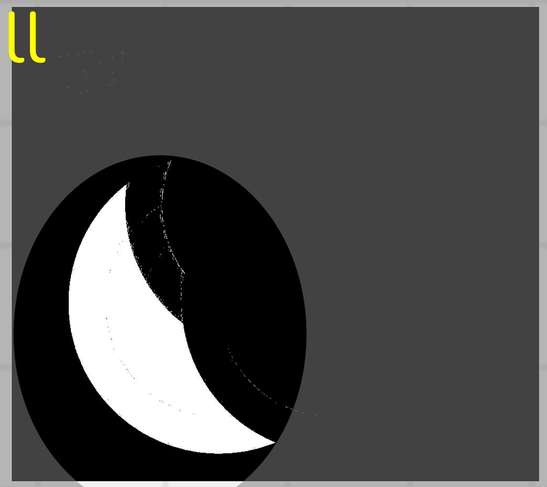


Color Threshold

Color thresholding is one of the most important techniques for object detection. It works by extracting pixels that fall within a specific color range while ignoring all other pixels. This helps in identifying and isolating objects based on their color.

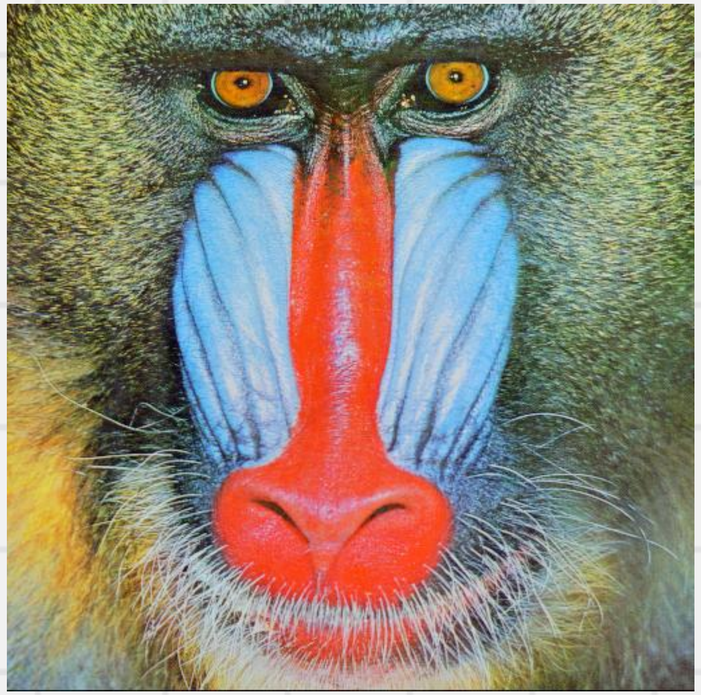
Using color thresholding, we will extract the BLUE colour range and replace all remaining pixels with zero.





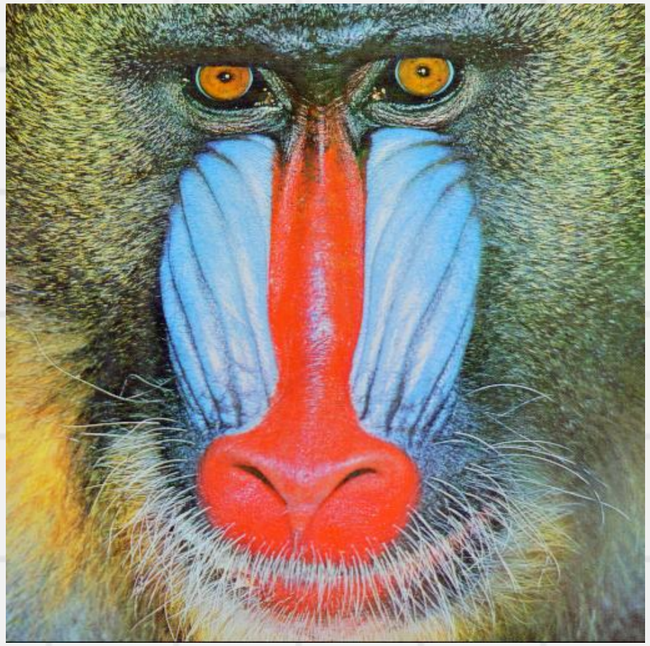
Color Threshold

Now, I need to show you some cases for color threshold and observe the results? 🔎🤔



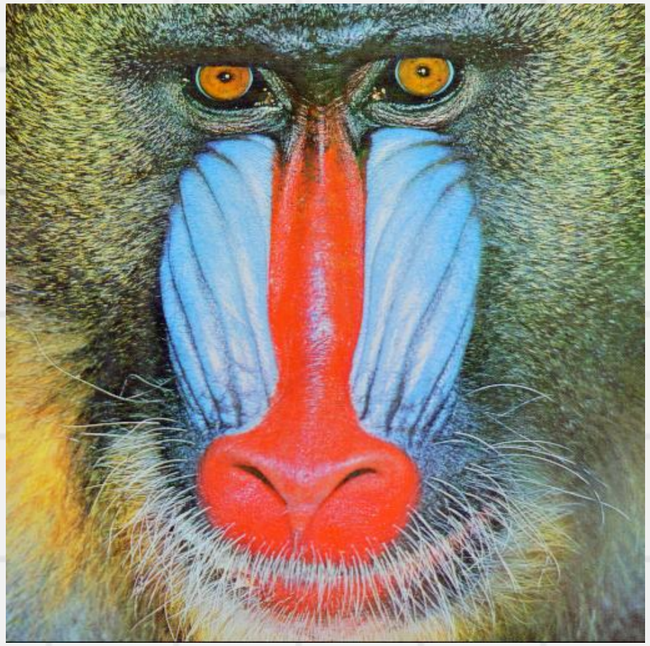
Color Threshold

In this experiment, I tried to extract the chimpanzee's nose. However, you may notice that some pixels from the nose are missing, while other pixels outside the nose have been included in the extracted region. Now, the question is: why did this happen, and how can we fix it? 🤔

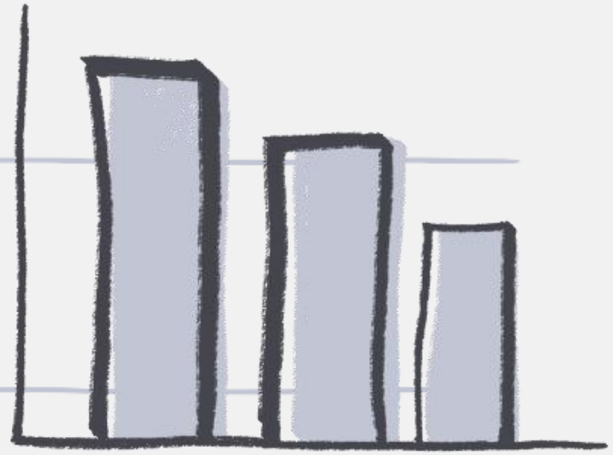


Color Threshold

This happened because of the image format. I used the RGB format, which has a major limitation—it cannot accurately capture natural colors due to lighting conditions when the image was taken. Additionally, RGB does not provide information about color saturation, which is crucial for distinguishing natural colors.



03

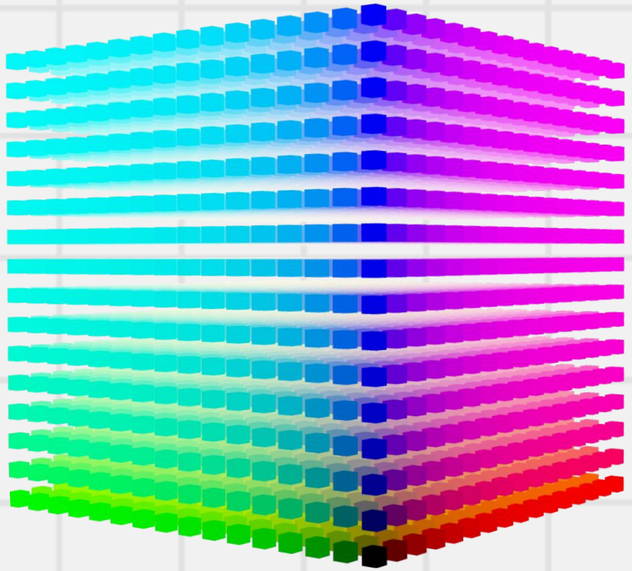


HSV Image Format

HSV Image Format

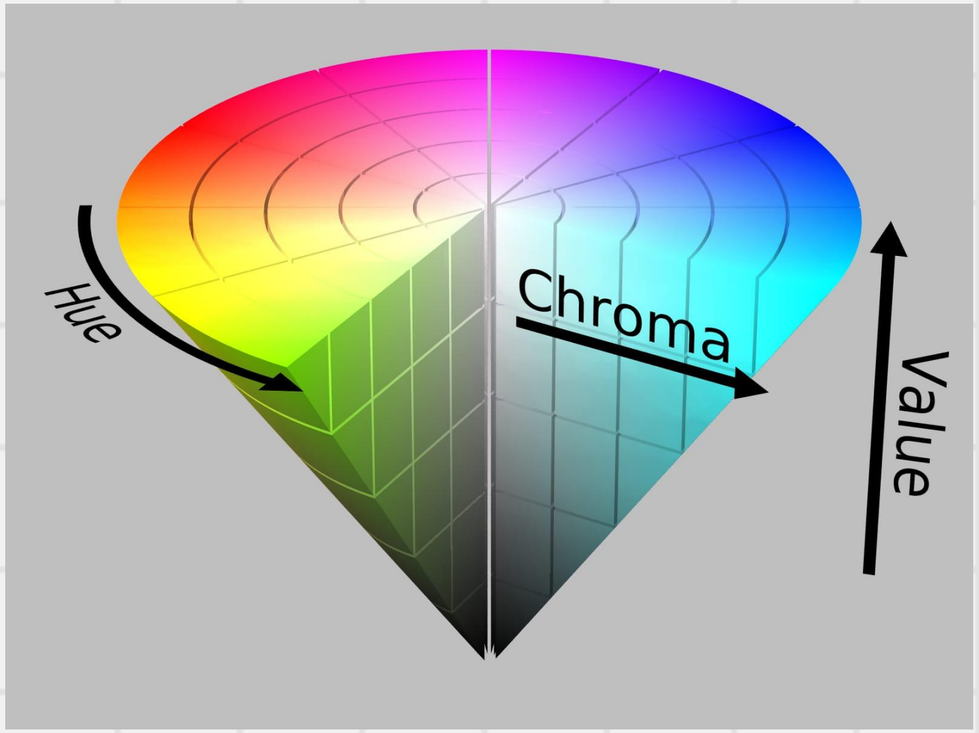
This problem would open to us a backdoor 🚪 🔑
for a new image format called HSV which stands for
HUE SATURATION VALUE

This is the 3D representation for RGB palette. It is a cube which X-axis represents the red and Y-axis represents green and Z-axis for blue. The origin is (0, 0, 0) is the black color and (255, 255, 255) is the white color



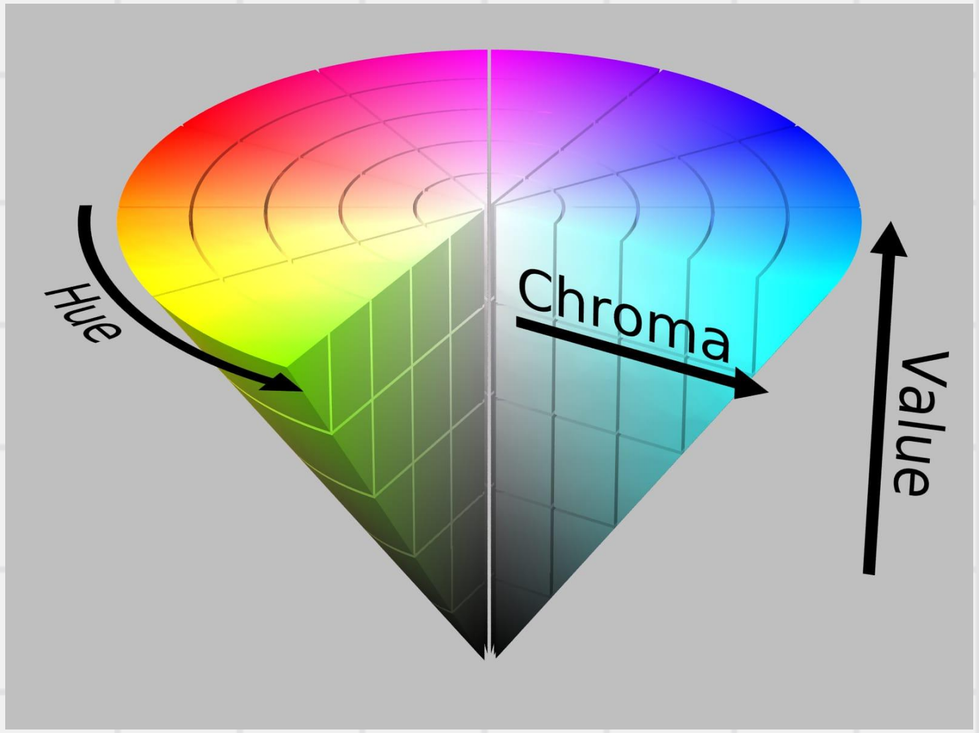
HSV Image Format

This is the 3D representation of the HSV color model 🎨, shaped like a cone 🔻.
The base arc 🌈 represents the rainbow colors, known as Hue (H).



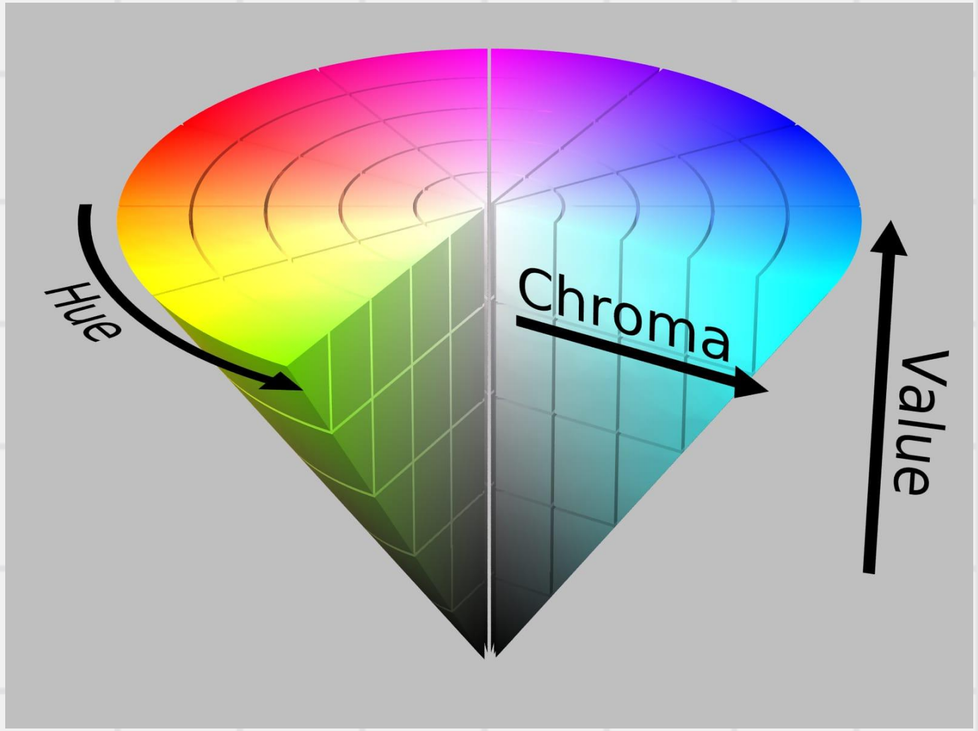
HSV Image Format

The radius of the base controls the Saturation (S) 🎨 how intense the color is which is why the center appears white ⚪ as colors fade.



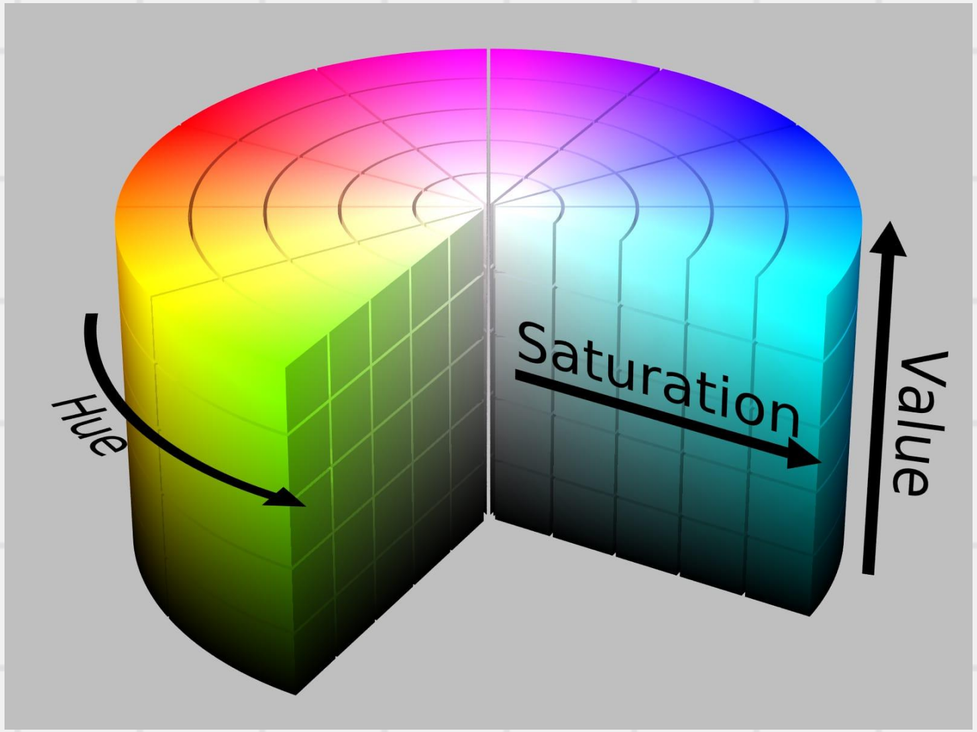
HSV Image Format

The height 📏 of the cone represents the Value (V) 🌼 the brightness of the color. As we move downward ⬇️, colors get darker ⚫ until reaching the black point at the bottom of the cone.



HSV Image Format

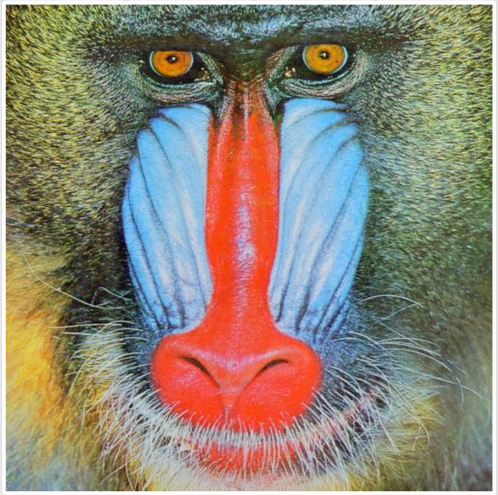
Sometimes, HSV is represented as a cylinder instead of a cone. Both models are similar, but in the cone, colours naturally fade to black at lower brightness levels, whereas the cylinder keeps a uniform shape and does not visually emphasize this transition.



HSV Image Format

Now, let’s go back to our chimpanzee’s nose extraction example and try to apply color threshold using HSV format.

Original Image



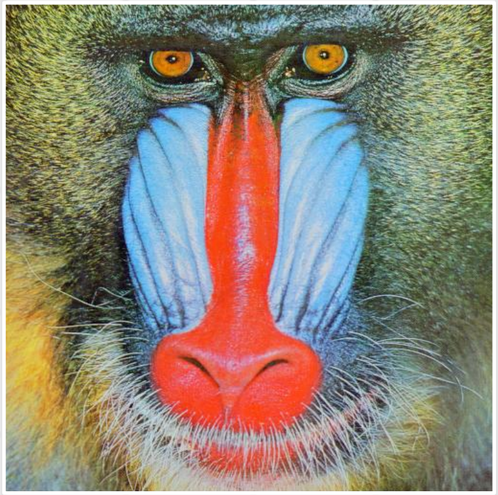
RGB Threshold

HSV Threshold

HSV Image Format

Now, it’s obvious for everyone that the noise reduced and many of the nose gabs get more filled.

Original Image



RGB Threshold

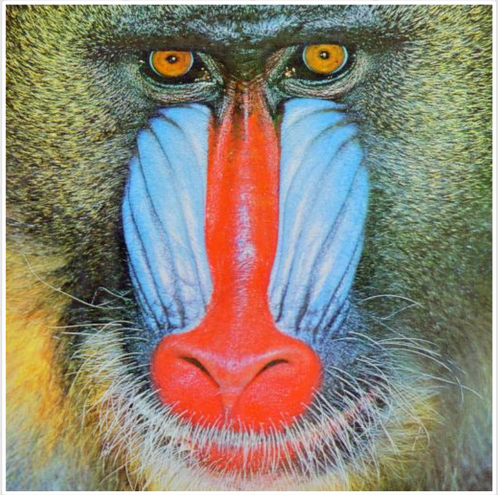
HSV Threshold

HSV Image Format

But till now our picture still noisy somehow and the nose has many gaps.

Next time question: How could we reduce noise? 🤔💭

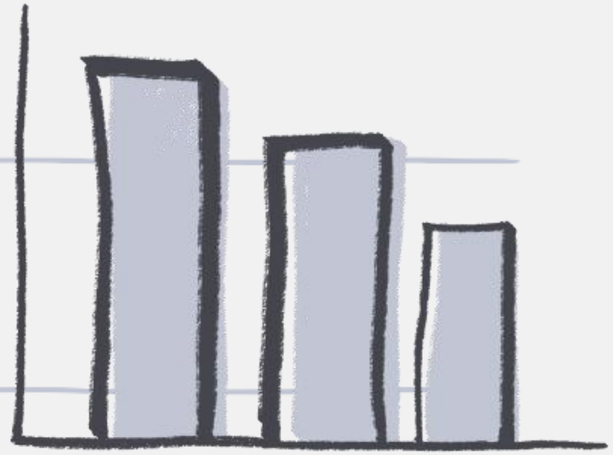
Original Image



RGB Threshold

HSV Threshold

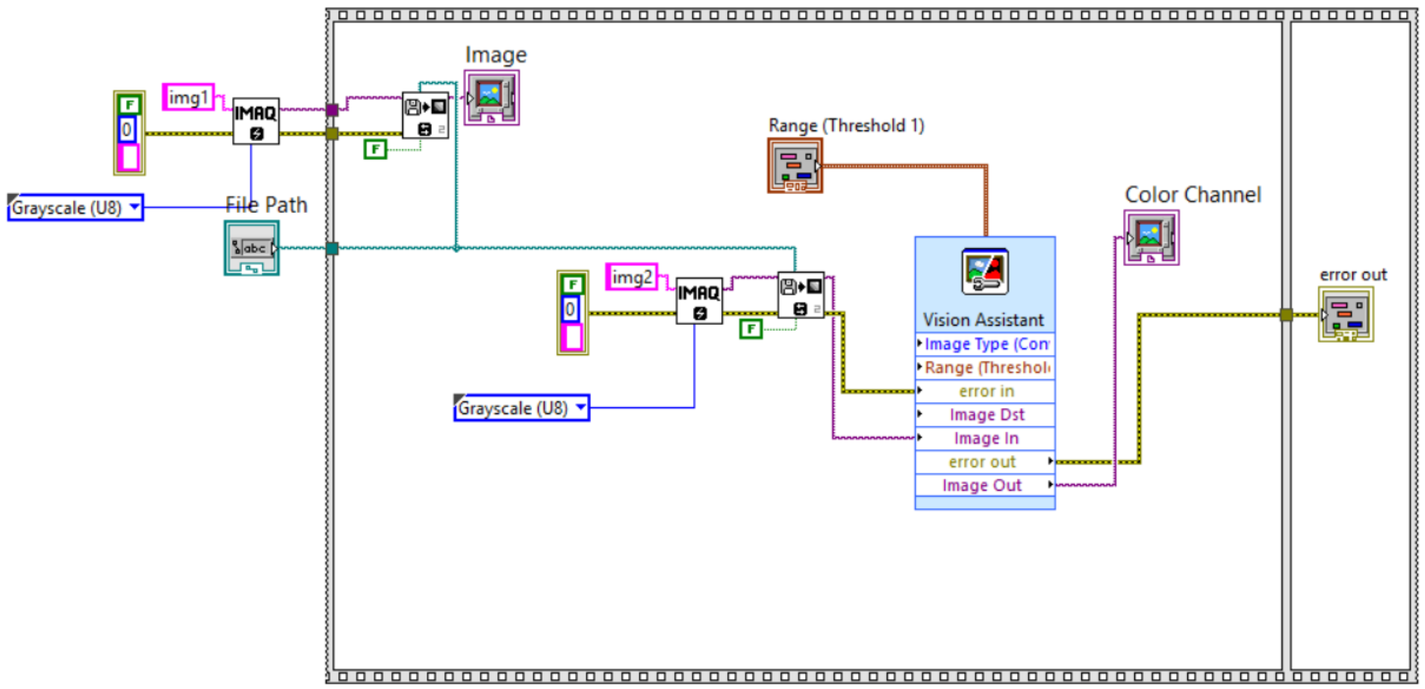
04



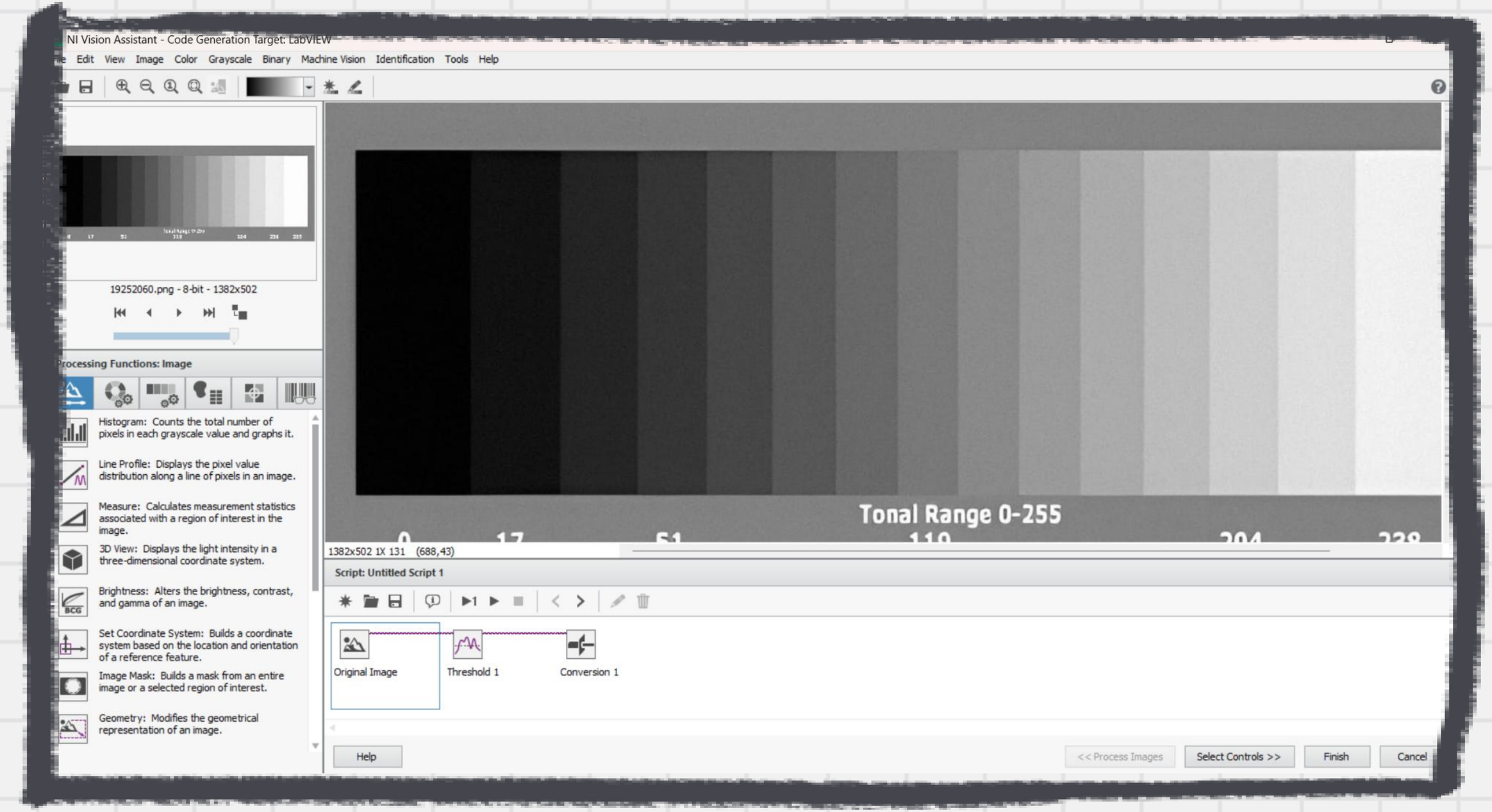
LabVIEW

EX5. Threshold

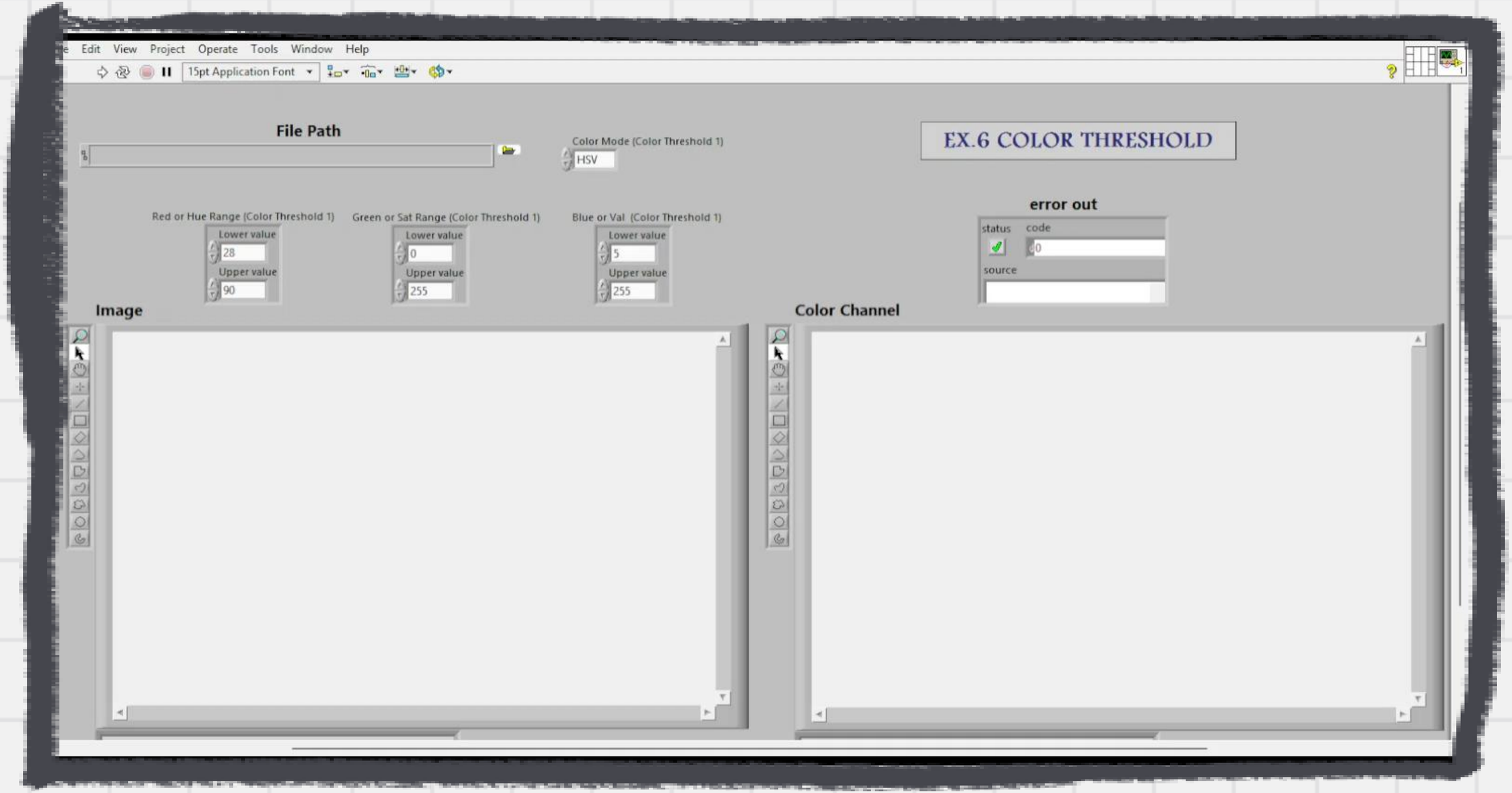
EX5. Threshold



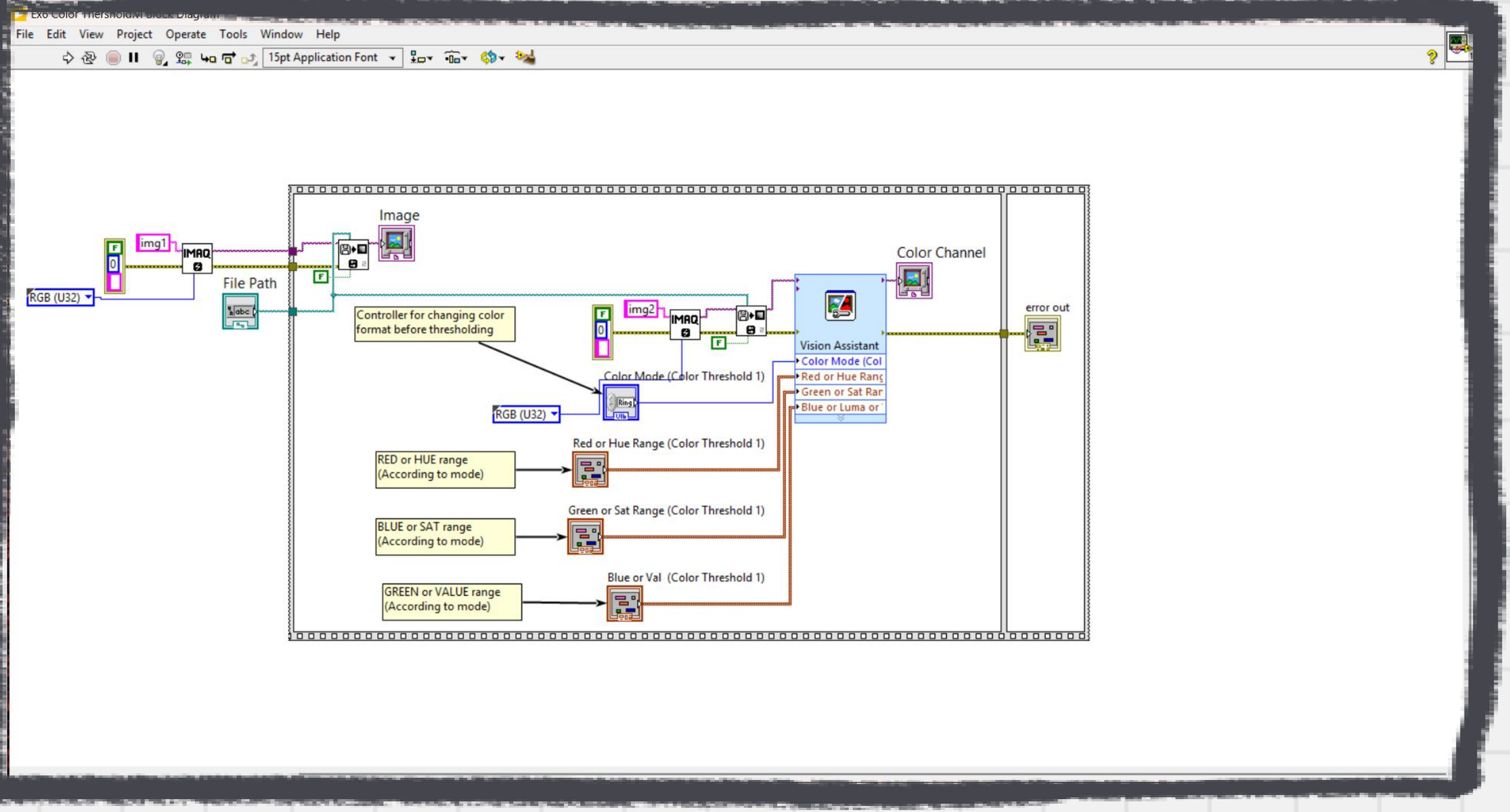
EX5. Threshold



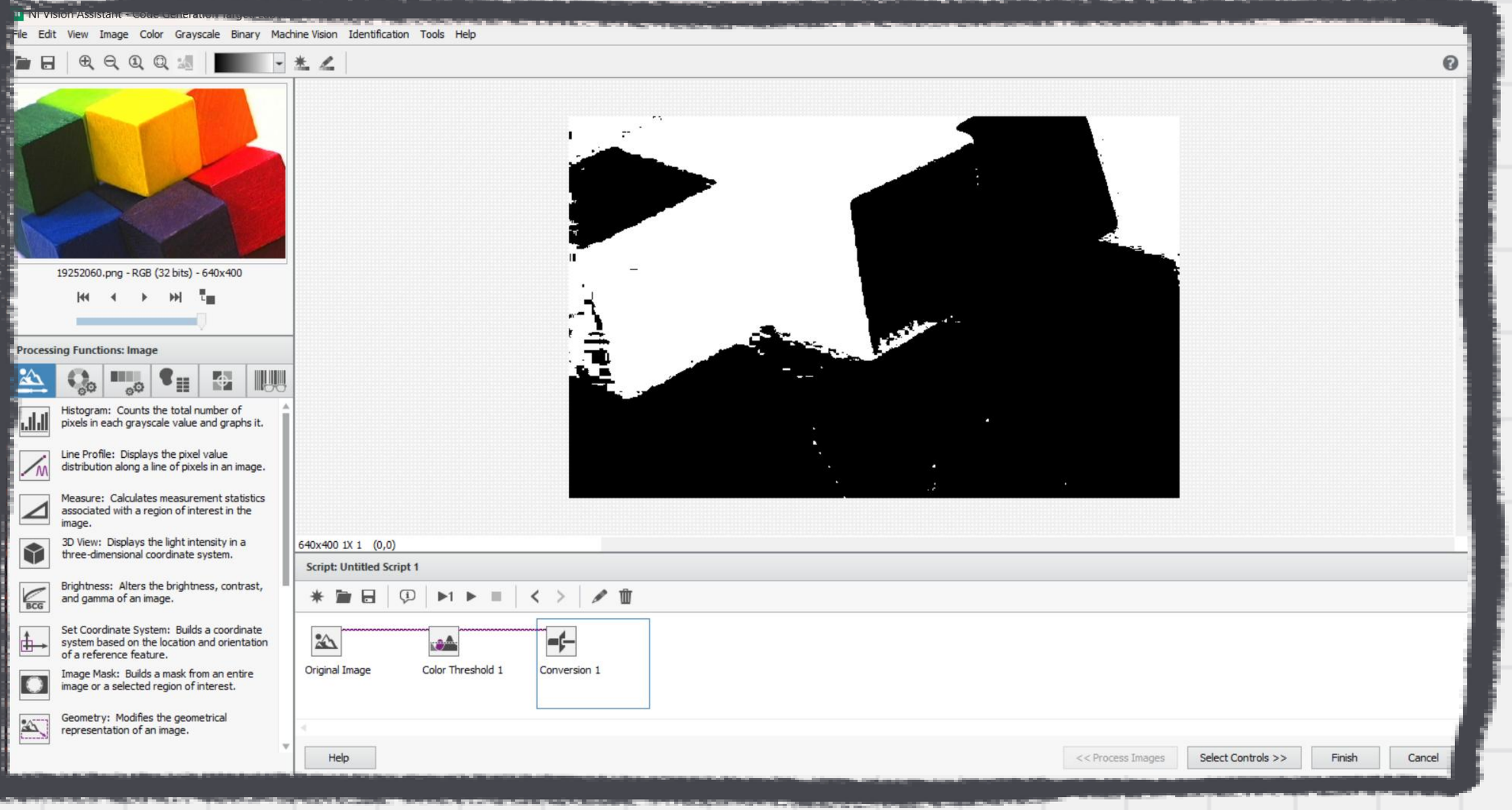
EX6. Color Threshold



EX6. Color Threshold



EX6. Color Threshold




THANK
YOU