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Impossible Colors Project

Impossible colors are one of the few aptly named concepts in physics. It portrays the same amount of mystery and inherent frustration that the concept itself exudes. Put simply, impossible colors are colors which our brains interpret, but do not actually exist. These colors are created through the red, green, and blue cones in our eyes. When two different wavelengths of light hit our eyes from the same source, our eyes interpret the color to be the average of the wavelengths. This is why red and green LEDs look yellow to our eyes. However, this process can fail when the wavelengths we see should average to a wavelength of a color the cones in our eyes can interpret directly. For example, the wavelength of red light is approximately 600nm and the wavelength of blue light is around 500nm. When we see red and blue light together, the light averages to 550nm. However, 550nm is the wavelength of green light. The green cone knows that the light is not green light, so our brain just has to make a consistent guess for what this color could be, and that consistent guess is magenta. To investigate this concept, I created a self portrait using solid pixels of red, green, blue, black, and white. I originally just input the colors individually, but to speed things up, I created a function that allowed me to input how many pixels of each color I wanted, and it would randomly orient them in the cell. The picture was 1250 pixels by 850 pixels. From here, I redefined the red, green, and blue pixels to be a combination of cyan, magenta, and yellow. Using this, I rerendered the portrait, and it looked surprisingly similar in color to the original. The biggest difference was that this version had much more faded colors than the original. After this, I created a function that found the average rgb value of each cell, and then I performed a FFT to determine just the peak frequency and amplitude of each cell. By rerendering the portrait using these values instead of rgb values, I effectively eliminated any impossible colors that were showing up in the picture. This was super interesting to see because any purple areas turned much more green. I am super sad that there is not much evidence to this because Mathematica thought this information was too dangerous for this world so it killed itself and my program.