



CALIFORNIA STATE SCIENCE FAIR 2009 PROJECT SUMMARY

Name(s) Rachel M. Andrews	Project Number J1601
Project Title The Effect of RGB and CMYK Color Formats on the Number of Colors in Photographs	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of this project is to determine if photographs in the RGB format demonstrate the same number of colors as photographs in the CMYK format.</p> <p>Methods/Materials Photographs of twelve subjects were taken with an 8 megapixel digital camera using manual settings at three specified F-stops. All 36 photographs were then entered into Adobe Photoshop CS on a laptop computer and each photograph was then converted to the CMYK format. The photographs were then saved to files identified by subject and format type, both RGB and CMYK versions. Each photograph was then analyzed for the total number of colors using Corel Paint Shop Pro X2 and then recorded.</p> <p>Results Ten out of twelve photographs demonstrated a greater number of colors in the CMYK format than the same photographs in the RGB format. The same results were repeated at all three F-stops. All 30 of the CMYK photographs (ten at each of 3 F-stops) had an average of 23-31% more colors. Two photographs at each F-stop did not follow the trend. No characteristics were identified in the two photographs that were different from the others used in this experiment.</p> <p>Conclusions/Discussion The CMYK photographs in this study often, but not always, demonstrated a significantly greater number of colors. It is unknown why there were two photographs that had more colors in the RGB format. The experimental results do not support my hypothesis. RGB color images are represented by 3 channels and CMYK images are represented by 4 channels, resulting in 16.7 million RGB and 4.4 billion CMYK color possibilities per pixel. It is possible that the CMYK images generally had a greater number of colors due to the difference in the number of color possibilities per pixel. The percentage difference in the number of colors counted for the RGB and CMYK photographs in this experiment was dramatically less than the difference in color possibilities per pixel for these formats. In the future, I would change the experiment to use the same shutter speed for all the photographs. I might also run a separate experiment to test what effect F-stop and shutter speed changes have on the number of colors in a photograph. This experiment did show the color counts dropped consistently as the F-stop was increased.</p>	
Summary Statement Photographs were taken, converted from the RGB to the CMYK format, and the number of colors in the photographs for both formats were counted and compared to determine which format displayed a greater number of colors.	
Help Received My dad showed me how to use manual functions on the camera. He helped to download the photographs to files and showed me how to convert the color format of the photographs. He also helped me search for a color counting program and download it.	