

## A Bayesian Approach to Color Constancy

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Color vision can greatly simplify recognition of objects and scenes. In the real world, however, the spectral returns from an object are a mixture of the object's surface color and the color of the illuminant. Color constancy algorithms use information present in the scene to estimate the illuminant and thereby uncover the true reflective properties of the objects in view. We have developed a Bayesian approach to color constancy that estimates the illuminant by combining illuminance and reflectance priors with measurements relating to the number, intensity, and chromatic and spatial properties of the color "patches" in the scene. We also discuss the implications of non-trivial reflectance priors that represent materials likely to be found in (natural) scenes, and probabilistic interpretations of specular and brightest-is-whitest theories (Macleod, 2002). To test the efficacy of our approach, we created a database of 1,500 images of 100 objects photographed under 5 different illuminations (daylight, fluorescent, halogen, incandescent, and green) and 3 backgrounds (multi-colored, gray, and green). Using a color-based recognition task as a benchmark, we find our approach outperforms several other published color constancy algorithms (Figure 2). We explore the implications for color-processing in primate visual cortex.

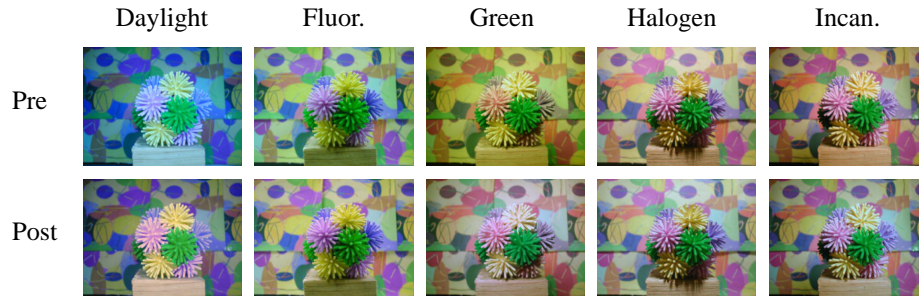


Figure 1: Images before and after processing by our algorithm.

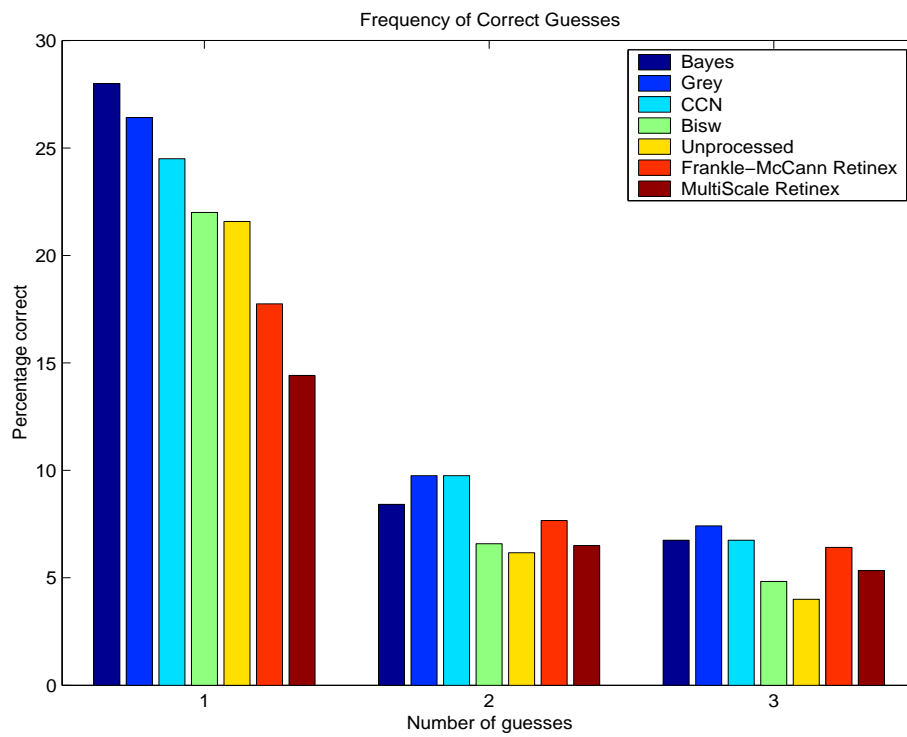


Figure 2: After processing the input images by each of the respective algorithms, the number of guesses that were required to recognize an object by color alone were compiled. Multiple guesses of the same object were ignored.