Eye Tracking Observers During Color Image Evaluation Tasks

Jason S. Babcock

B.S. Imaging and Photographic Technology
Rochester Institute of Technology (2000)

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Signature of the Author

Accepted by Coordinator, Roy S. Berns
M. S. Degree Program
The M.S. Degree Thesis of Jason S. Babcock has been examined and approved by two members of the color science faculty as satisfactory for the thesis requirements for the Master of Science degree.

Dr. Jeff B. Pelz, Thesis Advisor

Dr. Mark D. Fairchild, Thesis Advisor
Thesis Release Permission Form

Chester F. Carlson Center for Imaging Science
College of Science
Rochester Institute of Technology
Rochester, New York

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Abstract

This thesis investigated eye movement behavior of subjects during image-quality evaluation and chromatic adaptation tasks. Specifically, the objectives focused on learning where people center their attention during color preference judgments, examining the differences between paired comparison, rank order, and graphical rating tasks, and determining what strategies are adopted when selecting or adjusting achromatic regions on a soft-copy display.

In judging the most preferred image, measures of fixation duration showed that observers spend about 4 seconds per image in the rank order task, 1.8 seconds per image in the paired comparison task, and 3.5 seconds per image in the graphical rating task. Spatial distributions of fixations across the three tasks were highly correlated in four of the five images. Peak areas of attention gravitated toward faces and semantic features. Introspective report was not always consistent with where people foveated, implying broader regions of importance than eye movement plots. Psychophysical results across these tasks generated similar, but not identical, scale values for three of the five images. The differences in scales are likely related to statistical treatment and image confusability, rather than eye movement behavior.

In adjusting patches to appear achromatic, about 95% of the total adjustment time was spent fixating only on the patch. This result shows that even when participants are free to move their eyes in this kind of task, central adjustment patches can discourage normal image viewing behavior. When subjects did look around (less than 5% of the time), they did so early during the trial. Foveations were consistently directed toward semantic features, not shadows or achromatic surfaces. This result shows that viewers do not seek out near-neutral objects to ensure that their patch adjustments appear achromatic in the context of the scene. They also do not scan the image in order to adapt to a gray world average. As demonstrated in other studies, the mean chromaticity of the image influenced observers’ patch adjustments. Adaptation to the D93 white point was about 65% complete from D65. This result agrees reasonably with the time course of adaptation occurring over a 20 to 30 second exposure to the adapting illuminant.

In selecting the most achromatic regions in the image, viewers spent 60% of the time scanning the scene. Unlike the achromatic patch adjustment task, foveations were consistently directed toward achromatic regions and near-neutral objects as would be expected. Eye movement records show behavior similar to what is expected from a visual search task.
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-Jason Babcock
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