D6.7 Personalization for viewer preference and numerical optimization

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Table of Contents

1	EXECUTIVE SUMMARY	4
2	BACKGROUND	4
3	MODEL	7
4	METHODS	8
5	DISCUSSION	10
6	CONCLUSION	11
7	REFERENCES	12

1 EXECUTIVE SUMMARY

One of the essential mechanisms employed by the human visual system when interpreting the natural world is that of trichromatic integration of a physical scene spectrum by cone photoreceptors. By extension of this, different scene spectra can result in the same color sensation in an observer, a phenomenon known as metamerism which allows imaging systems to produce realistic reproductions of scene content by the same three channel mechanism. To predict these matches, color matching functions are used which aim to describe the average spectral integration behavior of all observers. This practice has been shown to result in significant color rendering errors, however, as there exists a significant and natural variability in the spectral characteristics of the optical pathway and photoreceptors within populations of color-normal observers. When this is crossed with the growing disparity between the spectral characteristics of emerging display technology it becomes evident that this inter-observer variability should be accounted for.

In lieu of more spectrally accurate imaging systems, a color management pipeline for motion picture production which considers the individual characteristics of key creative observers could remove this variability when color critical decisions are being made. For example, if for the various stages at which a Director of Photography reviews imagery (on-set, dailies, color correction, VFX, etc.) their monitoring equipment is calibrated to be a metameric match to some reference considering their individual physiology, this would remove inconsistency relating to observer metamerism at different stages and avoid any influence it may have on creative decisions. Additionally, it would allow an observer and display specific reference point to be established in the pipeline (for example, the colorist and primary mastering display) which imagery could be directly related to when remastering content for different formats.

Asano and Fairchild present a physiologically based individual observer model, as well as a method for separating a population of observers into a limited number of categories. Building on this work, a simulation pipeline which can be used to generate observer/display combination specific color management transforms for post-production is outlined, and future work is proposed.