Method Overview

Characterization

Characterization of the non-uniformities was conducted in two ways. The goal was to determine the extent of colour distortion caused by lenses, and to determine the contribution of the different factors to the distortion.

1. ISET was used, along with a wavelength-dependent aberrated lens model, to study the effect of the wavelength-dependent properties of the lens on image colouration.

2. Custom code was developed that performs position and wavelength dependent Gaussian blurring and intensity loss. The code was used to see if colour changes could be modelled.

For the purposes of the studies, two images were used. First, we used the Macbeth colour chart (see figure 1). This image is appropriate because the colours are well-defined and ISET can find the ideal colour balancing matrix to rectify errors in the colours for this image. Second, we used a uniform image under D65 illumination (figure 2). For some purposes, this image was more appropriate because the Macbeth colour chart would exhibit some colour blending at the colour boundaries

Figure 1: Macbeth Colour Chart used to detect colour distortion

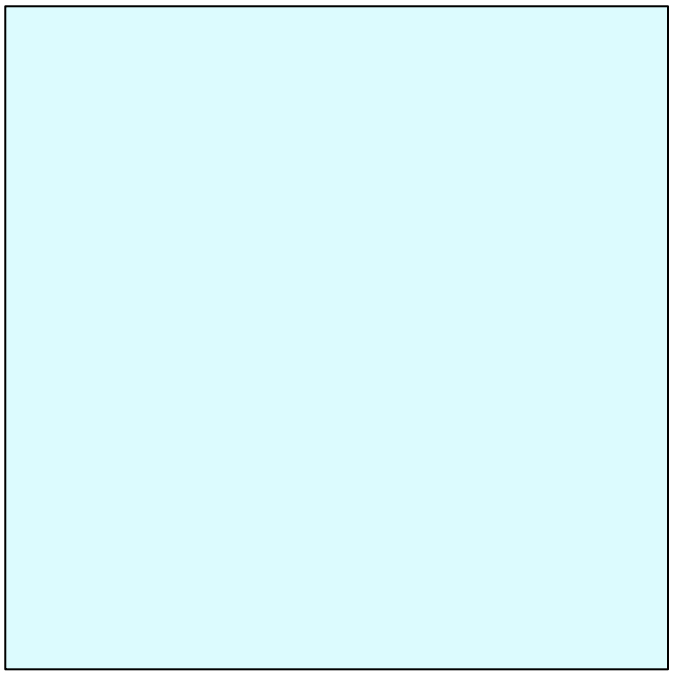

Figure 2: Uniform scene (D65 illumination)

Compensation Implementation

Images were generated by the custom code developed for performing position and wavelength dependent Gaussian blurring and intensity loss. These images with non-uniform chromatic aberrations were then used as input for investigating the Gray World colour balancing variants. The colour balancing algorithms presented are developed under generic Matlab.