

VISIBILITY METRICS

Visibility metrics fall into two broad categories: those that are scene dependent and those that are not. Those that are not scene dependent are referred to as universal metrics, while those that depend on scene characteristics are scene-dependent metrics. Universal metrics are most typically related to direct measurement while scene dependent metrics are derived from imaging systems most typically web-cameras. Each metric is related to fundamental atmospheric optical variables but in a variety of ways. The derivation of each metric highlighting the assumptions, strengths and limitations of each metric will be covered. Examples of the use of each of the variables will be demonstrated highlighting the differences in applying the metrics to urban and more pristine rural areas including national parks and wilderness areas. Demonstration of the effects that illumination and meteorology conditions have on visibility metrics and how sensitive these metrics are to the camera color “channels” used in the analysis will be covered.

Outline

Universal Metrics

- Atmospheric Extinction Coefficient

- Visual Range Concept

- Standard Visual Range

- Unimpaired Visual Range

- Deciview Scale

Scene-dependent Visibility Metrics

- Contrast

- Sobel and Similar Indexes

- The FFT

- Root Mean Square Radiance

- Average Scene Contrast

- Equivalent Contrast

- Image Color Characteristics

- Delta E and Chromaticity

The Just Noticeable Change (JNC)

- Weber's-Law-type JNC

Some Studies Relating Image Indexes to Visibility

- Focus is on urban landscapes

Can Indexes Derived from Routine Webcam Images in Pristine Natural Areas Be Used to Quantify Visibility?

- Effects of Time of Day and Lighting Conditions on Scene-dependent Visibility Metrics

- Grand Canyon Images

- Great Smoky Mt images