What Is the Size of the Isoplanatic Patch in the Human Eye?

Columbia Lloyd
Estrella Mountain Community College

Summer Research: University of Houston-College of Optometry
Isoplanatic Patch

Defined as the area in the image plane over which wavefront aberrations remain constant.

Courtesy of: Thomas Rimmele, NSO
Wavefront Aberration

Ideal Wavefront

Aberrated Wavefront
Wavefront Aberration

Ideal Wavefront

Aberrated Wavefront
Shack-Hartmann Wavefront Sensor

- Used to measure the wavefront aberrations of the eye.
- Gives you insight on the imperfections in the eye.

Courtesy of: Austin Roorda
Purpose

- Measure the size of the isoplanatic patch in the human eye:
  a) to understand the limits of human vision.
  b) to determine the maximum size of an image with Adaptive Optics (AO) correction.
Methods

- Used the Shack-Hartmann wavefront sensor to measure aberrations of the eye.
- Measured human eyes over a 6mm pupil.
- Subject looked at a fixation target.
- Took 5 snapshots at each location.
Analysis

- Analyzed 5 images at every fixation location (37 locations).
- Contour maps were placed at each location on the fixation target.
- Looked for statistical similarities in the wavefront.
KV wavefront with no defocus

Courtesy of: Austin Roorda
RMS of the wavefront used to generate contour map.

- Wave aberration at location X
- Wave aberration at center
- Wave aberration difference
Results

- Isoplanatic patch is asymmetrical.
- Size is at about 4 degrees centered on the fovea.
Conclusion

- Determined the size of the isoplanatic patch.
- Results gives the maximum field size of the retinal image using AO.
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Thank You!!!
With & Without AO

Courtesy of: Thomas Rimmele, NSO
KV wavefront with astig