Abstract VSS 2018

Fine scale measurements of the blind spot borders

Annegret Meermeier, Markus Lappe and Michele Rucci

The blind spot is both a nuisance and a necessity for seeing, since it represents the position at which the optic nerve leaves the retina. Although the blind spots presence and position (approximately 15 degree in the lateral periphery) have been studied, the precise way in which vision transients into blindness is to date unknown. A chief challenge to a precise mapping of this transition is the inevitable wandering of the human fovea even during careful fixation. As the fovea moves, a stimulus at a constant position in space will at times fall onto the functioning retina and sometimes into the blind spot. Hence mapping results will be spatially smeared.

Here we measure the edges of the blind spot during retinal stabilization, meaning stimuli are presented relative to the center of gaze. Using a digital dual purkinje eyetracker (dDPI) we mapped the blind spot borders of five subjects' right eye along the horizontal meridian. A custom designed calibration process helped participants to match the tracked eye position with their actual line of sight, hereby decreasing all over variability in the tracked signal. We selected an area of 40 minutes of arc at each blind spot border for fine scale measurement. In one trial, the probe (2*2 minute of arc) was presented at high contrast for 14 ms at a random position either from the nasal or temporal border. In a 2AFC task subjects indicated detection of the probe via button press. We determined the detection rate as a function of position.

For the nasal edge of the blind spot, detection rate dropped from 75% to 25% in 10.8 (3.89) minutes of arc on average. Visibility at the temporal blind spot border increased from 25% to 75% within 17.2 (8.07) minutes of arc. There was substantial variation between subjects.

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The blind spot is both a nuisance and a necessity for seeing, since it represents the position at which the optic nerve leaves the retina. Although the blind spots presence and position (approximately 15 degree in the lateral periphery) have been studied, the precise way in which vision transients into blindness is to date unknown. A chief challenge to a precise mapping of this transition is the inevitable wandering of the human fovea even during careful fixation, causing mapping results to be spatially smeared.
Using retinal stabilization on a dual purkinje eye tracker (DPI), we mapped the blind spot borders of five subjects' right eye along the horizontal meridian. In one trial, the high contrast probe (2*2 min of arc) was presented briefly (14 ms) at randomized positions. Detection rate dropped from 75% to 25% in 10.8' (3.89) at the nasal blind spot border and increased from 25% to 75% within 17.2' (8.07) at the temporal border. There was substantial variation between subjects.

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