

The impact of content-independent mechanisms on guiding attention

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Several eye-tracking experiments have shown that human observers tend to look at the center of photographs and movies more than expected by chance. This so-called “center bias” in gaze distributions may be caused by centrally-biased content, such as objects of interest (top-down bias) and salient features (bottom-up bias), or by other content-independent factors, such as experimental setup. Here we quantify the relative contribution of these potential causes.

We shot videos of natural scenes that were either biased (camera following a main actor) or non-biased (camera panning at a fixed speed) in terms of top-down influences. These videos were further classified into bottom-up biased versus non-biased based on a computational model of bottom-up influences, resulting in four bias conditions. We then tracked the eyes of twelve young adults as they freely viewed the videos, and extracted their saccades (12132). The extent of center bias was quantified using a metric that measures the average distance of saccade targets from the center (0: saccade targets uniformly distributed over display; 100: all saccade targets at center).

We found highly significant center-bias remained in the eye-movement patterns in all the four conditions. (1) For both top-down and bottom-up center-bias condition, it scored 45.26 ± 0.52 (mean \pm SE); (2) top-down and not bottom-up center-bias: 41.61 ± 0.61 ; (3) bottom-up and not top-down center-bias: 38.26 ± 0.64 ; (4) neither top-down nor bottom-up center-bias: 38.07 ± 0.56 .

Our data demonstrates for the first time that a bias exists which is due to neither cognitively interesting items nor bottom-up salient items being concentrated around the center. It also indicate that 84% of the maximal observed center-bias can be explained by factors that are content-independent, such as the methodological setup (chin rest, centralized gaze position of subjects when they look straight ahead), and a viewing strategy of looking at the center so as to minimize the amplitude of saccades.

Methodology/Approach: Behavior/Psychophysics

Primary Topic Descriptor: Eye Movements: Mechanisms

Presentation Preference: talk preferred

Award Consideration: