The impact of image size on eye movement parameters

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1 Introduction/Related Work

Eye tracking studies have intensely addressed what attracts attention while viewing natural images. Hereby, it was found that image features (e.g. luminance, contrast) [1] and also semantic content of the scenery [2] play a high role to guide visual exploration. However, image size as causal factor has been rarely considered. Indeed, in typical laboratory setups visual stimuli lay in a small central part of the visual field only. Furthermore, image and screen sizes differ across laboratories. Thus, it is unclear in how far observed eye movement parameters indicate properties of the human visual/occulomotor systems in the real world or of typical laboratory setups.

2 Our Contribution

Here, we investigated the effect of image sizes on eye movement parameters. Specifically we test the hypotheses that visual exploration scales with images size or, alternatively, remains constant in absolute measures.

Participants were exploring images of different categories (web pages, urban scenes, nature scenes) varying in image size (7, 10, 15, 21, 30”) in a free viewing task, while their eye movements were recorded. The distance to the screen was set to 80cm. In the 30” full screen condition, this provided an almost full coverage of the image on the visual field to imitate scenarios for watching urban places and landscapes in the real world.

Results revealed a central spatial bias of fixations in urban and nature scenes, whereas web pages showed an upper-left bias. These bias effects increased linearly with stimulus size, as indicated by measures of fixation eccentricities in horizontal and vertical direction as well as entropy. Additionally, the mean saccadic amplitudes also increased linearly with size. To test whether this effect arose of a general shift of amplitudes towards higher values or of a few single very large saccades in large images, we looked at the histogram of amplitudes. We saw that amplitudes were log-normally distributed within each stimulus size. However, with increasing size the distributions became more broadly shifting towards higher amplitudes. The maximum of the log-normal curves decreased for larger images but remained at the same location over all sizes. Thus, we did not find a sharp general shift of saccadic amplitudes but rather more spread distribution. According to single fixation analyses we showed that larger images led to a higher amount of fixations combined with a decrease of the mean duration of single fixations. Hereby, both parameters followed a logarithmic rather than linear trend (positive and negative, respectively).

Published at SAGA Workshop 2015, proceedings archived under DOI: 10.2390/biecoll-saga2015_0.
Individual article archived under DOI: 10.2390/biecoll-saga2015_9

3 Discussion

Consequently, the size in which visual stimuli are presented significantly affects those parameters that are commonly investigated in many studies on overt attention. Still, we cannot clearly claim either if larger images are treated as such leading to a visual exploration in different absolute measures or if exploration is up scaled.

References

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Published at SAGA Workshop 2015, proceedings archived under DOI: 10.2390/biecoll-saga2015_0.
Individual article archived under DOI: 10.2390/biecoll-saga2015_9