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Different visual explorations between free-viewing and target finding tasks in websites: evidence from temporal analyses of ambient and focal modes

Alexandre Milisavljevic^{1,2,3}, Thomas Le Bras¹, Fabrice Abate¹, Matei Mancas², Coralie Petermann³, Bernard Gosselin², Karine Doré-Mazars¹

¹ Laboratoire Vision Action Cognition EA 7326, Institut de Psychologie, Université Paris Descartes, Boulogne-Billancourt, France

² Numediart institute, University of Mons, Mons, Belgium

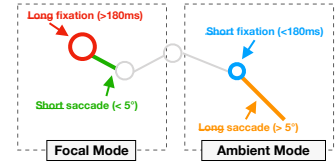
³ Research and Development department, Sublime Skinz, Paris, France

alexandre.milisavljevic@etu.parisdescartes.fr

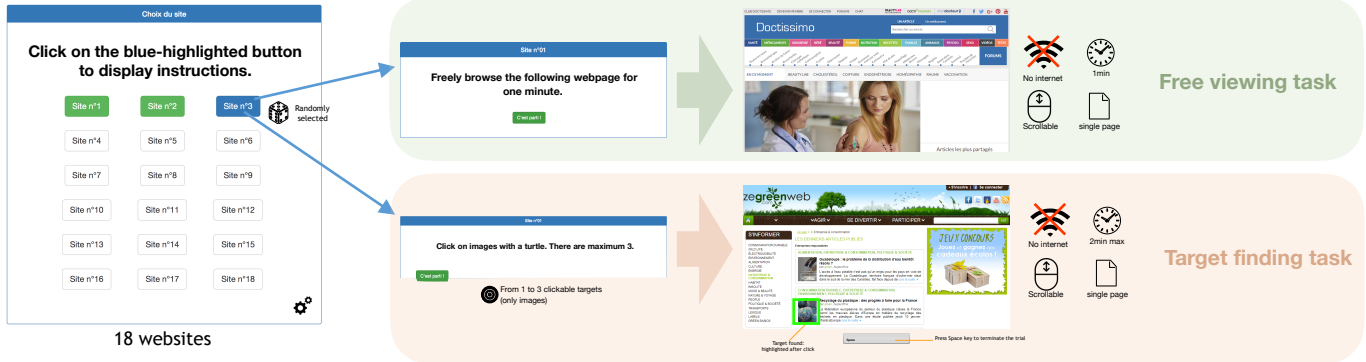


INTRODUCTION

Two visual exploration modes were highlighted by Unema et al. (2005) from Trevarthen's work (1968) on the two visual pathways. An ambient mode which is influenced by bottom-up factors and a focal mode which is influenced by top-down factors. Krejtz et al. (2016) proposed the K coefficient to measure these two modes. In the present study we use K-derived new variables as described by Milisavljevic et al. (2019) in order to study task's effects on gaze during the exploration of webpages.



METHODS



Apparatus

- EyeLink 1000 (SR Research®).
- 24.5-inch screen size.
- Temporal resolution of 1KHz.
- 144Hz screen's refresh rate.
- Spatial resolution of 0.05°.
- 1920x1080 of screen resolution

Participants

- 116 participants.
- Normal or corrected-to-normal vision.
- 19 ♂ ; 97 ♀ ; ~25.5 y.o.

Stimuli

- Mean height of 6505px.
- Width of 1920px.
- Scrollable.

Data Cleaning

- Records >= 35s are kept.
- 15 bins of 2.33 seconds each.
- Blinks and outliers removed.

RESULTS

Global analyses

First, we ran global analyses on classic eye movements variables which are *fixation duration* and *saccade amplitude*. We found significant differences between Target Finding and Free Viewing tasks.

Then, we computed the K coefficient (Krejtz, et al., 2016; **see formula on the right**) from which we computed 3 new variables from (Milisavljevic et al., 2019):

- number of mode switches
- mean duration in focal mode
- mean duration in ambient mode

$$K = \frac{1}{n} \sum_n \frac{d_i - \mu_d}{\sigma_d} - \frac{a_{i+1} - \mu_a}{\sigma_a} \quad K > 0 \rightarrow \text{Focal} \quad K < 0 \rightarrow \text{Ambient}$$

All the new variables related to the K coefficient (**see table on the left**), in contrast to the K coefficient itself, are able to significantly better differentiate the gaze behavior dynamic between the tasks.

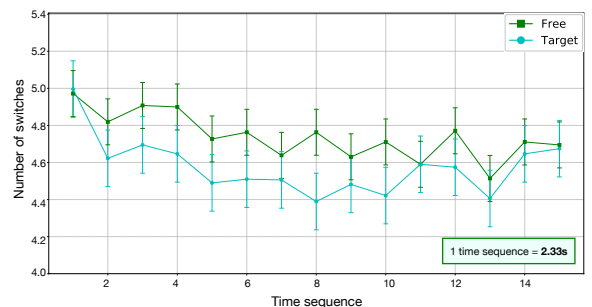
Global analyses show the task's influence on all our variables. New variables show that participants stay longer in both focal and ambient modes during the target finding task than during the free viewing task. The significant task's effect on the number of switches highlights that gaze behavior dynamic varies as a function of the task given to the participant.

Temporal dynamics analyses

The number of mode switches (**see figure on the right**) is different between tasks only for the first part of the visual exploration.

However, Target Finding task seems to have a smaller number of switches, for every time sequences, compared to Free Viewing task.

Taken together, these results can be explained by the fact that in Target Finding task, participants have to stay more often in focal mode to discriminate the target.



CONCLUSION

Global analyses show a significant effect of the task on all variables except the K coefficient. This result highlights that the new variables we propose are more useful than the K coefficient to discriminate tasks based on gaze behavior. Further dynamical analyses show that our new variables are more robust and thus reveal significant task's effects on the K coefficient.

Future work should focus on visual processing modes when the target is detected by the participant. These analyses should also be put in perspective of the mouse's scroll during the exploration of the webpage.

References

- Trevarthen, C.B. (1968). Two mechanisms of vision in primates. Psychol. Forsch. 31: 299.
- Unema, P. J. A., Pannaasch, S., Joos, M., & Velichkovsky, B. M. (2005). Time course of information processing during scene perception. Visual Cognition 12(3), 473-494.
- Krejtz, K., Duchowski, A., Krejtz, J., Szarkowska, A., & Kopacz, A. (2016). Discerning ambient/focal attention with coefficient K. ACM Transactions on Applied Perception (TAP), 13(3), 11.
- Milisavljevic, A., Le Bras, T., Mancas, M., Petermann, C., Gosselin, B. & Doré-Mazars, K. (2019). Towards a better description of visual exploration through temporal dynamic of ambient and focal modes. ACM Eye-Tracking Research and Application (ETRA), Denver, United-States.