Eye-tracking street users' visual exploration of buildings across the Western World

Suurenbroek, Frank; Spanjar, Gideon

EYE-TRACKING STREET USERS' VISUAL EXPLORATION OF BUILDINGS ACROSS THE WESTERN WORLD

Prof. dr. Frank Suurenbroek and Dr. Gideon Spanjar
Amsterdam University of Applied Sciences (AUAS), Faculty of Engineering,
Centre of Expertise Urban Technology, The Netherlands, Europe

Sensing Streetscapes

ABSTRACT

People in western countries spend approximately 90% of their time indoors. This severely affects their health (WHO 2013; Klepeis et al. 2001). The health risks are exacerbated if people travel between indoor spaces by car or public transport. Buildings on streets specifically designed to create a human scale and connected with the street-space can potentially invite people to walk and enhance their engagement with their surroundings (O'Mara 2019; Ewing et al. 2013). Since the 1960s, influential empirical studies have raised awareness of the walkability of streets (e.g. Jacobs 2008) but reliable evidence on the effectiveness of applied design solutions remains scarce (Spanjar & Suurenbroek 2020).

This eye-tracking study focused on the visual 'scanning' of streetscapes and people's appreciation of applied design principles. The aim was to gather together lessons learned from a variety of streetscapes in cities around the Western world (see fig. 1) and use them to inform the design of new developments in the Netherlands. Google Street View was used to select 19 images of streets in high-density environments with human-scale attributes in their façades and street-spaces (see fig. 2). They were presented in a randomized order in a laboratory setting to 40 participants, who viewed them for 5 seconds (see fig. 3). The participants' visual explorative behaviour was recorded with advanced eye-tracking technology. A survey recorded their overall appreciation of the scenes and mouse-tracking collated their specific areas of interest.

The comparative analysis of the participants' aggregated eye-fixation images together with the supplementary methods (see fig. 4) suggests that certain attributes for creating a human scale catch the eye in the first few seconds and are highly appreciated. These include the variety of a street's façades, a street's enclosedness, and the level of detail in the transition zone between the private ground floor and the public street (see fig. 5). Green features are particularly valued and might have important restorative qualities for people who spend most of their time indoors (Kaplan 1995; Ulrich 1984). Future research should focus on the design of façades and the street-space itself, taking people's indoor lives and related stress levels as a starting point.

Figure 1 – For the first eye-tracking laboratory test, several streetscapes from eight cities were selected: Amsterdam, Chicago, London, Manchester, New York, San Diego, Toronto, Vancouver.

METHODOLOGY

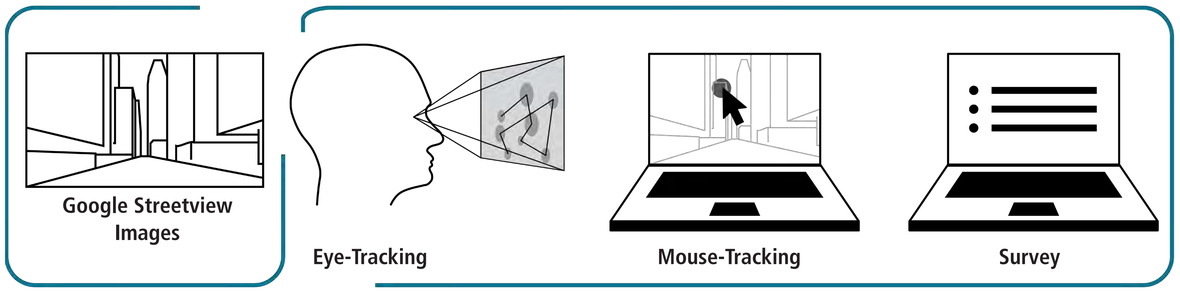


Figure 2 – Illustrating the applied research methodology flow chart: searching and selecting Google Street View images, eye-tracking in a laboratory setup, participants' eye-movements, followed by mouse-tracking and surveys to collect the levels of appreciation value.

PROCESS - EYE-TRACKING

Figure 3 – In a laboratory setting, 40 participants viewed for 5 seconds the 19 different images of streetscapes.

ANALYSIS - CO-RESEARCH SESSIONS

Figure 4 – Currently, the meta-data output consisting of eye patterns and user perceptions, are further analyzed by a panel of experts such as urban designers.

CASE STUDIES - OUTPUT

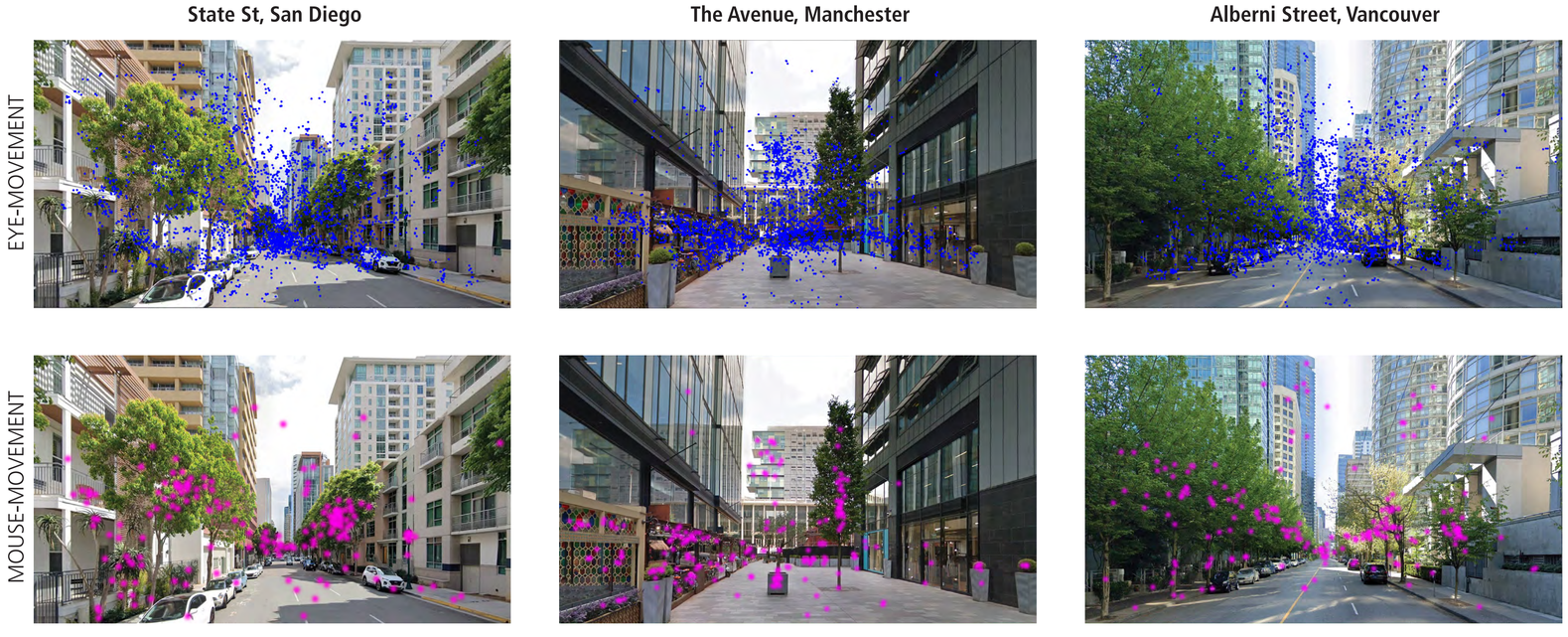
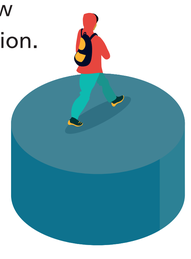


Figure 5 - Above, images of aggregated eye-fixations; below, the images of the highest aggregated levels of appreciation value recorded by mouse-clicking each of the 40 participants' areas of interest.

NEXT STEP

The research is taken forward to investigate opportunities to enhance human-centered urban design through eye-tracking research where urban densification continues. For the Sensing Streetscapes project, we are seeking collaboration with researchers from the ANFA community to join forces and explore together new pathways of innovation.



REFERENCES

Ewing, R. & O. Clemente (2013). Measuring Urban Design Metrics for Livable Places. Washington: Island Press.
Jacobs, A. B. (2008). Great Streets and City Planning. In: Tigran Haas ed., New Urbanism and Beyond: Designing Cities for the Future. New York: Rizzoli, 109-111.
Kaplan, S. (1995). The Restorative Benefits of Nature: Toward an Integrative Framework. J. Environ. Psychol., 15 (3), 169-182. doi:10.1016/0272-4944(95)90001-2.
Klepeis, N. et al. (2001). The National Human Activity Pattern Surveys (NHAPS): A resource for assessing exposure to environmental pollutants. J. of Expo Anal and Environ Epidemiol, 11 (3), 231-52. doi: 10.1038/sj.jea.7500165.
O'Mara, S. (2019). In Praise of Walking: The new science of how we walk and why it's good for us. London: Bodley Head.
Spanjar, G. & Suurenbroek, F. (2020). Eye-Tracking the City: Matching the design of streetscapes in high-rise environments with users' visual experiences. JoDLA, 5-2020, 374-385. doi: 10.14627/537690038.
Ulrich, R. S. (1984). View Through a Window May Influence Recovery from Surgery. Science, 224, 417-419. doi: 10.1126/sciences.6143402.
WHO (2013). Combined or Multiple Exposure to Health Stressors in Indoor Built Environments. Bonn: WHO Europe.

Amsterdam University of Applied Sciences

ACADEMY OF NEUROSCIENCE FOR ARCHITECTURE
ANFA 2020 SEPTEMBER CONFERENCE
SENSING SPACES, PERCEIVING PLACE

Regieorgaan SIA

For more information:
Sensingstreetscapes.com

Dr. Frank Suurenbroek
Prof. of Spatial Urban Transformation, board member of Centre of Expertise Urban Technology
f.suurenbroek@hva.nl

Dr. Gideon Spanjar
Project Leader - Senior Researcher
Sensing Streetscapes
g.spanjar@hva.nl