Sensing Streetscapes: 2-year research on the physical-behavioral interrelationship aimed at informing the design of human-scaled densification in Amsterdam

Author(s)
Suurenbroek, Frank; Spanjar, Gideon

Publication date
2020

Document Version
Final published version

Sensing Streetscapes: 2-year research on the physical-behavioral interrelationship aimed at informing the design of human-scaled densification in Amsterdam

Prof. Dr. Frank Suurenbroek and Dr. Gideon Spanjar, Amsterdam University of Applied Sciences, Faculty of Technology, Chair of Spatial Urban Transformation

Figure 1: Image of our pre-study pilot.

Amsterdam faces the challenge of accommodating 50,000 to 90,000 new homes in the next five to ten years. That is equivalent to 10% of the city's current total housing stock. The new homes have to be built within the existing urban fabric. This will entail high densities and the construction of new 'un-Dutch' typologies with high-rise residential buildings (see fig. 2).

Figure 2: The Amsterdam context, with its more traditional, fine-grained morphology with buildings of 4-5 stories high. In the nineties of the twentieth century the waterfront next to central train station was redeveloped and residential buildings with 7-9 stories has been built. Currently, new high-density areas are planned named Haven-city and Sluisbuurt on both sides of the banks and on reclaimed land in the river IJ.

Densification is currently accelerating in many Western cities and high-rise living environments are gaining ground as today's typology. Yet these new typologies come with potentially serious risks to the liveability of cities in general and those new environments in particular (Asgarzadeh et al. 2012; Lindal and Hartig 2013; Gifford 2007). Urban designers and (landscape) architects are challenged to prevent and soften the negative impact that is often associated with extremely densified environments. This entails mitigating contradictive demands: to create high-density capacity *and*shape streetscapes that relate to a human scale. Designers might resort to the large body of applied design solutions and theories, yet these tend to be derived from more traditional urban fabrics of low-density developments (for example: e.g. Sennett 2018; Haas 2008; Jacobs 1993; Banerjee and Southworth 1990; Alexander et.al. 1977; Jacobs 1961).

Therefore, the question of the research project Sensing Streetscape is if the classical design solutions are without any alterations, applicable in these new high density settings and able to create streetscapes with a human scale. A combination of emerging technologies and principles from both worlds; neuroscience and architecture offer the opportunity to investigate this question in-depth as a relation between the designed and the visually perceived streetscape.

Evaluating three key-design principles

As a response to the dominant modernistic architecture, the second half of the twentieth century saw an increase in architects and urban designers who intended to create a *human-scaled environment,* materializing in specific design principles. Multiple scholars have theorized these principles, among others Jacobs (1961), Jacobs (1993), Alexander (1977), Lynch (1960), Gehl (1906). Until now, the effects of these design principles each alone and the interplay among them on the observer was difficult to evaluate, let alone to transmit situationally. Yet, it deepened the understanding of the physical-behavioral interrelationship of streetscapes and they were widely applied in practice. To some extent, we may assume these principles work in classic streetscapes – with their active plinths, maximums of four to five stories, individual buildings, morphology of blocks and green spaces. For our research, we have selected three commonly applied design principles for evaluation as a solution for creating streetscapes with a human scale in high density living environments:

- An active plinth of buildings
- A rhythm created by buildings' heights and widths
- Use of tactile materials for the skin of building and streetspace.

Taken together, these design principles ought to create a sense of scenery, complexity and enclosedness, comforting the user of the space (see also Lovene 2019).

Understanding human perception in public space

The field of neuroscience and environmental psychology offers a rich body of literature on humans' perception and experience of outer-body environments. A key element concerns the way our brain *filters* the overload of received information collected by our senses – and how they do so mostly unconsciously. Recent research suggests the processing of this filtering is a mutual interaction between the body and the brain, shifting from the traditional focus on the brain and the dichotomy of brain versus body see for instance (Ruzzon, 2018). Moreover, much of these processes run unconsciously, but dictate our *state of mind*, evoke emotions, and build-up the perception of the observed public space. Colours, buildings, situations may bring back memories of earlier times and influence the way we (visually) experience and perceive the current state of the space.

Essential for any public space, as perceived by individual users, is the infinity of possible unknown occurrences. We never know if and who we might encounter, how people behave or respond – and what might happen, if anything happens. Hence, we sense the environment constantly, again mostly unconsciously – if necessary, adjusting our (walking)behaviour accordingly, which happens most of the time unconsciously as well. From all our senses, neuroscientists point to our visual senses as the dominating sense, responsible for 90% of the information we process and assess. Thus, we limit (for now) our explorative research to the visual sense.

Research Strategy

For our research, we combine architectural and neuroscientific research, methods and principles (e.g. Andreani & Savegh 2017; Kondyli & Bhatt 2016; Lebrun et al. 2016; Bhatt & Schultz 2017).

We mimic, as much as possible, the conditions of passer-by in streets with participants who with any other situation, view the scenery and visually scan their environment constantly, yet unconsciously. Further, we hypothesize that the applied design solutions of an active plinth, rhythm in height and width of buildings and the use of tactile materials creates a human scaled streetscape-scenery on eye-level, which mitigates the negative feedback from the high density environment. As such, one can assume, while visual scanning streetscape the eye movement is guided by the appearances (or lack) of the design solutions.

As a research strategy, we work in a cycle of (sub)hypothesis, each test informing the plausibility of the previous hypothesis and informing the formulation of a more precise or adjusted hypothesis, which are tested. In terms of epistemology, we chose to resort in the realm of design. Hence, we do not expect to find one fits all design solution, but a more profound understanding of the physical-behavioural interrelationships of streetscapes and how designers and their clients deliver a more practice proven understanding of the perceived effects the array of design solutions they can choose from, may have.

Methodology

Our research addresses design solutions for high-density environments. We use the latest eye-tracking technology and software. Accompanied in the next stages of our research with social research methods creating a triangulation of methods, working from a lab setting to outdoor tests (see fig. 3). In the lab setting factors that may influence the test such as weather, present of people and signs are controlled. It allows us to analyse the appearances of design solutions in many different situations. In 2020, several outdoor tests are planned in existing high density to analyse the visual experience of streetscapes in a more 'natural' setting. Questionnaires, (walk-along)interviews with the participants on their perception and observations of the users' (walking)behaviour of streetscapes deliver valuable information to interpret the eye tracked patterns.

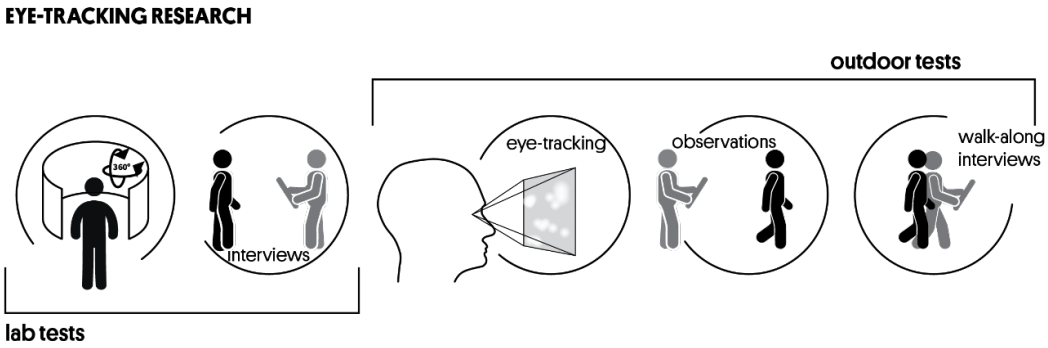

Figure 3: We conduct laboratory tests and outdoor tests using eye-tracking technology to measure the (visual) experience of streetscapes. In addition, we use interviews and observations for triangulation purposes and to interpret participants' eye patterns.

As part of our research methodology, we assembled a panel of practitioners from nine innovative Dutch urban design and (landscape) architecture firms and the Dutch professional association for urban designers. The expert panel categorize the streetscapes beforehand on the appearance of the design principles in order to analyse afterwards the tracked patterns and the (mis)match between the design space and perceived space. As our research touches upon many disciplines and possibly influential variables during the tests (especially outdoors), we constructed an international academic group of experts to be part of the advisory- and reflection board. We met some of the members of our board at the ANFA 2018 conference in San Diego and at the Ux+Design 2019 Conference in Boston. Twice a year and if necessary more often, we will discuss our methodological choices and preliminary findings. We hope, their reflective role, will operationalize our research as part of the evolving new field of neuro-architecture.

Preview of findings

Our research proposal was granted by the Dutch national research fund SIA in the first half of 2019 and we are roughly eight months on the way. Based on our first research, we can preview some first findings, although we think they might be defined mostly as challenges as well. Participants eye fixated on people, traffic and signs. Zones where interior and exterior comes together in the active plinth of buildings and terraces in front, draws instantly the attention (see fig. 4 left photo). Searching for social activity is also what can be observed with eye tracked patterns of other viewed streetscapes. In particular when a building at the end of street blocks the view, the eye is driven towards the modern facade going from one oriel window to another and also colourful balconies is part of the eye pattern (see fig. 4).

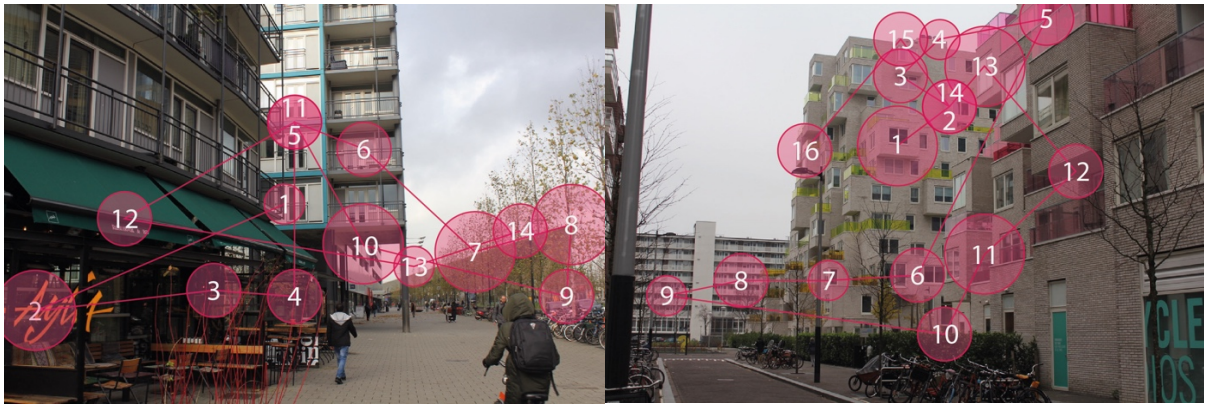

Figure 4: The first 8 seconds of one participant's eye fixation with viewpoint close-up left and viewpoint distant right.

To conclude

Neuro-architecture research might deliver essential 'building blocks' and technologies to enhance the design processes when epistemological *knowledge-transfer* problems can be bridged. The design process is partly an artistic process and requires an appropriate translation of observed neurological mechanisms and cognitive psychological theories to be adopted by architects and urban designers. The new field of neuro-architecture is *the* setting to address these transfer problems, making them more explicit, and defining their boundaries.

Additional information on this project can be found at www.sensingstreetscapes.com

About Frank Suurenbroek

Dr. Frank Suurenbroek is Professor of Spatial Urban Transformation at the Faculty of Technology at the Amsterdam University of Applied Sciences (AUAS). His Chair is embedded in two interdisciplinary Research Programs, i.e. Urban Technology and Urban Governance & Social Innovation. Frank is member of the Executive Committee of the international Media–Architecture Biennale, to be held in Amsterdam in July 2021 (www.mab20.org), which is related to an earlier project on Responsive Public Spaces (www.responsiveurbanspaces.amsterdam). Frank is also responsible for the multidisciplinary Inclusive Area Development research track.

About Gideon Spanjar

Dr. Gideon Spanjar holds a PhD in Landscape Architecture from the University of Essex. He is currently manager of the research track: Designing Future Cities at AUAS. He is also project leader and senior researcher of Sensing Streetscapes (www.sensingstreetscapes.com) and of the European Union-funded Cool Towns project, which aims to make cities climate-proof. He is an associate fellow at the Centre for Econics and Ecosystem Management and a member of the editorial board of *Rooilijn*, a peer-reviewed Dutch journal on science and policy in the field of spatial planning.