Abstract Book of the CNR IMATI Workshop
https://www.sciencepg.com/ISBN/979-8-88599-188-9/003

Quantifying Urban Experience: Geometry, Visual Appearance, and Human Perception

Simona Cutruzzulà[1, 2, *]

[1]Istituto di Matematica Applicata e Tecnologie Informatiche, Consiglio Nazionale Delle Ricerche (CNR-IMATI), Genoa, Italy

[2]Department of Mathematics, University of Genoa, Genoa, Italy

Email address:

simona.cutruzzula@ge.imati.cnr.it (Simona Cutruzzulà)

[*]Corresponding author

Abstract

People's sense of comfort in urban spaces is shaped not only by personal factors but also by measurable features of the built environment and its visual qualities. Identifying which of these elements most strongly contribute to our impressions is crucial for designing cities that better support well-being and foster positive interactions with the city. In this work, we present a computational framework that examines urban scenes through the lens of human visual perception, aiming to bridge the gap between environmental structure and experiential response. The method relies on an explicit representation of the human field of view, allowing us to isolate and analyse the portion of the environment that an observer effectively sees from a given position. Building on this representation, we derive a set of geometric descriptors that capture the spatial organisation of urban elements, the amount of visible sky, and the degree of visual obstruction or openness. Alongside these geometric features, we incorporate analyses rooted in optics and colour science to quantify chromatic composition, light distribution, and other aspects of visual appearance that contribute to the overall character of a place. A central objective of this framework is to relate these measurable environmental attributes to people's lived experience. When the extracted metrics are paired with citizens' feedback – whether expressed through surveys, field studies, or other forms of qualitative reporting – they enable the detection of meaningful correlations between specific urban characteristics and levels of comfort, appreciation, or perceived quality. Such insights can illuminate which aspects of the environment matter most to individuals, even when people themselves cannot explicitly identify the cause of their reactions. Such correlations can inform the evaluation of proposed urban changes, help monitor the evolution of urban livability over time, and help guide interventions aimed at improving the quality of public spaces. Although the project is still under development, early results indicate that this methodology has significant potential to deepen our understanding of how urban form shapes perceptual experience and to enrich future strategies for human-centred urban design.

Keywords

Urban Perception, Field of View, Scene Analysis