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Continuous Measurement of Spatial Exposure Based on Visual Perception in Three-Dimensional Space

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Abstract : In the backdrop of expanding urban landscapes, accurately assessing spatial openness is critical. Traditional visibility analysis methods grapple with discretization errors and inefficiencies, creating a gap in truly capturing the human experi-ence of space. Addressing these gaps, this paper introduces a distinct continuous visibility algorithm, a leap in measuring urban spaces from a human-centric per-spective. This study presents a methodological breakthrough by applying this algorithm to urban visibility analysis. Unlike conventional approaches, this tech-nique allows for a continuous range of visibility assessment, closely mirroring hu-man visual perception. By eliminating the need for predefined subdivisions in ray casting, it offers a more accurate and efficient tool for urban planners and architects. The proposed algorithm not only reduces computational errors but also demonstrates faster processing capabilities, validated through a case study in Bei-jing's urban setting. Its key distinction lies in its potential to benefit a broad spec-trum of stakeholders, ranging from urban developers to public policymakers, aid-ing in the creation of urban spaces that prioritize visual openness and quality of life. This advancement in urban analysis methods could lead to more inclusive, comfortable, and well-integrated urban environments, enhancing the spatial experience for communities worldwide.

Keywords : visual openness, spatial continuity, ray-tracing algorithms, urban computation
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