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LAPLACIAN-GAUSSIAN SUB-CORRELATION ANALYSIS FOR SCALE SPACE IMAGING

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Abstract. *A new framework is presented for combining perspective projection and self-similarity as two universal imaging rules to detect maneuvering affordance in complex scenes. To this end, first, scale shift due to perspective projection is indexed through Laplacian-Gaussian image analysis. On this aspect of scale space, the expansion of horizontal space is visualized as the probability of deviation from the generic roadway. Next, the observed roadway is associated with a fractal attractor generated by a set of unknown contraction mappings. For stochastic covering of the generic roadway, 2D Brownian motion is introduced on successively reduced domain. By representing the capturing probability of Brownian motion on the dynamic domain as the multi-scale aspect of imagery, discrete features are extracted to identify the mapping set. The identified generic roadway is visualized on the scene image as a cue to induce 'one-step-ahead' motion. Finally, the representation scheme was tested through experimental studies to clarify the effectiveness and limitations of the proposed framework.*

Keywords: Scale space representation, 2D Brownian motion, Perspective projection, Self-similarity, Scene analysis, Maneuvering affordance

1. **Introductory Remarks.** Visual perception organizes randomly distributed image features into cues to the recognition of an encountered scene. As an *as-is* part of the real world, the natural object itself maintains consistency within the scene, independent of observer specific context. On the other hand, it is not easy to identify real objects deterministically by image features even in a specific recognition context. Thus, the complexity of the real world results from twofold uncertainty: the volatility of context selection and the statistical diversity of image features. The capability of visual perception implies the existence of universal rules concealed in the visual complexity of real scenes. From the earliest stages of pattern analysis, both statistical and syntactic approaches have been invoked as a theoretical basis for computer implementation. By integrating these approaches, geometric and grammatical aspects of natural complexity can be extracted from observed imagery. However, statistical and syntactic operators manipulate a space of continuous fields and a set of discrete symbols, respectively. Due to essential discrepancies between the operands, it is not easy to invoke universal rules as the basis of cooperation for statistic and syntactic schemes.