

STATISTICAL ANALYSIS OF SECOND-ORDER RELATIONS OF 3D STRUCTURES

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Abstract: Algorithmic 3D reconstruction methods like stereopsis or structure from motion fail to extract depth at homogeneous image structures where the human visual system succeeds and is able to estimate depth. In this paper, using chromatic 3D range data, we analyze in which way depth in homogeneous structures is related to the depth at the bounding edges. For this, we first extract the local 3D structure of regularly sampled points, and then, analyze the coplanarity relation between these local 3D structures. We can statistically show that the likelihood to find a certain depth at a homogeneous image patch depends on the distance between the image patch and its edges. Furthermore, we find that this prediction is higher when there is a second edge which is proximate to and coplanar with the first edge. These results allow deriving statistically based prediction models for depth extrapolation into homogeneous image structures. We present initial results of a model that predicts depth based on these statistics.