IMPROVING JUNCTION DETECTION BY SEMANTIC INTERPRETATION

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Abstract: Every junction detector has a set of thresholds to make decisions about the junctionness of image points. Low-contrast junctions may pass such thresholds and may not be detected. Lowering the thresholds to find such junctions will lead to spurious junction detections at other image points. In this paper, we implement a junction-regularity measure to improve localization of junctions, and we develop a method to create semantic interpretations of arbitrary junction configurations at improved junction positions. We propose to utilize such a semantic interpretation as a *feedback mechanism* to filter false-positive junctions. We show results of our proposals on natural images using Harris and SUSAN operators as well as a continuous concept of intrinsic dimensionality.

1 INTRODUCTION

Junctions are utilized in computer vision and image processing for tasks that especially require finding correspondences between different views of the same scene, mainly due to their *distinctiveness*, *seldomness* and *stability*.

Correct localization of junctions[1] is crucial because even small errors in localization lead to wrong interpretations of the scene (Rohr, 1992). Nevertheless, it is shown in (Deriche and Giraudon, 1993; Rohr, 1992) that energy-based junction detection methods smooth out junctions and face the problem of wrong localization.

Junctions also have the property of being *interpretable*: *i.e.*, you can construct a meaningful interpretation about how the junction is formed, as proposed in (Parida et al., 1998; Rohr, 1992). Such a semantic interpretation (*SI*) can be utilized in rigid body motion estimation, depth estimation, feature matching etc. and should be more robust than a single junctionness measure in identification of junctions and in correspondence finding.

Junction detectors, no matter what the underlying methods are, have to make a decision about the junctionness of image points. The decision is made by a set of automatically or manually set thresholds (on a set of measures) that determine the *sensitivity* of the algorithm to contrast (in most of the cases, a high threshold means low sensitivity and vice versa). On the other hand, a method that utilizes a junction detector requires the detector to be *complete*: *i.e.*, the detector should be able to detect all the junctions that represent the image.

The relation between sensitivity and completeness presumably looks like as plotted in figure 1(a). Increasing the sensitivity increases not only the completeness of a detector[2] but also increases the amount of false-positives, or 'spuriousness', of the detector as illustrated in figure 1(b). These observations suggest that spuriousness and completeness are two compet-

[1] In this paper, corners are considered to be a special case of junctions, and the term 'corner' is avoided.

[2] Exact shape of this relation might be different in real world; however, the authors claim that completeness should be still an increasing function of sensitivity in any case.

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