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ROBUST CANDIDATE PRUNING APPROACH BASED ON THE DEMPSTER-SHAFER EVIDENCE THEORY FOR FAST CORNER DETECTION WITH NOISE TOLERANCE IN GRAY-LEVEL IMAGES

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Abstract. *A fast two-stage corner detector with noise tolerance is presented in this paper. At the first stage, candidate-corner pixels are selected by a proposed candidate pruning approach. At the second stage, real corners are recognized by the Harris detector among the candidate-corner pixels. In general, corners are considered as the junction of edges. Therefore, edge pixels with a high gradient in more than one direction can be selected as candidate-corner pixels. Meanwhile, noisy pixels always cause false detections in most corner detectors. Those noisy pixels thus must be excluded from candidate-corner pixels to enhance the noise tolerance capability. In this paper, candidate-corner pixels are selected based on local features that are extracted from a sliding observation window. These features including gradient, edge and impulse noise are regarded as pieces of evidence and are further combined by Dempster's rule to yield a final belief value. Through the well-selection of candidate-corner pixels, the candidate pruning approach can 1) enhance the noise tolerance capability, and 2) reduce the computational cost of the proposed corner detector. Experimental results show that the proposed method outperformed other well-known corner detectors.*

Keywords: Dempster-Shafer theory, Corner detection, Harris detector, Evidence theory, Mass function

1. **Introduction.** Corners have long been recognized as the bearers of rich visual information and thus have been used as features in many basic visual tasks. Actually, corner detection has been widely used in applications [1-5]. However, despite the widespread use of the existing corner detectors, most detectors have some common limitations such as high computational cost and/or sensitivity to noise described as follows.

First, the use of corner detectors may be restricted in practical systems due to their high computational cost. Especially, dealing with high-resolution images for real-time processing is a very common requirement in applications of computer vision. Hence reducing the computational cost is a crucial issue for the applicability of corner detectors in real systems. Second, corner detection usually can not perform well on noisy images. As we know, noise is an inherent feature of digital imaging sensors. It is impossible to completely eliminate that noise. Some existing corner detectors ignore noise and assume that the input image is always clean. Consequently, their performances will deteriorate if the input image is noisy.

The motivation of this paper is to propose a novel method to overcome the aforementioned limitations. A candidate pruning approach is employed at the first stage and a back-end Harris detector is employed at the second stage in the proposed two-stage corner