**Cross-based Matching Constrained by the Classes of Pixels**

Yang, Y.C. 1\*and Jaw, J.J.2

1PhD student, Department of Civil Engineering, National Taiwan University, Taiwan

2 Associate Professor, Department of Civil Engineering, National Taiwan University, Taiwan

[\*ivy.ycyang@gmail.com](mailto:*ivy.ycyang@gmail.com)

***ABSTRACT***

In the field of computer vision, accurate depth estimation is crucial for various applications such as 3D reconstruction, object recognition, and autonomous navigation. This paper presents an optimized approach to stereo matching that integrates Cross-Based Matching and image segmentation. In this research, a classified image is generated by pixel classification to enhance the precision of disparity maps. This method leverages Semi-Global Matching (SGM) for its robustness and reliability while introducing a unique constraint based on pixel classification. This constraint incorporates image segmentation to inform the Cross-based matching process, setting this approach apart from traditional SGM and Cross-based matching methods. Classifying pixels into distinct categories and using these classifications to restrict the matching area significantly reduces ambiguities and improves consistency in disparity estimation. The experiment used different numbers of objects in image segmentation to perform several tests. The results of Cross-based matching versus the proposed method were evaluated by five metrics: pixel accuracy, difference map, histogram, error evaluation, and error distribution map. Experimental results demonstrate that the proposed method indeed reduces the error in Cross-based matching, particularly distributed around the borders of the different objects. However, some new errors arise because of insufficient quality of segmentation. This integration of Cross-based with image segmentation constraints provides an ideal path in stereo matching techniques, paving the way for more accurate and reliable depth estimation in various computer vision applications. Yet, how to best employ segmentation information and quality for improving stereo matching remains not only interesting but also challenging.

**Keywords:** SGM, cross-based matching, image segmentation, classified image, disparity map