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A FEATURE-BASED AND HIERARCHICAL STEREO MATCHING METHOD

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Abstract. *This paper proposes a stereo matching algorithm that consists of two consecutive steps: initial disparity map generation and refinement. In generating the initial disparity map, it uses edge information as an image feature, which is obtained by segmenting the image into R, G, B and white channels. First, disparities along the edge are obtained. Then, they are diffused to the surroundings by evaluating the autocorrelation values in each color channel to form the initial disparity map. The refinement separates possible occlusion regions first. The non-occlusion regions are refined by hierarchical stereo matching such that the size of the matching window is reduced to half in each recursion. For the occlusion regions, the disparities are filled with those from the background by examining the surrounding pixels. Four test images provided by Middlebury stereo vision were used to evaluate the performance of the proposed algorithm objectively. The experimental results showed that the average disparity error rate for the entire image after final refinement was about 11%, which is better than the previous methods by graph-cuts, dynamic programming, etc. The disparities at the boundaries with our algorithm are clearer and accurate enough to remove the streaking problem, which is another strong point.*

Keywords: Stereo image, Feature, Hierarchical stereo matching, Disparity, Disparity map

1. **Introduction.** Recent research on 3-dimensional (3D) images has been gathering more attention all around the world. The channel of BS11 continues to provide 3D video broadcasting services in Japan, and has since April 2008. Research in this area has also been carried out actively at MPEG so that the standardization of multi-view video coding (MVC) technology has been completed [1]. In addition, research on free-viewpoint television (FTV) has also been started. The reason why big companies, universities and research organizations in many nations are interested in this area is that the media is gradually advancing realistic broadcasting to meet consumer and business demands. A lack of 3D content is compensated for by converting 2D content to 3D [2]. 3D images are also used for other purposes such as motion estimation [3].

Stereoscopic images are two stereo images which are highly correlated because they are obtained at the same time from adjacent viewpoints. The process to find such a correlation is called stereo matching. The positional difference between two corresponding pixels (one in the left and the other in the right image) is their disparity. A disparity map consists of the disparities of all the pixels of the original image (left or right). This correlation information can be used in rendering the intermediate view (IVR), and also actual depth information can be extracted from it. It is also possible to separate specific information