

Multiresolution energy minimization framework for stereo matching

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Abstract-

Global optimisation algorithms for stereo dense depth map estimation have demonstrated how to outperform other stereo algorithms such as local methods or dynamic programming. The energy minimisation framework, using Markov random fields model and solved using graph cuts or belief propagation, has especially obtained good results. The main drawback of these methods is that, although they achieve accurate reconstruction, they are not suited for real-time applications. Subsampling the input images does not reduce the complexity of the problem because it also reduces the resolution of the output in the disparity space. Nonetheless, some real-time applications such as navigation would tolerate the reduction of the depth map resolutions (width and height) while maintaining the resolution in the disparity space (number of labels). In this study a new multiresolution energy minimisation framework for real-time robotics applications is proposed where a global optimisation algorithm is applied. A reduction by a factor R of the final depth map's resolution is considered and a speed of up to 50 times has been achieved. Using high-resolution stereo pair input images guarantees that a high resolution on the disparity dimension is preserved. The proposed framework has shown how to obtain real-time performance while keeping accurate results in the Middlebury test data set.

Index Terms-

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