A Stereo-Matching Method Using Multiresolution Images

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1. Introduction

A driving support system developed for preventive safety purposes, such as a collision prevention system needs to have a method for detecting obstacles near the vehicle. A stereo-matching method using on-vehicle cameras is expected to be the means of providing distance information (distance images) of higher resolution than radar. The conventional on-vehicle stereo-matching method using the correlation of a single-size area base had a low reliability with a large computational processing.

2. Methodology

To solve problems related to the conventional method, we propose a stereo-matching method using multiresolution images, which 1) carries out stereo-matching from low to high resolution in the coarse-to-fine search mode; and 2) produces short-distance images with low resolution and long-distance images with high resolution (**Fig. 1**).

3. Experiment

We made a comparative evaluation of the reliability and computation volume of distance images using both the conventional and proposed methods. The distance images were compared with the correct disparity rate for each sampling ratio (ratio of distance images, extracted from the reliability evaluation of respective methods, to the total images). Judgment of the correct/error value of the distance was made in comparison with the visually collated values. The computation volume was determined by comparing the processing time for installing the software.

4. Result

As **Fig. 2** shows, the correct disparity rate of distance images was improved by about 10% to 30% compared with the conventional method. The computation processing time was reduced from 5.6 sec to 0.7 sec, or approximately 1/8. **Fig. 3** shows a stereo input image and the distance images for the same sampling ratio (dotted line in Fig. 2) produced by the conventional and proposed methods.

5. Conclusion

A stereo-matching method using multiresolution images was proposed and improvement in the reliability of distance images and the reduction of the computational volume[1] were realized. In the future, the author intends to achieve real-time operation and cost reduction.
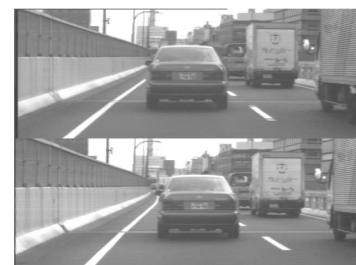
Reference

1) Kimura, K., Ota, M., and Ninomiya, Y. : "Stereo-Matching Method Using Multiresolution Images", 6th Image Sensing Symp., Collection of Reports, (2000), 315
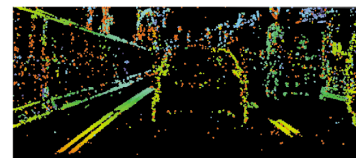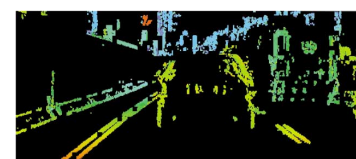
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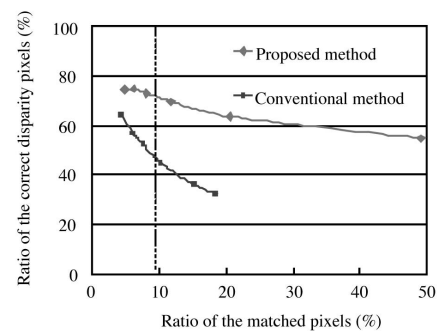
Fig. 2　Correct disparity rate.
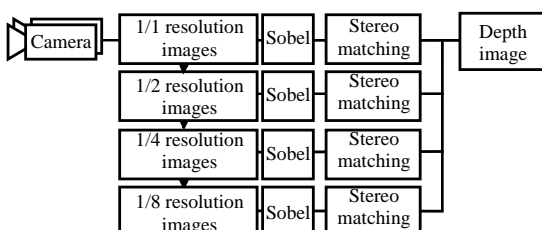

Fig. 1　Block diagram of the proposed method.

Fig. 3　The road image experiment, (a) input stereo images, (b) depth image obtained by the conventional method and (c) depth image obtained by the proposed method.