

Automatic Design of Image Acquisition Environment and Recognition Process for Picking

Recently, to increase production capacity and/or to reduce production cost, image recognition technique is actively used in manufacturing system such as product assembly and inspection. First, it is necessary to design image acquisition environment to construct the image recognition system. Then, the process to recognize target objects, such as type, position and angle is needed to design. The recognition process usually consists of three steps: image conversion, feature extraction and identification. There are vast amounts of combinations of parameters in image acquisition environment and recognition process. In addition, the parameters included in image acquisition environment and recognition process mutually depend. Therefore, it requires long-term to design whole recognition system even for experts.

The purpose of this study is to automatically design the image acquisition environment and the recognition process for picking system (Fig. 1). For picking, to recognize the kind, position and angle of target objects is necessary. The image acquisition environment included distance between target objects and camera and intensity of RGB light. For recognition process, we used method based on local features and targeted the automatic design of image-conversion-parameters and identification using the local features. This automatic design was formulated as optimization problem and the problem was solved by metaheuristic method. For the optimization calculation, the experiment-based optimization was used because there are some uncertainties of environment in the real world. For the uncertainties, it is too difficult to solve this problem only using theoretic and/or computational methods. Fig. 2 and 3 show conceptual image of the experiment and proposed algorithm of the experiment-based optimization respectively. As the results or evaluation experiment, sufficient recognition accuracy was obtained within a reasonable time.

Key words: automatic design, optimization, image recognition, image acquisition environment

Reference

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- [2] T. Yukisawa, *et al.*: Automated Design of Image Recognition System Including Image Acquisition Environment for Picking, Proc. JSPE Semestrial Meeting 2016 JSPE Spring Conference, Chiba, March, 15-16, p. 155, 2016 (*in Japanese*)

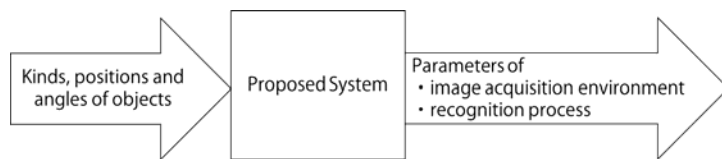


Fig. 1 Problem setting

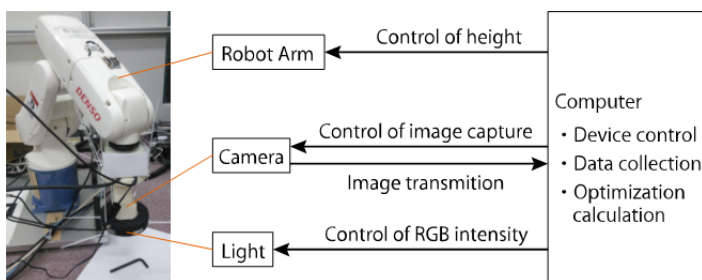


Fig.2 Conceptual image of proposed experiment-based optimization

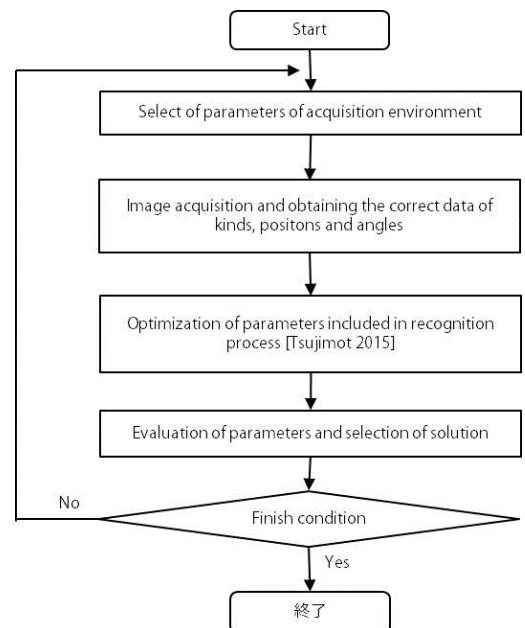


Fig. 3 Proposed algorithms