

Design of image recognition procedures in manufacturing system using optimization algorithm

Image recognition technique is often use in manufacturing system. Image recognition includes finding objects from images and identification of the objects by the feature criteria. The procedure of image recognition is generally consisted by the three steps; image conversion, feature extraction, and identification (Fig. 1). In the three steps, there are a huge amount of design factors: the various image conversion and combinations of them, many parameters in each image conversion and the criteria and those values included in identification dictionary. Furthermore, it makes the design difficult that the designed procedure is evaluated by the task is accomplished using the procedure. Therefore, only experts can design image recognition procedure, which prohibit the wider progress of image processing in manufacturing system.

We took an example which to recognize the shape and the position of the objects in order to grasp the objects by the robots in the production line (Fig. 2), and propose a method (Fig. 3) to generate image recognition procedures by focusing only to image conversion parameters and identification dictionary. By giving the images of recognition objects instead of the identification dictionary to the computer, it can create an appropriate identification dictionary for every image conversion process. We optimize the image conversion parameters and identification dictionary. There is two objectives; first priority is to maximize recognition rate of shape, and second priority is to minimize the greatest value of position error. The proposed method shows good result from the view point of recognition rate in comparison to a comparative method that gives identification dictionary and so doesn't create it with respect to each generated image conversion process (Fig. 4).

Key words: optimization, image recognition, parameter tuning, identification dictionary

Reference

[1] K. Tsujimoto, *et al.*: "Simultaneous Design of Image Conversion Parameters and Classifier in Object Recognition for a Picking Task," Proc. Int. Conf. Robotics Biomimetics (ROBIO2014), pp. 457-462, 2014.

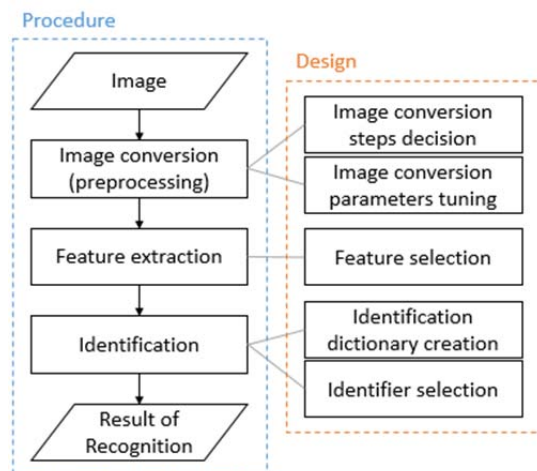


Fig. 1 Procedure and design of image recognition

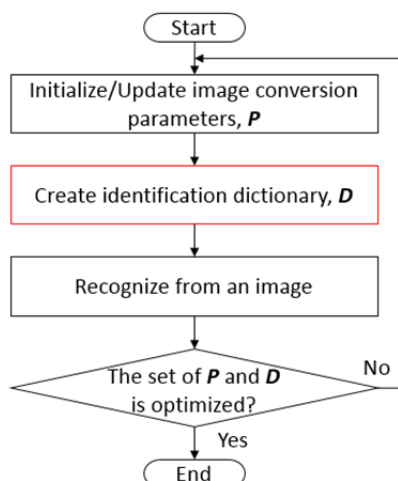


Fig. 3 Proposal method



Method	Evaluation index	
	Recognition rate (F-measure)	Maximum position error [pixel]
Proposed method	1	4.04
Comparative method	0.875	4.04

Fig. 4 Evaluation index for proposal method and comparative method