Generation of Image Recognition Procedures in Production Lines by Using Optimization Algorithm

In order to improve the productivity, reduce the production cost and other purposes, many tasks in the production line, such as the assembly task and the inspection task, are automated. For those tasks, the image recognition technique is used. It is necessary for image recognition to find recognition objects from images and then identify the objects from the criteria called feature. The procedure of image recognition is generally consisted by 3 steps; image conversion, feature extraction, and identification (Fig. 1). By appropriately designing these 3 steps, the process of image recognition works as expected. The experienced engineers design the steps, but they have a tough time because of several reasons; a huge amount of the combination of a step for image conversion, necessity to tune parameters of every step for image conversion, the difference of the criteria and those values, called identification dictionary, due to the difference of image conversion process, the fact that the adequacy of the designed procedure is only by whether the task is accomplished, and so on.

In this study, we take 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 are 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 does not create it with respect to each generated image conversion process (Fig. 4).

***Keywords*:** optimization, image recognition, parameter tuning, identification dictionary

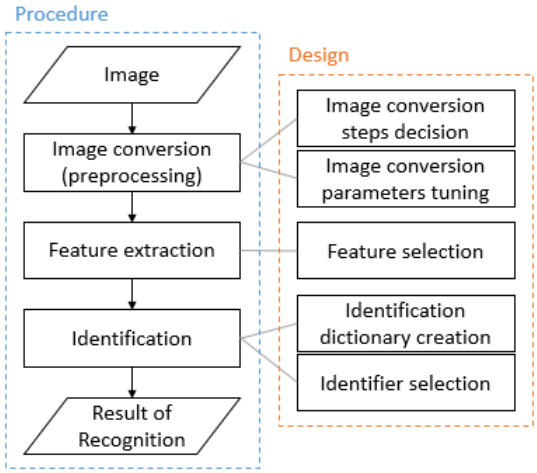

Fig. 1 Procedure and design of image recognition

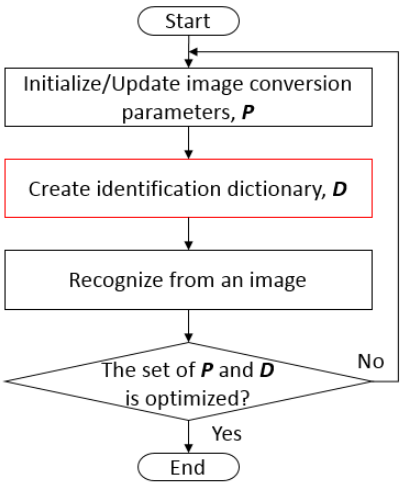

Fig. 3 Proposal method

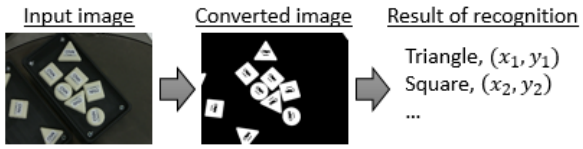

Fig. 2 Example task for image recognition

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