

Utilization of CG in Training Data Preparation for Deep Learning

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Abstract

Nowadays, deep learning is utilized in a wide range of fields and has achieved great results. However, in order to use deep learning, it is necessary to prepare a large amount of training data, and this becomes a serious obstacle in some fields. In this study, I show the case to estimate quantities from actual images (photos) by a scalar regression model of deep learning, which is trained by CG images generated automatically.

For example, since inventory quantities of bulk containers shown in Fig. 1 cannot be counted visually, their stock taking requires man-hours. So, we showed a method to estimate their quantities from the actual inventory shelf images, and it is useful for inventory management in the actual factory [1]. On the other hand, it took a long time to accumulate the training data using actual images. So, we built a function to create the training data using the automatically generated CG images. However, there was a difference between CG and actual images based on material and illumination, and it has been a deteriorating factor for the accuracy of the quantity estimation.

For this problem, we tried the following improvement methods: to replace some of the CG images with actual images; and, to convert the color of CG images. Firstly, we confirmed the accuracy could be remarkably improved by replacing actual images by 20%. This suggests that the accuracy can be improved by accumulating actual images through inventory management.

Secondly, as for the material and illumination, improvement of accuracy could be made by simple conversion of saturation and intensity in HSV color space. In an experiment, the accuracy was achieved similar to the case of replacing with actual images about by 15%. Here, the study on the generative deep learning has been advanced recently, and it has become to be possible to create realistic images automatically by using such as the generative adversarial network (GAN).

So, future study will be focused on the automatic and further improved method of the estimation accuracy by using such as GAN.



Figure 1. Bulk container

Keywords: deep learning, regression model, computer graphics (CG), quantity estimation.

References

[1] Kawanaka, T., Kudo, T., 2018. Inventory satisfaction discrimination method utilizing images and deep learning. *Procedia Computer Science* 126, 937–946.