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Department of Electrical and Electronic Information Engineering	ID	M183270
Name	Ken Murai	

Supervisor	Shuichi Ichikawa

Abstract

Title	Examination of kuzushiji recognition by object detection

In recent years, it has become popular to digitally archive old documents and publish them. Old documents are written in ”Kuzushiji”, and the delimiters of the characters are expressed in an unclear form, so they cannot be understood by general users. In addition, since many ancient documents are handwritten and have strong personal habits, it is still difficult to fully automate reprinting using handwritten character recognition technology. Therefore, the images separated for each character were used to recognize the characters.

After that, at the 21st PRUM Algorithm Contest held in 2017, the number of characters recognized increased to three or more. Then, Kaggle Kuzushiji Recognition was held in 2019. The winning tascj model adopted MMDetection to detect Kuzushiji characters. It was shown that the object detection is a hopeful and promising approach to improve the accuracy of character. Thus, this research verifies whether the accuracy is improved from the direction of object detection, as opposed to the method that has been trying to improve the accuracy of character recognition. In addition, I compared the character recognition system with the object detection system.

First, I verified the recognition of Kuzushiji characters by character recognition.The net structure for character recognition used was a combination of three-layer CNN and two-layer MLP. I trained it to classify 683464 training images, separated by letter, into the 4212 class. It had an accuracy of 0.8660 after 400 cycles (4 epochs) when it was testing by inputting test images every cycle.

Next, I verified the recognition of Kuzushiji characters by object detection. For object detection, it used MMDetection, which was used by tascj, who won the Kaggle Kuzushiji Recognition. Faster R-CNN was used as the object detection method, and 3605 training images were divided into 512 * 512 sizes and 133000 images were trained. After 10 epoch of learning, 1736 images were input with 0.5 times the height and width, where the accuracy was 0.6846 and the F1 score was 0.8128. In addition, it carved 1736 test images character by character, which were then input to the trained model. The derived accuracy was 0.7209 and the F1 score was 0.8378.

Regrettably, compared with the previous research, neither of the two models created this time could reach the level of the previous research. In addition, while Kaggle Kuzushiji Recognition was able to recognize the Kuzushiji character by object detection, the accuracy of character recognition was better in the created model. It is thought that this is because character only determines whether the judged character can be classified, whereas object detection does not give a correct answer unless it is detected as a character and then classified.