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A STUDY ON JAPANESE HISTORICAL CHARACTER RECOGNITION USING MODULAR NEURAL NETWORKS

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Abstract. *In this research, we develop the Japanese historical character recognition system for the reading support system for Japanese historical documents. We use the directional element features as feature vectors and use the modular neural networks as pattern classification method. The modular neural networks consist of two kinds of classifiers: a rough-classifier and a set of fine-classifiers. In the rough-classifier, we use the multi-templates matching in order to find the several candidates of character categories for the input pattern. The multi-templates for each category are derived from the input samples using the Self-Organizing Maps (SOM). In the fine-classifiers, we use the multi-layered perceptrons (MLP), each of which solves the two-category classification problem. The final result of character recognition is derived by selecting the MLP which has the maximum output among the set of MLPs. We also use the rough-classifier for the selection the training samples in the learning process of multi-layered perceptrons in order to reduce the learning time. Through the experiments of historical character recognition for 57 character categories, we confirmed the effectiveness of our proposed method compared with the conventional research.*

Keywords: Japanese historical character recognition, Modular neural networks, Directional element features, Self-organizing maps

1. **Introduction.** It is one of the fundamental works to translate the historical characters called "kuzushi-ji" written in the Japanese historical documents into the contemporary characters in Japanese historical studies and Japanese literature. Not only in these academic fields, there are also many general people who enjoy reading the Japanese historical documents in the weekend as one of the hobbies. In order to read "kuzushi-ji" characters and translate it into the contemporary character, the expert knowledge on Japanese historical characters and documents is required. However, it takes a lot of period of learning and training to acquire such knowledge.

In this research, we develop the Japanese historical character recognition system to integrate into the reading support system for Japanese historical documents as shown in Figure 1. In this reading support system, the user selects the unknown character by mouse operation and the character recognition system outputs five candidate characters with each typical character image. In order to realize this historical character recognition system, it is necessary to recognize many kinds of "kuzushi-ji" characters and have the robustness for transformation of character shapes. The multi-layered perceptron is one of the useful methods for such pattern recognition. However, it is difficult to deal with many character categories in a single neural network. Therefore, we develop the Japanese historical character recognition system using the modular neural networks and reveal