Development of an application that uses AI to identify and explain flowers that grow on Mount Takao.

Tomohiko OTSUKA

Professor, Dr. Eng.

Email : tootsuka@gifu-nct.ac.jp

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Research Outline

1. Introduction

Mt. Takao has about 1,600 plant species, which is equivalent to the number of plants in the whole of the United Kingdom. In this study, a flower recognition system based on convolutional neural networks (CNNs) is implemented in society for tourists visiting Mt. Takao. Previous studies [1-2] on flower image classification using CNNs are already known. In this study, we further identified what functions are truly useful from the user's perspective and implemented them in society. Finally, we received a subjective evaluation of the system from Mr. Komota, Deputy Director of Takao 599 Museum (a curator of botany).

2. Overview of the CNN-based flower recognition system

The CNN in this system consists of an input layer (image input), an intermediate layer (feature extraction), and an output layer (judgment) (Figure 1). Prior to social implementation, we interviewed Mr. Komoda, the deputy curator of the museum, to find out what functions were desired for tourists to easily investigate the characteristics of flowers, etc. Based on these interviews, the following innovations were made. Based on the above, the following innovations were made. The Deputy Curator of 599 Museum, Mr. Komoda (a curator of botany), gave us a subjective evaluation of the system.

The problem with CNN-based image recognition is the increase in the number of images required for training. In this system, the user can easily adjust the direction and range when capturing flower images, so all flower images are limited to capturing only one flower from the front. As a result, a high recognition rate (see below) was obtained with a relatively small number of images for training.

A function to display the name, blooming period, habitat, etc. is provided.

In general, it is difficult to recognize flowers completely only by images, so the next and third candidates are displayed.

A function is provided to display how to distinguish flowers from similar flowers and to leave the final judgment of flower recognition to the user.

3. Performance Evaluation Experiments

To evaluate the performance of this system, we conducted an evaluation experiment using 300 training images and 100 evaluation images for each of 20 types of flowers.

4. Conclusion

In this study, we constructed the flower recognition system using CNN, identified necessary functions from the user's perspective, and implemented the system in society. The performance of the system was evaluated, and the average recognition rate for 20 types of flowers was 97%. According to the subjective evaluation by Deputy Curator Komoda, the flower feature display, the display of next and third candidate flowers, the display of how to recognize similar flowers, and the recording function were evaluated to be effective functions that could satisfy the intellectual curiosity of tourists.

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Fig. 1 Internal structure of the CNN.