A Trial of Developing an Application for Mobile Devices to Analyze Saga Prefectural Sightseeing Information

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Abstract

In the preceding studies, an analysis of Saga Prefectural sightseeing information by a self-organizing map (SOM) has been tried. And recent development on information and communication technology (ICT) will help us to access any results via the mobile devices easily. Then, in order to realize this basic idea, development of an application for mobile devices is investigated through some preliminary computer simulations on the standard desktop PC in this article.

■ Keywords : self-organizing map (SOM), sightseeing information, mobile device, touch gesture

1. Introduction

Recent development on the mobile devices, e.g., smartphones and tablet computers, is remarkable, and it might be equivalent to the past PCs released several years ago. It makes us possible to develop some applications by ourselves easier than before. By the way, an analysis of Saga Prefectural sightseeing information by a self-organizing map (SOM) has been tried in our research group. Then, in order to integrate them together, a possibility of installation is investigated in this article.

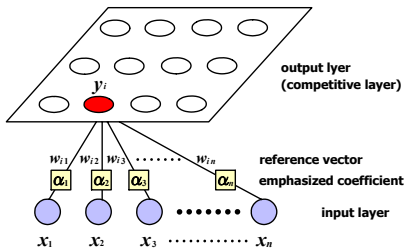
2. Basic idea

2.1 Self-organizing map (SOM)

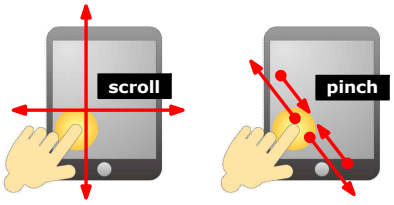
Originally, a self-organizing map (SOM) [1] is proposed as one of the neural network models for the biological visual information processing system. But, in these days, it can be seen as a good tool for signal conversion preserving neighboring arrangement containing the applied data set. Its major feature is visualization as a result of projection from the multi-dimensional space (the input layer) to the two-dimensional plane (the output layer†). Figure 1 is a revised version of the standard SOM for analyzing the sightseeing information in this study. And its results are acquired as a sort of feature map in the output layer.

2.2 Development of applications for mobile devices

From the viewpoint of tourists, it must be convenient that we can access any results of sightseeing information analysis not only via the PCs inside a room but also via the mobile devices wherever we are. In general, a developed feature map will be displayed on the touchscreen, so we can easily change both its placement and magnification depending on our interests. As can be seen in Figure 2, some popular touch gestures, e.g., scroll in the four directions (upward, downward, leftward, and rightward) with one finger, and pinch in two ways (open and close) with two fingers, must be useful for controlling the feature map's appearance.



▶▶ Figure 1. A revised version of the standard SOM for emphasizing particular items. Each circle depicts a single neuron.



▶▶ Figure 2. Some popular gestures on the touchscreen suitable for controlling the developed feature map's appearance.

† Among the SOM researchers, it is usually called "*a competitive layer*". This is why a feature map is developed through training in the competitive manner.

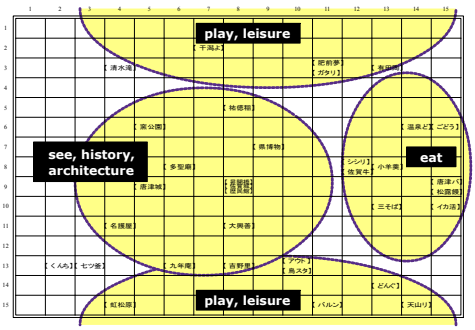
Table 1. Sightseeing information consisting of three major categories, ten items in total, used for training.

category	item
purpose	i) see, ii) eat, iii) play, iv) buy
location	v) latitude, vi) longitude
contents	vii) nature, viii) history, ix) rchitecture, x)leisure&event

3. Computer simulations

3.1 Methods

In this article, sightseeing information provided by the Saga Tourist Federation Information Center, Japan [2] is adopted, and a feature map is developed by the SOM to confirm a possibility of installation. The data set consists of 39 topics, and each of them are represented by a binary code (0/1) based on the three major categories, ten items in total, as summarized in Table 1. A configuration of the output layer (competitive layer) is formed torus, as adjoining both the top to the bottom and the left to the right, because of eliminating the edges. The number of neurons in the input layer is fixed at 10, while that in the output layer is fixed at 225 (=15x15). Under the above-mentioned condition, some computer simulations are carried out on a standard desktop PC.



▶▶ Figure 3. An example of the developed feature maps based on the Saga Prefectural sightseeing information.

3.2 Results

During the training period for 100 epochs, 34 topics are applied to the torus SOM. Figure 3 shows an example of the developed feature maps. It is clear that each topic is assigned in the output layer based on similarity to the attributes of neighboring topics. Roughly speaking, there are three major groups, i.e., a) eat, b) see, history, architecture, and c) play, leisure. Although not shown here for brevity, it might be possible to adjust the arrangement of each topic with the help of an emphasized coefficient $\alpha \geq 1.0$ [3].

As can be seen in Figure 3, any groups are sometimes divided into two separate regions in appearance. But since the output layer is torus, i.e., the uppermost/leftmost line adjoins to the lowermost/rightmost line, respectively, they share the same single region in fact. Then, paying attention to the region entitled "play, leisure", for example, the line #1 (top) of the feature map is adjoined to the #15 (bottom), so scrolling upward on the touchscreen allows us to move continuously without any breaks, and vice versa. In the same manner, scrolling leftward/rightward is expected to have the same effect in the horizontal direction.

By the way, the region entitled "eat" contains most topics related to foods, and it is limited to a small area even though each topic is distributed all over the prefecture. Then, pinching open on the touchscreen allows us to magnify it continuously, and vice versa. This kind of operation must be useful when we want to find out any local specialties nearby.

4. Discussion

As mentioned above, some elemental technologies have been confirmed through the computer simulations. Even though each of them seems to be immature, it might be possible to realize the proposed basic idea near future. One of the problems in front of us is the gap between the theoretical world (virtual space) and the practical world (real space). Taking into account of recent development on information and communication technology (ICT), the threshold of startup is becoming lower and lower. Therefore, it must be possible, but how to construct the human-friendly interface is a key issue as a next upcoming stage of this study.

5. Conclusions

In this article, a possibility of installing an application for mobile devices is investigated. Though its original objective is to analyze Saga Prefectural sightseeing information by the SOM, utilizing its result via mobile devices is also interesting according to the recent development on ICT. As a result of some preliminary computer simulations on a standard desktop PC, it is found that the proposed basic idea seems to be applicable. It is true that there are some problems to be solved, and hence further investigations will be required to realize this idea.

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References

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