Interactive Character Education System

Jungpil Shin and Atsushi Takeda
Graduate School of Computer Science and Engineering, University of Aizu,

1 Introduction
The learning of Chinese characters is an important subject in writing a Japanese text. However, it is very difficult for people from countries which do not use Chinese characters to memorize Chinese characters during a short period of time. A software which can aid students in mastering Chinese character in a short period of time is necessary [1].

In this system, a novel instruction method is proposed which directs letter-shape by using inter-stroke information, such as the relative position and relation among strokes.

2 Character Learning System
The system has the following features:
1. Real time reference of a stroke correspondence based on Cube Search.
2. Instruction of the letter-shape using inter-stroke information.
3. Drawing of the writing order by animation (f) in Fig. 1. A user can input a character while observing an operation of animation.
4. A study range that can be chosen according to grade in (a).
5. Japanese and English support in (b).
6. A display of meaning of a Chinese character to promote understanding in (j).

3 The flow of learning
The interface of this system is shown in Figure 1.
1. The learning range is chosen with the study range selection button in (a).
2. A desired Chinese character is chosen from the range list in (c, i).
3. The Chinese character is inputted into the input column in (d) while a reference character is viewed. If the order of strokes in writing that character is unknown, the stroke order can be examined by the “animation” button.
4. The stroke correspondence is examined by the “check” button of the operation button in (e). If an error in stroke correspondence occurs, the color of the stroke will change. A click on the desired stroke presents the number of the right stroke for the wrong stroke in the order display column in (g).
5. If a mistake occurs in the wrong stroke order display column or stroke correspondence table in (h), the “clear” button is pushed and the system returns to step 3.
6. If there are no mistakes, return to 1.

4 Stroke correspondence search
One-to-one stroke correspondence is defined by bijection \( l(k) \) to stroke number \( k \) of the input pattern. The measure of dissimilarity between input pattern stroke \( A_k \) and reference pattern stroke \( B_l \) is calculated using stroke information on the shape and position: the measure of dissimilarity is denoted as \( \delta(k,l) \) and called the stroke distance [2].

Figure 1: Interactive Character Education System
As a valuation basis of the optimal correspondence, the sum of the distance \( \delta(k,l) \) calculated by DP-matching and inter-stroke information between \( A_k \) and \( B_l \) is used.

5 Inter-stroke information
As a geometric feature of a character, a relative arrangement relation exists between strokes other than the form of each stroke. Moreover, the relative length between strokes, which is carried out, is important work for discernment between some characters. Such information is defined as inter-stroke information.

Based on the definition of the inter-stroke information, the letter-shape is corrected by guiding a relative position relation with other strokes. A student views the display and corrects the relative balance during a stroke. If the position relation between all strokes is corrected, it results in a correct letter-shape which is also a whole letter-shape.

6 Conclusion
A novel instruction method is proposed which directs letter-shape by using inter-stroke information, such as the relative position and relation among strokes.

Using this system, it is possible for learners to efficiently master the order of strokes of Chinese characters. As a future work, the educational experiment is carried out for elementary or foreign students.

References