Abstract

The most popular way of learning oriental calligraphy has been by practicing the calligraphy under the supervision of a human teacher, but finding a good instructor could be difficult.

Therefore, this study proposes a Kanji calligraphy learning system with computerized supervision and analyzes the learning efficiency of the system, where the supervision includes symmetries between strokes.

The main contribution of this paper was to identify and reveal the efficacy of computerized supervision in comparison to a human supervisor. The proposed system decreased the writing-error-rates of learners from 32.7% to 3.4%, whereas the traditional practice reduced the error rates from 31.0% to 6.8%. This result shows that computerized supervision is more efficient than human supervision for learning calligraphy.

Introduction

Oriental calligraphy is a visual art that represents languages and emotions using signs and symbols, which was developed and has been evolving for centuries in countries that utilize Chinese characters in their scripting system. The Kanji calligraphy is well-known to people in many countries and has received much artistic attention throughout history.

This paper introduces a calligraphy learning system that indicates error spots specifically. It was difficult for users to understand error spots in previous systems because the written characters were evaluated in holistic ways. We introduce the present calligraphy learning system for Japanese Kanji in later sections and show experimental results to prove its efficiency.

Calligraphy Learning System Overview

Screenshots of the developed calligraphy learning system are shown in Figure 1. At the system start, a user selects a letter to learn and checks the stroke order to draw.

Selection of Letters for Learning Calligraphy

An online handwritten character database (Nakamura et al. 2005) is used to cluster the strokes. This database was recorded with a pen tablet (Wacom, Japan), which includes the traces of the XY-coordinates of the pen together with the information on pressures and elevation angles at each of the data points. The characters in the database were normalized to the size of 256 × 256, and all the strokes of the characters were separated. The strokes were adjusted for their starting points to be (0, 0).

Evaluation of Calligraphy Writing

The proposed system was evaluated with 19 characters comprising the 44 types of strokes. Twenty-two Japanese people (aged 18 to 55 years, 20 males and 2 females) participated in scripting Kanji calligraphy, and the learning efficiency was evaluated in comparison to the traditional method with brush and paper. None of the participants were expertized in Japanese calligraphy.

Conclusions

Traditional ways of learning Japanese Kanji calligraphy is writing on a paper with a brush and ink, under the supervisions of a teacher. This method has been verified throughout history; however, preparing the equipment and finding a good supervisor is not always easy depending on the circumstances.

The main contributions of this paper are as follows: 1) a calligraphy learning system that indicates errors was introduced; 2) it was proved that calligraphy learning with computerized supervision can be more efficient in reducing the number of errors than the traditional method with a human supervisor.

Although this study showed that the proposed system outperformed the human supervision regarding calligraphy teaching, this does not ensure that the proposed system is always better. Excellent teachers may supervise the learners better, and the learners can ask calligraphy-related questions to improve their knowledge. Moreover, personal relationships between teacher and learners could not be mimicked by the proposed system.

Further, variant brush effects (e.g., dirt, blurring of characters) should be included for a better representation of virtual brush artwork.