Chapter XIV

A Distance Learning System for Teaching the Writing of Chinese Characters Over the Internet

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Abstract

This chapter proposes an intelligent tutoring system (ITS) for teaching students to write Chinese characters over the Internet. Since each Chinese character is like a picture, knowing the correct stroke orders can enable a person to write characters more easily. Accordingly, primary schools in Taiwan teach the correct orders in which strokes should be made when writing Chinese characters. In the proposed system, students can use a pen (or drag the mouse) to write Chinese characters on a digital board through a browser such as Microsoft Internet Explorer. For realizing the situation of student's writing behavior, a neuron-based student model was designed

to learn the writing style of each student. When a wrong stroke order is used, a short animated cartoon is displayed to show the error to the student, and the reason for the error will be explained. An intelligent tutoring module selects a Chinese character that is similar to the character written with the wrong stroke order, to teach the student again. Several databases and rule-bases are used to store important information such as the correct stroke orders and the structure of each Chinese character, the screen positions of each stroke, the writing behavior of each student, the rules of inference by which training characters are selected, and the error codes (types). This system has been in development since 1996, and includes 2734 Chinese characters (taught in primary schools). It has been used in elementary schools, and by thousands of students. Educational research reveals that over 82% of primary school students had some problems in using the correct stroke orders when writing Chinese characters, and the improvement exhibited by the experimental group was significant (F = 25.331, p < .005). The proposed system has been verified as being of high value in teaching students to write Chinese characters.

Introduction

Around 4,000 Chinese characters are commonly written, and they have a wide variety of shapes and stroke orders. Each Chinese character is like a picture, and each stroke has a special shape, direction, and position. Chinese characters can be written more easily if the correct stroke order is used (Bjorksten, 1994; Lam, et al., 2001; Law, Ki, Chung, Ko, & Lam, 1998; McNaughton & Ying, 2000; Yao, et al., 1997). Additionally, the written characters are then more understandable and beautiful. Accordingly, the correct stroke orders of the characters should be learned before Chinese characters are written. Primary schools in Taiwan therefore teach correct stroke order of each Chinese character (as defined by the Ministry of Education, Taiwan, ROC, 1996). However, a teacher cannot verify the correctness of the stroke orders of characters written by every student in a class of 30. Therefore, an intelligent tutoring system (ITS) (Anderson, 1988) is required to help students learn the correct stroke orders of Chinese characters.

CAI (computer-assisted instruction) has been developed over the last two decades. Several good systems, such as the declarative model SCHOLAR (Carbonell, 1970; Carbonell & Collins, 1974), the black-box model SOPHIE-I (Brown & Burton, 1978), the qualitative model SOPHIE-III (Brown, Burton, & de Kleer, 1982), the glass-box expert model GUIDON (Clancey, Barnett & Cohen, 1982), the procedural knowledge model BUGGY (Brown, & VanLehn,

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