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Development of a User Adaptive Graphical Learning System

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Abstract: This paper describes the development of a user-adaptive e-learning system. A user can select e-learning content that he/she desires on this system to make questions automatically at random for the selected content. Computer graphics are used to display e-learning content and messages on this system, which is expected to allow the user to understand much more about content and to arouse the user's interest in it.

Keywords: e-learning, learning system, computer graphics

1. Introduction

Various studies on the e-learning system have been reported [1],[2]. Generally speaking, however, many e-learning systems are completely standardized and are often difficult to use as the utility of study that the user desires and to meet the user's learning level at any time.

The advantage of using computer graphics as learning materials is that we can expect the user to understand much more about e-learning content and arouse his/her interest in it with the computer graphics introduced in making visual effects. A variety of studies on the learning materials including computer graphics have also been informed [3],[4].

Matsushita et al. have been developing the learning systems using computer graphics [5]. One problem was that the user had to solve unnecessary questions because these systems make questions at random for all e-learning contents. The other problem was that the user remembered the answers because these systems always put questions for the selected e-learning content in the same order.

In this study, we developed a new user-adaptive e-learning system that the visual effects can be expected without submitting uniformity questions. This paper presents the outline and construction of our newly developed e-learning system.

2. System Development Policy and Environment

The purpose of this system is to allow the user to study at not only educational sites but also home. Therefore, the specifications of this system were set so that it can be operated in a standard computing environment. An easy-to-use interoperability system is required for not only teachers but also primary school students and their parents. As a result, the operation buttons were simplified and the screen structure and transition were integrated to make the user realize them easily.

The Microsoft Windows 7 operating system was used on a personal computer in order to develop this system. The computer graphics were created using the POV-Ray [6] software.

3. Our Newly Developed User-Adaptive E-Learning System

3.1 System outline

A user can select e-learning content that he/she wants to study on this system to make questions automatically at random for the selected e-learning content.

The English alphabets, Japanese Kanji characters and elementary mathematics are available in the branches of learning on this system at present. When changing the branches of learning on this system, it is possible to do so only by replacing e-learning content with another one that is set into the system with little modification.

Computer graphics are used to display e-learning content and messages in the branches of learning on this system, which is expected to allow the user to understand much more about e-learning content and to arouse the user's interest in it.

3.2 System construction

This system consists of HTML, JavaScript and PHP with the Web browser interface built. Fig.1 shows the system construction.

3.3 Screen structure

This system is composed of e-learning content selection screen, e-learning content confirmation screen, question screen, correct/incorrect answer screens and termination screen. Fig.2 shows the screen structure.

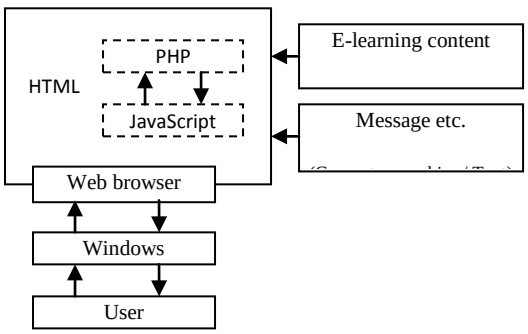


Fig.1 System construction

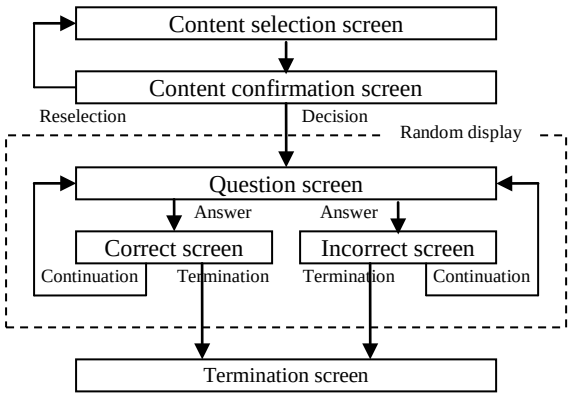


Fig.2 Screen structure

4. System Operation and Screen Transition

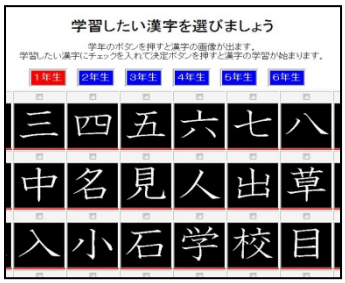
First, accessing the system displays the e-learning content selection screen (Fig.3(a)). This screen shows all e-learning contents available on the system and the user selects e-learning content that he/she wants to study.

Second, the system displays the e-learning content confirmation screen (Fig.3(b)). When the user is satisfied with the displayed contents, he/she moves to the question screen. However, when the user tries to reselect the e-learning content due to selection error, he/she can return to the e-learning content selection screen.

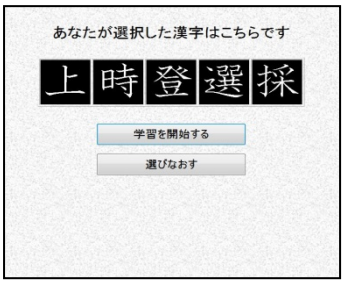
Third, the system displays the question screen (Fig.3(c)). This screen shows the selected e-learning content at random. After answering the question, the user moves to the correct answer screen (Fig.3(d)) or the incorrect answer screen (Fig.3(e)) depending on the correct/incorrect answer.

The correct/incorrect answer screens show the corresponding computer graphics animations. Multiple computer graphics animations are prepared for each individual screen and are displayed at random. In addition, both screens enable the user to select whether he/she continues learning or not. When the user continues learning, the e-learning content

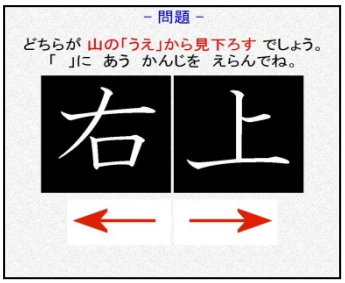
reselected at random is displayed on the question screen. However, when the user terminates e-learning, the termination screen (Fig.3(f)) is displayed.



(a) Content selection screen

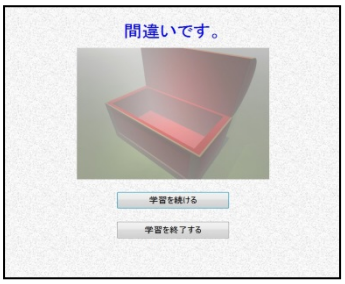


(b) Content confirmation screen

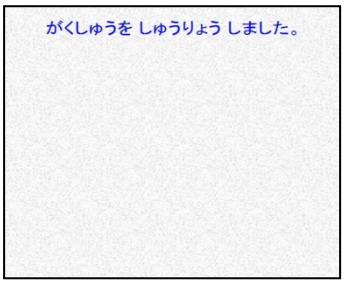


(c) Question screen

(d) Correct answer screen



(e) Incorrect answer screen



(f) Termination screen

Fig.3 Screen transition (Japanese Kanji characters in the branches of learning)

5. Conclusion and Future Research

In this study, we developed a new e-learning system to be used at both educational sites and home. This system allows the user to select e-learning content and to study user-adaptive content effectively at any time. Further, the use of computer graphics for e-learning content may make the user obtain some learning effects including the visual effects.

In future, we are going to create an interface that can change the branches of learning without modifying the system and to introduce our new e-learning system into the educational sites and home for system evaluation.

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