Design and Implementation of Hanja Training Serious Game for Smart Phones

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Abstract. This paper consist of learning board to make oneself familiar with HANJA to give a stimulus learner's learning volition and to give rise to learning motivation based on constructivism. Therefore, we propose to design a serious game on smart phone. This game is correspond to HANJA and DOKEUM[*] using smart phon. The design of this game is based on the founding principles of Hanja. This game give motivation to user for learning Hanja through the game. The result of this game, learner is able to reconstruct knowledge and is made to feel a sense of accomplishment.

Keywords: smart phone content, constructivism, serious game, hanja, constructivism.

1. Introduction

Education is, while not being stagnant in the traditional sheet, is becoming part of everyday life of learners by using the Internet and mobile devices; it is gradually changing in the direction of the learners configuring knowledge by acquiring high-quality education at the time and place that learners want. Thus, by moving away from the simple rote and memorization methods of education, stimulating the motivation of learners, and inducing interest, the educationally functional games, which utilize games that allow experiencing of elements of fun, have garnered attention.[1].

As such, this paper allows structuring of the lesson contents by learners themselves through stage configuration; also, it raises a sense of accomplishment by providing learners with clear time for each stage by putting it in data. In addition, the purpose of this study lies with increasing the effectiveness of lessons by leading a self-directed learning through the stimulation of learning motivation and inducement of interest of the learner, by the design of graphic-based functional games that matches Hanja and Dokeum and not text-based quiz games that are based on smart phones that allow learning without being inhibited by easily-manipulated time and place by offering an easily-manipulated interface by utilizing the touch screen of a smart phone.

2. Related Work

2.1. Constructivism

Constructivism could be viewed to be continuously configuring the understanding of given social phenomena by applying personal cognitive action based on the individual's particular social experiences and background. Understanding was defined as what is produced by these results. As such, in constructivism, instead of the concept of truth in objectivism, appropriateness and applicability are advocated as opposing concepts [3].

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[*] HANJA is Chinese character used Korea and DOKEUM is pronunciation of HANJA

2.2. Features of Smart phones

Smart phones are equipped with touch screen and a gravitational acceleration sensor, and they offer new game play experience to the user by providing experiential environment such as touch and wiggle that are new operation methods in conventional games. Experiential game is a game that operates by reflecting the user's body movements, and since its game play method is intuitively and easily understood, it provides a more easily approachable environment than the previous mobile phones or PDAs even for the children or elderly who are not proficient with computers. In other words, in order to provide an easily-approachable environment for everyone, the touch screen and gravitational acceleration sensors of smart phones are used [4].

2.3. Serious Games

Serious games were first mentioned in Clark Abt's book, "Serious Games,"[6] and with the establishment of the "Serious Game Initiative" in the United States in 2002, studies on functional games were started, and currently, through the proven effectiveness of functional games, they are being utilized in various areas.

The Korea Game Industry Agency defines functional games as, "unlike the recreational games of general sense, refers to games intended for the effects of a particular purpose, and if the recreational games are intend for fun, then functional games advocate particular types of benefits in addition to fun"[5].

3. Design of Serious Games with Hanja Training

3.1. Game design consideration elements

These serious games with Hanja training unlike the text-based memorization method of conventional Hanja education applications, lets the user choose difficulty level and the content of Hanja, by maximizing the advantages of functional games; therefore, they configure Hanja lessons to be not boring, by inciting motivation for learning and adding fun. As such, in the design of serious games, by associating the principles of Hanja with constructivist education, the serious games become more helpful for learning and the characteristics of which reflected

3.2. Selecting the difficulty of the games

Serious games affect the development of cognitive functions, by attaining cognitive skills such as prediction in accordance with the learner's repetitive thinking, organization of information, heuristics, visual information interpretation, MEA (Means-Ends Analysis), etc.

These serious games with Hanja training, by providing appropriate difficulty levels thereby inducing motivation for leaning in accordance with the learner's skill level and adding fun, construct to keep learning from being boring [2].

The processing of games consists of serious game pre-processing and main processing steps. The pre-processing step is to configure the learner's profile, and it configure vectors by setting the elements for adjusting the difficulty of games, as shown in Fig. 1.


```
/////////////////////////////////////////
 Setting the difficulty of games
/////////////////////////////////////////

preprocessing-step  // step of construction in student profile
Begin
    determine-game-leveling-facter( )
    compose-of-game-leveling-vector( )
end

main-step // main processing
Begin
    comport-adaptive-game-using-learner-profile()
    update-game-leveling-vector-using-learner-profile()
    if (game-end-signal)
        { feedback-game-result( )
          game-end }
    else
        balancing-game-leveling-for-leaner()
end
```

Fig. 1: Game difficulty setting algorithm

The main processing is a step for the learner to execute the games, and it adjusts the difficulty level by calculating even the level of adaptation. At the end of the game, the game results are fed back to the learner, otherwise, the difficult level of game is adjusted and new game is suggested to the learner.

3.3. Game Layout Design

Game layout should be designed for easy viewing and utilization. On the main screen of a game, the game titles and three buttons are placed. When the user clicks the game start button, the user is moved to the stage selection screen, and in the score and option menu, the clearing time and various settings needed during the game are shown to the user. The stage selection screen shows the stage of the game, and lets the user choose the part of a stage he/she wants to play. To enable playing in accordance with the stage order, only the subsequent part after clearing the previous part can be selected. However, any parts that have been cleared can be selected regardless of order, and the clearing times for these are indicated using 1~4 stars.

The game screen is divided into six regions and the stage the user is playing is indicated. Through this the user recognizes his/her progress, and the user is induced to remember the contents of cleared stages and the lesson contents of the current stage.

The score screen induces the learner's motivation by showing the minimum average times for clearing the parts in each stage. Fig. 2 shows the game screen layout and design.

Fig. 2: Game Layout

3.4. Game Flow Design

Use case diagram: The relationship between the learner and Hanja learning game and the use cases in the game system are shown in Fig. 3.
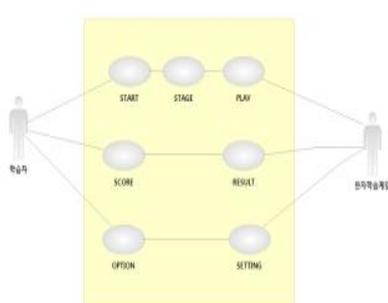

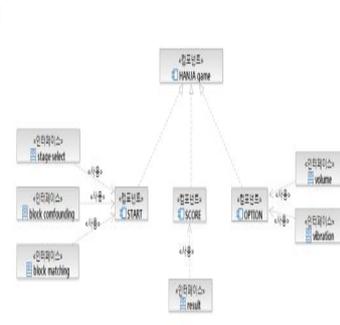Fig. 3: Use Case Diagram   Fig. 4: Sequence Diagram   Fig. 5: Component Diagram

Sequence diagram: Fig. 4 shows the interaction of messages exchanged between the game and other objects based on the time sequence in a sequence diagram.

Component diagram: Fig. 5 shows the interdependencies among the production of games with Hanja training functionality, scores, options, and block game process components in a component diagram.

4. Implementation of Hanja training serious games

4.1. Initial game screen

When the START button is touched in the initial game screen, the game can be started from the stage selection screen. When the START button is touched the first time, a simple tutorial about the game playing methods. The SCORE button is touched, a screen that confirms the learner's progress status per stage and clearing times appears; when the OPTION button is touched, the sound and vibration can be set. Fig. 6 shows the initial screen and the user runs the application.

4.2. Game stage selection screen

In the game stage selection screen, the learner can identify and select the difficulty level of the game at each of the stages from the stage 1 (pictograms) through stage 6 (derivative characters); the learner can also verify his/her progress through the stage selection screen.

Fig. 7 shows the game stage selection screen. By preventing the selection of uncleared parts of stages, the learner is induced to learn by abiding by the difficulty levels for lessons that have been determined in accordance with the founding principles of Hanja. Stars are used for each part to indicate levels in order to induce the learner to restudy the parts in which he/she lacks. In addition, by enabling the learner to replay any of the cleared parts without limitation, additional learning can be facilitated for the lacking parts.
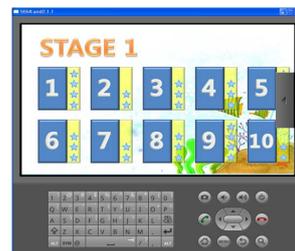
Fig. 6: Initial Game Screen   Fig. 7: Game Stage selection Screen

4.3. Game playing screen

In the stage selection screen, when the learner selects an appropriate difficulty level in accordance with his/her lesson progress and enters, then the learner can see the arranged blocks from the entry level difficulties as he/she is learning.

The lesson is over, the learner starts a game by shaking the smart phone. When the learner shakes the smart phone while in the game play screen, the blocks are randomly rearranged and the game begins.

When the learner selects the matching blocks and touches and if they are correct blocks, then the correctly-selected blocks are eliminated; if the blocks are wrongly selected, then his/her life blocks are reduced. As the blocks are eliminated, points are awarded.

Fig. 8: Game Playing Screen   Fig. 9: SCORE Screen

4.4. SCORE Screen

The learner can verify, for each cleared stage, the average elapsed time and the progress status for each difficulty level of stages. The learner can feel a sense of accomplishment by verifying his/her own elapsed time and progress.

5. Conclusions and Future Study Directions

In this study, the Hanja education that accounts for over 70% of the Korean language education, to facilitate the learner to lead his/her own learning rather than passively receiving an education, a game with Hanja training functionality was implemented with a focus on the following elements.

First, the learner is enabled to take lessons without neither time nor location restrictions. Second, the learner is induced to taking interest in learning and approach lessons in his/her own accord. Third, by facilitating the learner to recognize his/her own lesson position, the learner is able to reconstruct knowledge and is made to feel a sense of accomplishment. Fourth, the elements, which can cause systematic presentation to occur in the lesson contents, are incorporated into the game with Hanja training functionality.

In the future, studies regarding the expansion of contents and diversification of game are needed.

6. References

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