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DEVELOPMENT OF AN EDUCATIONAL COMPUTER GAME FOR PRIMARY SCHOOLS

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ABSTRACT

In this study, an assessment of the use of digital devices by pupils was made; design and implementation of a model for computer educational game was carried out. This was with a view to harnessing computer games for the purpose of enhancing learning at the basic education level in Nigeria.This work adopted sequential, zero-sum game theory as the research philosophy. Unified Modeling Language (UML) was used to design the system and Visual Basic 2010 used to implement it.In conclusion, this study revealed that the system being proposed will positively affect the learning patterns of students at the basic education level.

Keyword: Computer game, education, learning

1.0 INTRODUCTION

Computer game is becoming popular day in day out. It is also good to note that academic research around computer games have increased tremendously (Ulicsak& Williamson, 2010; Michael & Chen, 2005). From a design point of view, games are becoming more available on different devices ranging from Personal computer, phones, pocket computers and websites. Games' influences on their players are enormous (Shaffer *et al*., 2005; White *et al*., 2007; Chuang & Chen, 2009; Ulicsak& Williamson, 2010). Games are able to get the attention of many individuals all over the world. It is common practice among youth discussing games and even forming fan groups based on one interest of game or the other (Granic*et al*., 2013). Apart from entertainment, other areas in which computer games have been applied include training, education, modeling and simulation (Cagiltay, 2007).

In shaping the future of Nigerian education system for better standard, all stakeholders must look beyond classroom activities and one tool to help in this regard is the computer game. Education in Nigeria, if not attended to, will keep on deteriorating. The computer games attract the attention of their players until such players are able to master the tasks of the games (Cornett, 2004). It is, therefore, a tool that can improve the mode of educating pupils at the basic education section in Nigeria primary schools.

Despite their entertainment focus, computer games have potentials in impacting knowledge in different disciplines to their players (Wilkins, 2002). Learning process can be made entertaining when computers games are engaged in the process, because playing games is fun among different categories of players (Tunzun*et al*.,2009). It is essential to look beyond classroom activities in shaping the futures of learning in Nigeria Society for greater explore. Computer Game is one of the tools to look unto if this should be done. Shaffer (2006) proposed that the future of learning lies within the emerging arena of video games.

1.1 STATEMENT OF THE RESEARCH PROBLEM

Though, there is an increase in the number of pupils that now play computer games in our society, but most available computer games are not tailored towards learning. At every opportunity they have, pupils will always want to play games on any phone or computers they can lay their hands on; even without much tutoring on how the games are being played. Overtime they master these games and will even be willing to teach whosoever wishes on how the game can be played. This practice has become part of them even at the expense of some other activities that can help their academic. Most of the games they are involved in are not tailored to their curriculum. Even majority of them are violent based games. However, the interest of pupils may be harnessed towards playing computer educational games that may enhance learning by developing curriculum-based games; hence this study.

2.0 REVIEW OF LITERATURE

To understand the meaning of a typical computer game, there is need to first have the understanding of the game. A game is a system in which players engage in an artificial conflict, defined by rules, which result in a quantifiable outcome (Salen& Zimmerman 2004). To play a game is to engage in activities directed toward bringing about a specific state of affairs, using only means permitted by specific rules, where the means permitted by the rules are more limited in space than they would be in the absence of the rules and where the sole reason for accepting such limitation is to make possible such activities. In most cases, the permitted rules are not the best approach of accomplishing the activities (Cornett, 2004; Dondlinger, 2007). Crawford (2002) defined a game as a closed formal system that subjectively represents a subset of reality. He explained each term of this definition carefully. By 'closed' he meant that the game was complete and self-sufficient as a structure. The model world

created by the game was internally complete; no reference needed be made to agents outside of the game. Some badly designed games failed to meet this requirement. Such games produce disputes over the rules, for they allow situations to develop that the rules do not address. The players must then extend the rules to cover the situation in which they find themselves. This situation always produces arguments.

3.0 THE DESIGN OF THE GAME

This game was designed to be simple and easy to play because of the targeted players. This is a board game and designed to have five levels of playing. It was made up of player playing against the system and some actions taken by the player.

3.1 GAME SET UP

Figure1 showed the Use Case Diagram of the game to consist of an actor named Player who is involved in playing the game according to the set rules. The game has **Play Game Use Case** which comprised the activities players involved in to meet up with goal of the game. The player move icons of the game as they are dropped on the board. Whenever a player starts a session of the game his/her level of play will be determined by the RestartLevel/FinalLevel Use case, which is part of Play Game. This determines the level of the current player and initiates the level as soon as the player set up the game. At the game set up stage, the name of the player would be captured. This would be used to determine the current level of the player if such player is not a new player. TestMatchOk Use Case is to look out for the matching of icons if they are of the same category as soon as they are place on the tiles of the game board.

Placing of icon on appropriate tile is the problem solving aspect of the game as the player is expected to interpret the icon representation and place the dropping icons side by side of icons of the same categories. Once this is done and three icons of the same categories are arranged vertically, horizontally or adjacently, then the **Compute Score** Case is called. The Compute Score increases the score of the player by three (3) scores and also remove the matching icons to continue with the game. The Compute Time Use Case is involving in taking the time lapse in playing the game. It also determines the rate of icon dropping based on the players' game level.

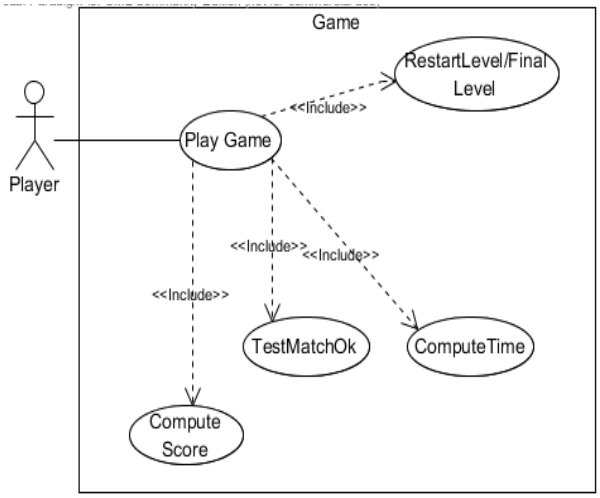

Figure.1: The Use Case diagram of the game

3.2 LEVELS OF THE GAME

To make the game fun, it was designed into five levels. As players move from one level to the other, the challenges increase. Levels One and Two were made up of 8x8 tiles and fifty different icons categorized into ten groups, which are family, religion, domestic animal, wild animals, birds, flies, transportation, plants, kitchen and source of water. These icons would be dropped on the tile randomly one by one. The difference between Level One and Level Two is that icons would be dropped on tiles sequentially in Level One but simultaneous on Level Two.

Level Three drops icons on 8x8 tiles but in two's as against one icon in Levels One and Two. The two icons would be picked randomly irrespective of their groups. Levels Four and Five drop icons on 12x12 tiles. Level Four drops three icon concurrently and in sequential manner while level Five drops three icons concurrently but in simultaneously. In all levels, rate of dropping icons increases with score of player.The activity diagram of the game (Figure2) depicts different stages of the game and event that led to each level. As shown in the diagram, it is expected of the player to set up the game, if the player is a new player, he/she will be placed on stage one or continue on stage one if he/she is an existing player but still on level one of the game. Otherwise, the player's level of play will be determined based on the last record of play, and placed on appropriate level. For a player in level one to move to level two, such player must have scored 100 marks while score above 250 will move player to level 3, obtaining 500 or more score places player on level 4. Level 5 is played when a player scores above 750. On getting 1000 score, the player is given a trophy. At each level, the challenge of the game is increased.

The terminal stage of the game is when icons are built up to the top most tile of the board of the game. Once the state is found, the game automatically terminates, and it is expected of the player to setup the game again.

3.3OPERATIONS

The game consists of five classes as shown in Figure3. The five classes also have their respective methods. The Player class has PName, PScore and PLevel as attributes representing Player's name, score and the level of play respectively. The player's methods are getLevel(), getScore(), getName() and getAction(). The methods' names are self-explanatory. The GameController class has other classes included in it. Those included in GameController class are GameTimer, GameBoard and GameIcons. The GameController class coordinates the game activities. Figure 4 shows the order in which these operations are carried out.

3.4 SCORING PATTERN ALGORITHM

In games, score refers to an abstract quantity associated with a player or team. Score is usually measured in the abstract unit of points, and events in the game can raise or lower the score of different parties. Most games use score as a quantitative indicator of success in the game, and in competitive games, a goal is often made of attaining a better score than one's opponents in order to win.

In this study, the player is expected to arrange the randomly (from binomial probability distribution) dropped icons of same category in threes, either vertically or horizontally or adjacently in other to earn a score of three. Otherwise a score of one is earned.

The algorithm (Algorithm1) below performs the scoring according to patterns (icons) the payer is able to recognize and arrange.

Repeat

onIconDrop()
getIconCategory(k)
getBoardCoordinate(X,Y)
fori = 1 To 2
ifIconCategory(K) ⊆
BoardCoordinate(X,Y-i) then ++score
ifIconCategory(k) ⊆ BoardCoordinate(X-i,Y) or BoardCoordinate(X+i,Y) then ++score
ifIconCategory(k) ⊆BoardCoordinate(X-i,Y-i) or BoardCoordinate(X+i,Y+i) then ++score
if score>=3 then
playerScore +=3
RemoveMatchIcon()
endif
Exit For
nexti
untilEndGame== True

Algorithm 1: Scoring Pattern Algorithm

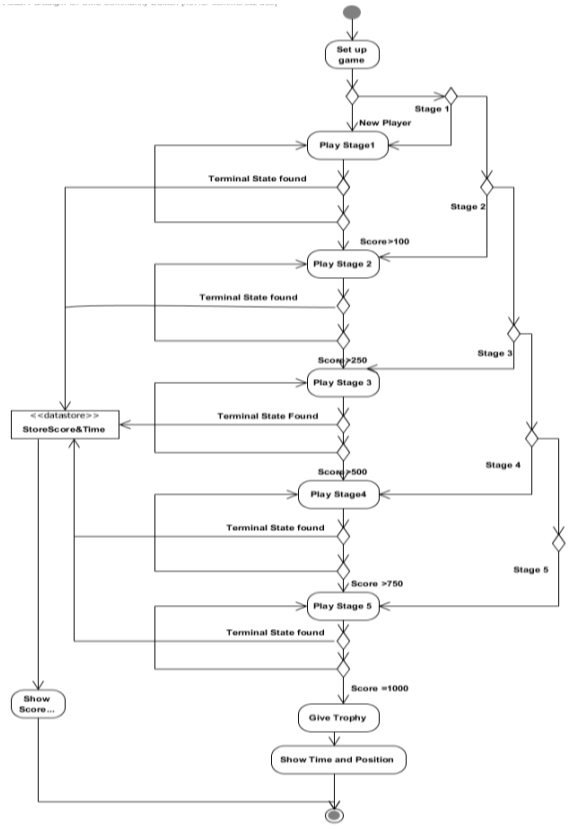

Figure 2: The Activity Diagram of the PlayGame Use Case

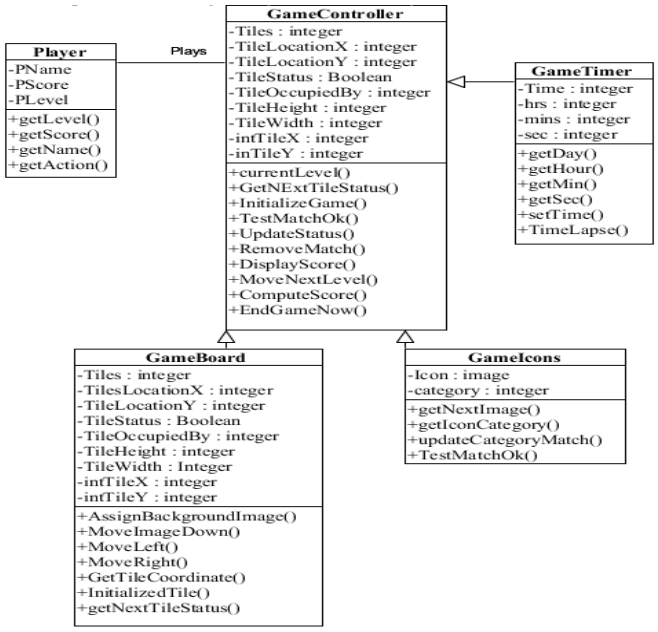

Figure3: Class Diagram of the game

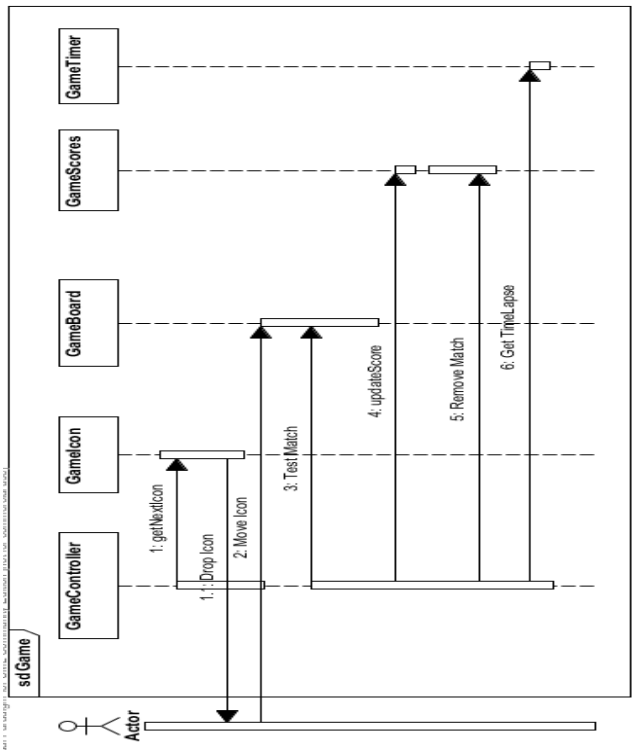

Figure 4: Sequence Diagram of the game

4.0 IMPLEMENTATION

The playability of game is enhanced by making it a graphical game. This necessitated the choice Visual Basic 2010 as the implementation tool. It is easier to develop the interface and lot of effort are saved in coding with this tool. The game is a desktop application of board game type. There are two boards of different sizes involved in the game; 8 x 8 tiles board for levels 1-3 while Levels 4 and 5 is a 6 x 6 tiles board. The boards were created using labels and named appropriately to handle their positions within the boards.

Icons are another set of elements in the game. There were fifty icons altogether grouped into five different categories. The icons would be picked randomly from different categories and dropped on the tiles from the topmost tiles of the board and at different coordinate of the board. The dropping rate is a factor of time and the level of the game. One icon would be dropped on Levels 1 and 2 while two icons would be dropped on Level 3. Icons on Levels 4 and 5 would be dropped in threes.

The design of the game was based on some of elements of games development as suggested in (Owen, 2005; Prensky, 2005). Prensky (2005) and Cagiltay (2007) outlined twelve elements that motivate players to continue with their games. The game was developed on some elements outlined by Prensky (2005).

Figure 5: The Screen shot of the game with a dropping icon

Figure 6: Terminal point of the game.

5.0 RULES OF THE GAME

For successful playing of the game, prospective players are expected to adhere to the following:

i. Identify and interpret icons as they are been dropped on the game board.

ii. Use the ⇐ ⇓ ⇒ arrow keys to move the icons to desired tile on the board.

iii. Icons can only be moved sideways or downward and not upward.

iv. Icons placed on tiles cannot be moved again unless it is removed by game when a match is found.

v. Icon cannot be moved across another icon.

vi. Icons of the same social categories should be places in threes horizontally, vertically or diagonally to earn 3 scores.

6.0CONCLUSION

It is clear that computer games affect the learning pattern of students because it is fun playing it and a long period of time is spent in mastering the complexities of these games and accomplishing their tasks. Educational system at basic education level will be improved upon when this approach to learning is included in the curriculum. It is a good thing to know that a lot of pupils are involved in game playing on electronic devices already. Hence, Schools need not budget much on efforts in training them on how to play while little will be needed to put in place devices on which educational computer games can be played

Further studies might explore what makes computer games interesting, fun and motivating enough to support teaching and learning and using graphical representation of some learning concepts in some courses like Mathematics. Also, database-based educational games in which multiple subjects can be played on a single game platform is another area of further study.

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