EDUCATIONAL DESIGN OF A SNAKE GAME FOR BASIC MATHEMATICAL OPERATIONS WITH A DIFFERENT APPROACH

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ABSTRACT: Today with the rapid developments in technology computers and computer related environments become a vital part of life. Such positive changes in information technology can affect all aspects of education positively including both content and learning process. In particular, computer games that make education fun are positively affected by this interaction, making computer games as one of the issues that should be emphasized in education and training. Games have a very important role in the development process of children. Therefore, games and educational tools are being developed to accelerate children's education and intelligence development. Educational games create opportunities for children to learn new things as well as increasing their mental abilities, and ease to understanding of boring subjects and courses. In this work, a snake game has been developed. C# programming language has been used and an educational game combining snake game and mathematical operations which have not been done before designed. A digital game that can teach basic mathematical operations easily, fast and a fun way to students mostly in primary education level has been designed. With the designed game improving player's skills in basic mathematical operations are aimed.

Keywords: digital games, mathematical operations with games, educational games, snake game

INTRODUCTION

Today, as a result of rapid development of technology, computers have become an indispensable part of our lives. With the growth of computer technology, computer games become one of the most popular part of this technology. As an entertainment means computer games become more interesting increasingly and more preferable than other media, such as cinema or TV, for people in every age (Korkusuz & Karamete, 2013). In 1980's while children were spending approximately 4 hours on gaming at homes or Atari saloons, nowadays it's 5.5 hours with girls and nearly 13 hours with boys who are primary and secondary education students (Christakis, et al., 2004; Bayırtepe & Tüzün, 2007). Additionally, today, while there are 1 billion gamers around the World, Turkey has 20 million gamers and 20 billion dollars market share. Because of this digital gaming market is growing rapidly in Turkey (Karahisar, 2013). Today only World of Warcraft has 10 million subscribers and in the near future it is expected MMOG (Massively Multiplayer Online Games) market share will be 15 billion dollars (Bostan & Tıngöy, 2015). The gamers who have played "Call of Duty Black Ops" game have spent over 600 million hours in game in the first month following the release (Korkusuz ve Karamete, 2013).

Today with the global advances and changes in the World another notion we hear with the education notion is educational games (Çoban, Yıldırım and Göktaş, 2011). With the help of educational games, gamers can consolidate previous knowledge and learn new things while having fun (Bayırtepe & Tüzün, 2007; Erkan, 2012). Therefore, games have significant value for education and intelligence development for children and teens. Another advantage of educational games is that they are easy to learn. The student learns the game through trial-and-error.

When age distribution is considered, teens and children form the majority of gamers. Usage of games in education is an important topic that needs to be focused considering the time children spend on games. Presky, William and Stock has found out that students who use educational games are %30 more successful than the control group students in a research that includes 400 schools (as cited in Korkusuz & Karamete, 2013). This research shows the necessity of using games for the purpose of education. For this purpose, an educational snake game has been developed for students starting from the second year of elementary school and enthusiasts of the snake game.

In this paper, a snake game for basic mathematical operations designed with the usage of C# programming language. Gamer requires finding the wanted number by using the given operations and numbers. There is a time limit for that. The player is scored according to usage of time and the difficulty level of the problem. Additionally, with the random bonuses (hard), it is granted that gamers have more points and lives. In this way, improving player's skills in mathematical operations is aimed.

Game

There are lots of definitions of 'game'. Game is an activity that people do willingly and happily in an appropriate time and place out of their responsibilities that supports their mental and physical skills. Games are things that people do willingly and things that people obligated to do are not games (Erkan, 2012; Hazar, 1996). Fundamental things that a game must consist are:

1. Aim
2. Finish factors and save
3. Realistic story
4. Playability
5. Replay
6. Balance
7. Prize
8. Environment

Computer Games

Nowadays, even though the word "game" generally refers to digital games, digital games have different features. Environments similar to real places are presented to gamers with computer games. Computer games are designed so that it includes competition, rules and a goal that motivates the gamer (Erkan, 2012; Pagulayan, et al., 2003).

Parallel to advances in computer science and its widespread usage, computer games have shown a continuous growth. Features in games have increased with the developments of high CPU power and graphic features. Also growing population that use computers have increased and people who play games take a place in gaming sector (Korkusuz & Karamete, 2013).

Educational Games

Educational games contain entertaining and motivating features like in common games. Educational games are a fun thing to do but also have features that teaches new things and reinforces previous knowledge. Therefore, to contribute to learning computer games can be used as a complementary tool. In educational game design, usage of imagination and ability to synthesise, determination of what to teach and how much student learned the taught concepts and effective usage of time and situations should be taken into account (Çankaya & Karamete, 2008). Educational computer games, when designed suitable for students' own levels, considering their interests and needs and suitable for individual study provide more effective and permanent learning. It is difficult to find the visual and auditory elements contained in the virtual game environments in books or movies. Because computer games, unlike to books and movies, grant interactions and allow users to trial and error (Erkan, 2012). Also they help students to improve their skills and learn new information around the patterns of the subject the game developed around.

Game Programming

Game programming is software developing department of video games. Game programming that requires significant work on software engineering is a combination of graphic design, entity system, user interface, physics engine, input handler, artificial intelligence component, game logic, level and sound systems as a whole (Türkmen, Yalın and Tekir, 2015).

Game programming due to its multidimensional and complex structures shows differences from other programming techniques. In lots of programs other than games, changes can be made after coding started and can be implemented to program easily. But in game programming, all rules should be determined and examined before coding the program and then coding part should start after. In game programming, any rule change requires that nearly whole program should be written again (Erkan, 2012).

In this project, C# programming language has been used. C#.NET is a Microsoft's robust, component-based programming language. The people who have experience with C, C++ or Java can learn C# easily.

Good-looking and timesaving projects can be made with Microsoft Visual Studio's rich tools. C# programming language is a new generation programming language which Microsoft developed. It is a programming language developed for Microsoft's .NET environment (Yıldırım, 2012).

APPLICATION

With this project, a game that improves student's skills with mathematical operations has been developed. There are 3 levels for different education levels. This way, extensive player base has been intended. Figure 1 shows the level choosing page.

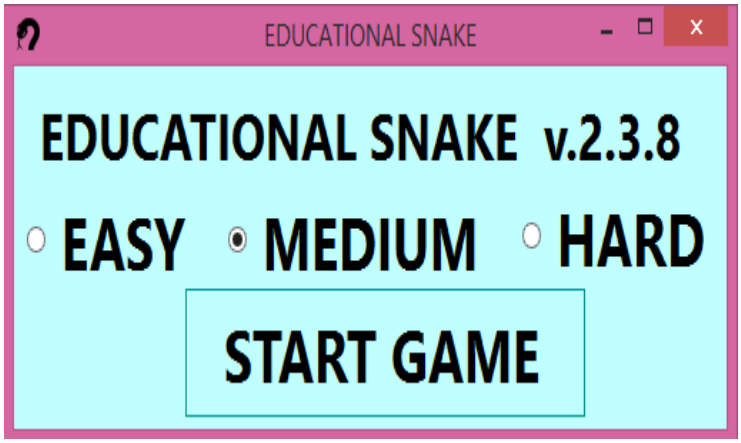

Figure 1. Level Screen

In all levels, game consists of 7 parts and each part includes 3 questions. The difficulty levels of questions change by levels and parts. The difficulty levels increase as the game progress. After choosing the level, player comes to the game screen that is shown by Figure 2.

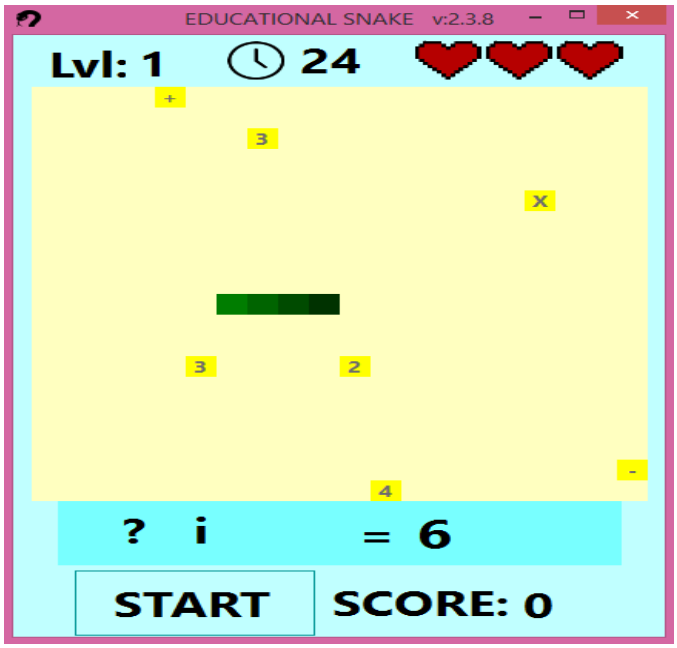

Figure 2. Game Screen

Appropriate questions will be asked to player according to chosen level. Three life points are given to players as shown in Figure 2. There is a time limit for the question. This way, getting rid of the slowness of the game and improving player's fast thinking abilities have been intended.

As soon as the game opens, time limit starts to decrease. Player loses one life point when the time limit ends or player gives a wrong answer.

Player needs to pick a number than an operation symbol than another number to answer the question. If the answer to the question is right, game automatically provides player with a more difficult question and asks for answer. If the player picks two numbers in a row, game will not accept the pick and will give an error that the player should choose an operation symbol. If the player picks a wrong operation symbol, player can pick another symbol before the time limit ends. The game accepts the last picked operation before picking the second number. In this way, the choice of taking different routes to the answer has given to the player.

In some parts, players may be asked random bonus questions. Bonus questions appear as a hearth symbol that flashes. If the player picks the random question, s/he will encounter with a hard question. If the player answers the bonus question truly, s/he will gain more points and an extra life point. In figure 3, the screen that bonus question appears has been given.

Figure 3. Bonus Questions

With bonus questions player can restore lost points so that his/her motivation increases. Also increasing the player's confidence has been aimed with the bonus questions. Player who lost all his/her life points sees the Score Screen as shown in Figure 4 and asked to enter his/her name. This way player's name and score can be stored.

Figure 4. Score Screen

The player's scores are saved in database according to chosen level categories and player can see his/her own score and highest scores. Score screen is shown in Figure 5.

Figure 5. Score Screen

Score system will increase player's motivation and player will show more effort to reach high scores.

CONCLUSIONS

Educating basic mathematical operations was made more interesting with this study. In this respect, this study will provide contributions to player's information gain, consolidation of existing information and children's intelligence development. Also, players will entertain themselves while improving their abilities with mathematical operations and learn effective usage of time.

While the player is playing the snake game, the player is also trying to obtain the target number using the numbers and actions displayed on the screen. Thus, educational snake game design will provide players with physical and mental stimulation.

With educational computer games, students learn more easily as they learn with fun and the topics taught become more permanent in memory. This will leave a more positive conception instead of the general negative conception in the majority of students against mathematics lesson. With the developed game, individual learning environments have been created for students with different learning levels. Each student will be able to play the game in accordance to his/her own level and will be able to provide feedback about the subjects taught. According to the feedbacks, teachers may have knowledge about student's level of learning. Thus, learning with fun, consolidating previous knowledge and getting feedback will be done at the same time.

Studies in this field are suitable ways to provide more effective and efficient learning in combination of education, entertainment and motivation.

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