COMPARATIVE CHARACTERISTICS
OF SERIOUS GAMES*

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Many serious games are developed with different purposes for different target groups (age, social, professional etc.). To perform their intended aims, they must meet specific requirements. In this paper several serious games for various target groups are shown and compared graphically by diagrams.

1. Introduction. A gaming technologies have been adopted as a tool for learning in many subject areas. Public experience shows that most young players become serious business and analytical professionals in their areas in adulthood, applying games and a playful approach to their work.

The serious games [1] are games or interactive systems similar to games developed with game technology and design principles for a primary purpose different than entertainment, such as training, advertisement, acquisition of habits.

Many serious games are developed with different purposes for different target groups (age, social, professional etc.). In addition to schooling, serious games can be used to inform about specific problems (health, psychological), to encourage physical activity, as well as for training in specific skills. Several serious games for various target groups are shown and compared in this paper. The comparison is presented graphically by means of diagrams.

2. Review of some existing serious games. A brief analysis of the serious games available on the world market is shown below.

2.1. Serious Games for Learning by Sirma Media. Sirma Media is a Bulgarian company developing games for educational purposes. The programs are designed mainly for pupils of the elementary school. A number of small games are developed, for example: mathematics; studying the traditional Bulgarian costumes from different areas; Bulgarian language [2].

2.2. Mingoville. The game was developed under the project Serious Games on a Global Market Place, which researches a game-based platform in the context of English language education in Danish elementary schools. The initial investigation suggested that one of the challenges of developing a serious game design for language learning consists in processing the genre "Serious Games" in a balanced exercise with contextual simulation,

which includes beneficial thinking, real language interaction and entertainment for the student. The developers' hypothesis is that the process of designing a serious game for Computer Assisted Language Learning (CALL) can be improved significantly through inclusion the students' personal experience using language (mainly English) to play and interact [3].

2.3. Exergames. Recently, exciting games that use the whole body are becoming popular as a form of entertainment and helping to reduce a number of health problems that are common in our immobilized society. The biggest problem for the game based on the body position is the difficulty in effective communication for determining the 3D position of the player and understanding the correct position that has to be repeated. In a situation when an individual coach is presents, he can direct the participants who find it difficult to present the position. However, this cannot be implemented in a computer-based training system. For this reason some methods for visual feedback to the end user, combined with a sensor system in the body are tested [4, 5, 6]. Examples of this type of games are: Nintendo Wii, Posemania, RealDance and The Sony Eye Toy.

2.4. Other Serious Games and their purposes. WeMakeWords is a serious game applied for improving literacy in the early years [7]. A model for adaptation of the game to the learner is proposed. The importance of the participants' teamwork is emphasized. The game is designed for children between 4 and 8 years of age to assemble words out of letters as they are divided into teams.

VIPROSA is an abbreviation from VIsual PROcess Simulation and Analysis and as a game it is a tool for simulation and analysis of business processes. Its first goal is to inform the participants about the current and future business processes in the organization and to encourage the process development between these two states and the collaboration between different user's groups. The second goal is for the game to be a training tool for the new members of the organization, acting as an introductory training that presents the business process and the various people working in the organization to the new employee [8].

Mat Zin and his team have created a learning history game, because they noticed that teachers and students perceive history as a boring subject, as it is hard to remember facts and dates. According to them, learning games can be used as an alternative to learning in a fun environment [9].

The possibility of virtual work experience would allow students to make connections between their education and the profession chosen by them. Some experiments could not be undertaken in the real life, because of financial, safety or other practical reasons. Several funny tools and games that appeared in the last years are able to present them in the virtual world. These tools also allow interdisciplinary learning, enabling teachers to involve students in less popular areas [10]. In this regard, IBM began to see "serious game for learning and work" as an important issue to consider about many business lines.

Second Life is a fascinating world or online representation of reality, which in essence is not a game, although there are many games that are played in the worlds created there. In this simulation the participant has a second life, and presents another person in another place or world on which he may have a much greater impact than in the real world.

Serious games in healthcare provide opportunities to people to demonstrate and apply what they have learned and receive immediate feedback for the decisions made in a

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realistic test environment. This learning environment is an individual assessment for those who are or are not health workers by allowing them to practice their skills without risking consequences in the real world.

In the health area, Rosser shows that children who have played and finished a game called 'Bronkie the Bronchiasaurus', which informs children about asthma and helps them learn to deal with it, understand the importance of their decisions and make better choices than those who did not have access to the game [15].
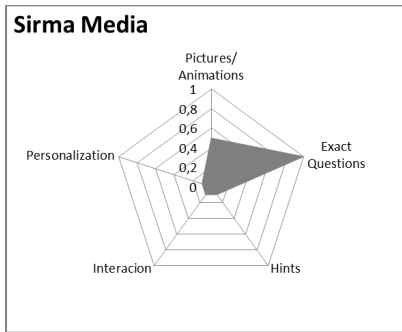
The serious game SGTAI – Serious Game for Traffic Accident Investigators has been developed to provide an environment that imitates the investigation of an accident which originates from the reality and its complexity may vary. The study showed that there was a statistically significant improvement in the performance of the two groups, novice and experienced investigators who trained with the game, compared to those who did not trained with the game [16].

A game called *The Map* developed for helping Bulgarian students with preparing their lessons for school. The selected thematic area for the prototype of the game is *Geography*. The selected initial target group is the age of 11–12 years or fifth grade. The players have to answer different questions and they receive additional information, connected to the question topic. The game does not provide direct interaction between the players, but they compete with each other with their best final results within a subject and age group. The experimental results show that there is a significant increase in the success of the class students that used the system compared to the previous year, who did not play the game [17].
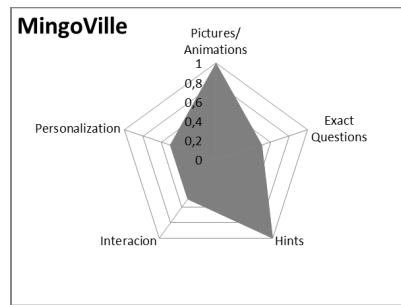
3. Comparative analysis of the presented games. Some of the presented games are compared in Table 1. The comparison is made by the following criteria: presence of images or animations of the subject; worded questions; providing additional information and hints; interaction between the players; offering personalization. (Due to the limit of space, we omit the details here.) Criteria were evaluated in the following way: presented – 1, partially presented – 0.5, not presented – 0. According to the data from the table, radar charts are made. Each game was evaluated by these criteria and the average values were calculated (Figure 1(a) to 1(j)).
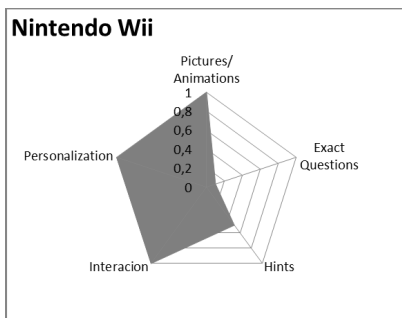
Table 1

	Pictures/ Animations	Exact Questions	Hints	Interacion	Personalization
Sirma Media	0.5	1	0	0	0
MingoVille	1	0.5	1	0.5	0.5
Nintendo Wii	1	0	0	1	1
WeMakeWords	0	0.5	0	1	0.5
VIPROSA	1	0.5	0.5	1	0
Second Life	1	0.5	0	1	1
Bronkie the Bronchiasaurus	0.5	1	1	0.5	0.5
SGTAI	0.5	1	1	0	0
Average	0.6875	0.625	0.4375	0.625	0.4375

Sirma Media

Pictures/
Animations
1
0,8
0,6
0,4
0,2
0
Exact
Questions
Personalization
Interacion
Hints

(a)

MingoVille

Pictures/
Animations
1
0,8
0,6
0,4
0,2
0
Exact
Questions
Personalization
Interacion
Hints

(b)

Nintendo Wii

Pictures/
Animations
1
0,8
0,6
0,4
0,2
0
Exact
Questions
Personalization
Interacion
Hints

(c)

WeMakeWords

Pictures/
Animations
1
0,8
0,6
0,4
0,2
0
Exact
Questions
Personalization
Interacion
Hints

(d)

VIPROSA

Pictures/
Animations
1
0,8
0,6
0,4
0,2
0
Exact
Questions
Personalization
Interacion
Hints

(e)

Second Life

Pictures/
Animations
1
0,8
0,6
0,4
0,2
0
Exact Questions
Personalization
Interacion
Hints

(f)

Bronkie the Bronchiasaurus

Pictures/
Animations
1
0,8
0,6
0,4
0,2
0
Exact
Questions
Personalization
Interacion
Hints

(g)

SGTAI

Pictures/
Animations
1
0,8
0,6
0,4
0,2
0
Exact
Questions
Personalization
Interacion
Hints

(h)

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The Map | Average
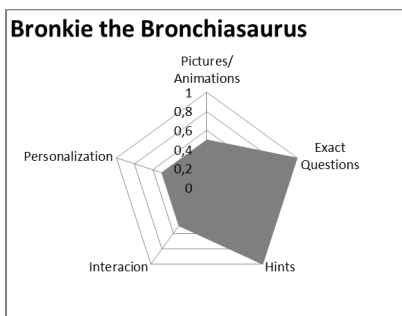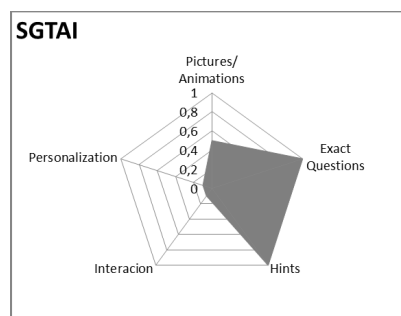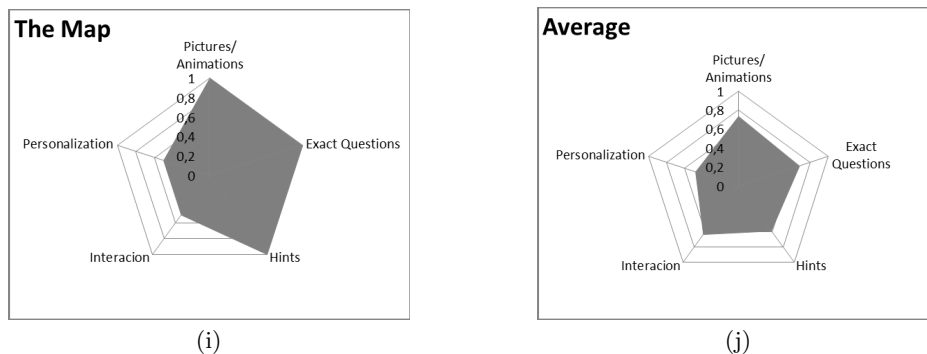
(i) | (j)

Fig. 1

These criteria were chosen because they are important for obtaining information and motivating students to play and learn. For the radar charts (Figs 1(a) to 1(j)) the average value for each of the criteria was calculated (Table 1).

The area of the diagram corresponds to the degree to which each game meets the selected criteria. The larger area of the figure shows a good coverage of the respective criteria. The lower plot (Figures 1(a) and 1(d)) shows that the game does not meet the selected criteria, but may be suitable for other purposes or ages. From the diagrams in Figure 1(a) to 1(j) it can be seen that different serious games have different capabilities. This makes them suitable for different purposes and ages.

4. Conclusion. Depending on the purpose of the game, it satisfies various criteria. The failure to satisfy some of the criteria which are not essential for the game purposes does not make the game less useful. However, the greater area of the radar charts indicates that the corresponding game covers more of the requirements and can be used for a wider range of users, and for achieving a variety of purposes.

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СРАВНИТЕЛНА ХАРАКТЕРИСТИКА НА СЕРИОЗНИ ИГРИ

Елена Паунова, Красимира Стоилова

Разработени са голям брой сериозни игри с различни цели и за различни целеви групи (възраст, социално положение, професионално направление и т.н.). За да постигнат целите си, те трябва да отговарят на определени изисквания. Показани са и са сравнени няколко сериозни игри за различни целеви групи. Сравнението е показано графично чрез диаграми.