Innovative Approach to the Presentation of Cultural Heritage in the Game Module of Serious Game for Blinded People

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Abstract. This research presents some of the problems in developing digital cultural resources for educational application of serious games. A model of wide access to context-based knowledge is considered. Some elements of gaming have been explored when creating learning modules and tools for contextual use of digital cultural resources and making them accessible to people with visual disabilities. The modeling of an accessible game module is presented by applying selected accessibility criteria to people with special educational needs.

Keywords: eLearning, Serious Games, Accessibility of Digital Content, Digital Learning Resources.

1 Introduction

The accelerated development of modern technologies and new information and communication technologies (ICT) in education has a positive impact on the development of innovative educational approaches. The new generation of learners in the 21st century imposes their challenges to learning methods. In acquiring new knowledge in the field of cultural heritage, the direction is to create widely available models and tools for contextual use of digital cultural resources for educational use through serious educational games (SEG), including for people with special educational needs (SEN).

The main objective of the study is to deliver educational results in eLearning through serious games (gamming) and to create accessible models and tools for contextual use of digital cultural resources for educational purposes. Teaching through SEG has incredible potential due to the availability of free choice of place, the time and the speed of learning. Major contribution has autonomous learning in the gaming context and self-controlled process, also and problem solving of access of people with SEN.

The team's research includes the digitization of objects from the cultural and historical heritage and the creation of semantic annotations and contextual links between the

surveyed objects (Bogdanova, Todorov, & Noev, 2018), (Todorov, Bogdanova, Shatko, & Noev, 2018).

The serious educational game "Thracians" and the project "Serious Educational Games as Instruments for New Educational Applications" were developed by a team of the Institute of Mathematics and Informatics - BAS and with the support of the Institute for the Study of Arts - BAS and the Institute of Computer Science and Control in Hungarian Academy of Sciences (Márkus, et al., 2018).

2 Model of Serious Educational Game "Mission Opalchenets"

The training system experimenting with this study is the "Bulgarian Military Logs" platform and the serious game "Mission Opalchenets" (Noev, Valev, Kancheva, & Sapundjiev, 2018). It is an adapted narrative of an excerpt from the history of Bulgaria with game elements. The narrative brings the player into real historical events by immersing him in the first person actions of a participant in the Bulgarian-Turkish War 1877-1878. The content of the story is based on real participants' memories and lots of details (events, clothing, equipment, bits and other interesting things relative to the description) are added to the storytelling, so the player learn about them in a fun and engaging way (Cholpanov, 2007), (Valkov, 1983).

The game platform contains a multimedia archive, an interactive map, a timeline, a vocabulary of terms, a library of literature, user statistics and controls. All knowledge and database uses semantic technology for connections between elements. The model of the game is presented in (Noev, Valev, Kancheva, & Sapundjiev, 2018).

The presentation of the contents to the player and the gameplay are designed to cover the six cognitive levels of learning according to Bloom's taxonomy (knowledge, comprehension, application, analysis, synthesis, and evaluation). This is achieved by the specially developed gameplay presented in the scheme on Fig. 1.

The content of gameplay of SEG "Mission Opalchenets" consists: narrative part, test part, and game elements as follows:

- Narrative part – storyline is an exciting narrative by a first-person participant in historical events. In the example SEG, the story is divided into 6 parts, each followed by test and play segment.
- Test part – consist: questions, tasks, puzzles, riddles, and more for the player on the narrative content to develop logical thinking, time orientation. The objectives of the player's tasks are: to reconstruct a particular fragment of the historical process, to analyze the historical information that is related to the studied period, to imitate the development of the historical process in stages, to understand the meaning and the significance of historical events.
- Game part – small fun games related to the theme of the story in the narrative. Their goal is to attract the attention of the player, to entertain him, to create positive associations with the presented knowledge.

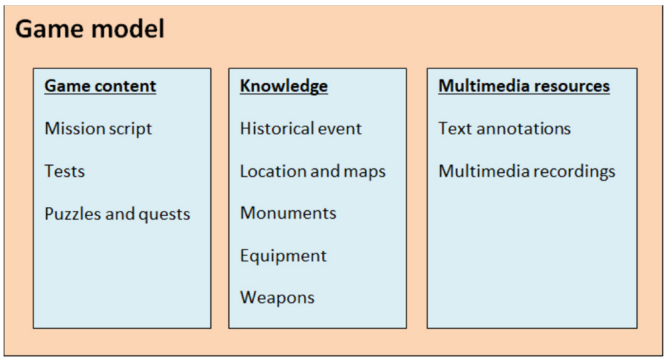

Fig. 1. The scheme of gameplay of SEG "Mission Opalchenets".

3 Model of Accessibility of a Module in SEG Platform

The aim of this research is to adapt the parts of the SEG to ensure a better accessibility for people with disabilities, especially people with visual difficulties. In the presented example, the model of SEG "Mission Opalchenets" is improved to guarantee more reach of people with SEN. All improvements are consistent with international standards and guidelines for accessibility.

People with SEN use tools and technologies that enable them to become more independent by encouraging them to perform tasks that they were previously unable to perform, or had great difficulty in implementing them. Under these circumstances, standards and guidelines for game accessibility have been developed. The guidelines give helpful instructions on how to develop the games to work under restrictive conditions.

3.1 Possible Approach for Design of SEG

There are a variety of possible approaches developers can take when providing accessibility. The list given below is just a starting point. These recommendations can either apply to PC games, console games, or both.

- High visibility graphics
- Color-blind friendly design
- Provide broad difficulty level and/or speed adjustment where applicable
- Practice, training, free-roaming and/or tutorial modes if applicable
- Accessible menus
- Standard Text Presentation
- Self-voicing Capability
- Keyboard navigation of all controls, with visual and spoken feedback
- Better in-game tutorials / user feedback / automatic help
- Ability to set unit color
- Audio map (audio GPS)
- Sound Compass
- Direct orientation

- No 3D graphics mode
- Auto aim, or auto centering, the ability to lock on a target and more

3.2 Presentation of Cultural Heritage in SEG for People with SEN

Several improvements have been made to ensure accessibility for people with SEN in the design of SEG.

SEG content management. Every digital multimedia content and resource must have these attributes: name, description, detailed description for people with SEN. This allows the visually impaired player to hear the description of the given media resource via the built-in audio reader.

SEG player management. The first thing the player needs to make when entering the game is to choose whether to continue in "normal" or "accessible" mode. Of course it can be done by keyboard or mouse and there is an audio guide to do that. If player turns on the "accessible mode" the game machine starts all audio guides, audio menus, audio compass, the image contrast increases, and some more options.

Accessibility of narrow part of SEG. The narrow part (Fig. 2) of the story in the game is recorded with an audio dubbing. In the sound records are marked all the places where there are related text or multimedia resources. In these marks, it is possible with simple keyboard commands to track links and then return to the same location or skip these tags.

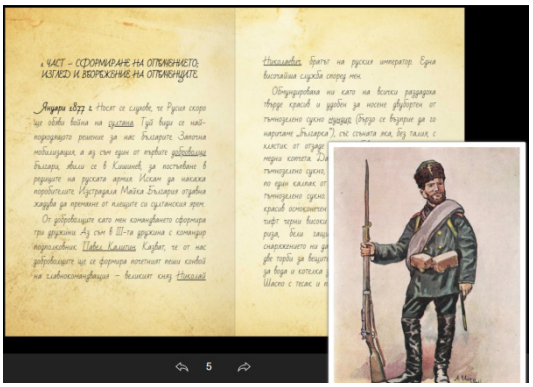

Fig. 2. Narrow part of SEG "Mission Opalchenets".

Accessibility of test part of SEG. In the test part of the game (Fig. 3) several preparations are needed to ensure the necessary accessibility. All the questions, tasks, puzzles, riddles have been transformed into a game of associations with audio dubbing. This also includes all activities related to multimedia resources that have been transformed into a game of association with an audio reader.

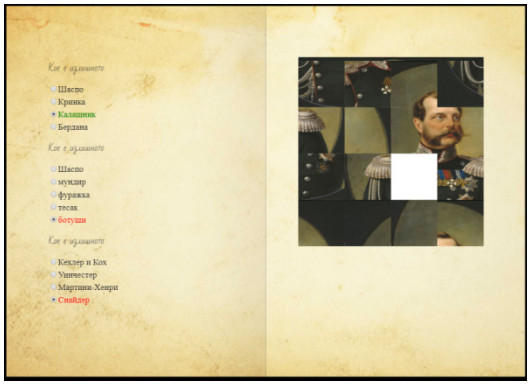

Fig. 3. Test part of SEG "Mission Opalchenets".

Accessibility of game part of SEG. Some of the entertaining games included in SEG include audio recordings and controls. But for others unable to present with an audio guide they have been replaced by different ones, accessible to people with visual difficulties.

4 Conclusions

A demo version has been made. Distribution and promotion of project results realized at scientific conferences and in educational institutions and consumer opinion is analyzed online surveys. Applying these criteria leads to a wider accessibility of the learning elements, using relevant multimedia resources from the cultural heritage area.

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