



Development of System Modules for Children's Games with Vision and Music-Based Interactive Real-Time Feedback Modules - A Design-Based Research Approach

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Abstract

Most past research on young children's attention focused on the design of multimedia games based on visual stimulation. In contrast, few studies have been on the development of teaching tools focusing on auditory stimulation. This study aims to develop a real-time interactive digital game with music and eye tracking for young children. The Design-Based Research (DBR) approach was adopted. Melodic tunes and lyrics composed by the researcher constitute the auditory stimulation, paired with visual images, in a game emphasizing interactivity between game content and players. Discussions were held between the various members of the developing team, during which the game developers and domain experts proposed suggestions to the researcher, who then continuously fine-tuned the game in line with the research objective. Our preliminary findings suggested that DBR, which emphasizes child-centered design, provides a novel and innovative approach to digital game design.

Keywords: Auditory stimulation, real-time interactive digital game, eye tracking

Background

"Information and technology literacy and media literacy" is one of the nine core competencies listed in the "Curriculum Guidelines of 12-Year Basic Education" of Taiwan (Ministry of Education, 2021). In the USA, the National Association for the Education of Young Children and the Fred Rogers Center (2012) also proposed the "use of information technology (IT) to provide adaptive scaffolds as a tool to support child learning and development." This shows that using IT is an important aspect of early childhood education.

To use an IT device, a child must be able to focus on visual elements on a screen, understand their meaning and mode of operation, and thus solve problems. Hence, visual attention is important for a child's IT usage ability. Here, we describe the development of a real-time interactive music and eye movement-based game for children based on the concept of "Digital Game-based Learning" proposed by Prensky (2007). This work aims to gain insight into children's visual attention using an IT device in the presence of musical auditory stimuli.

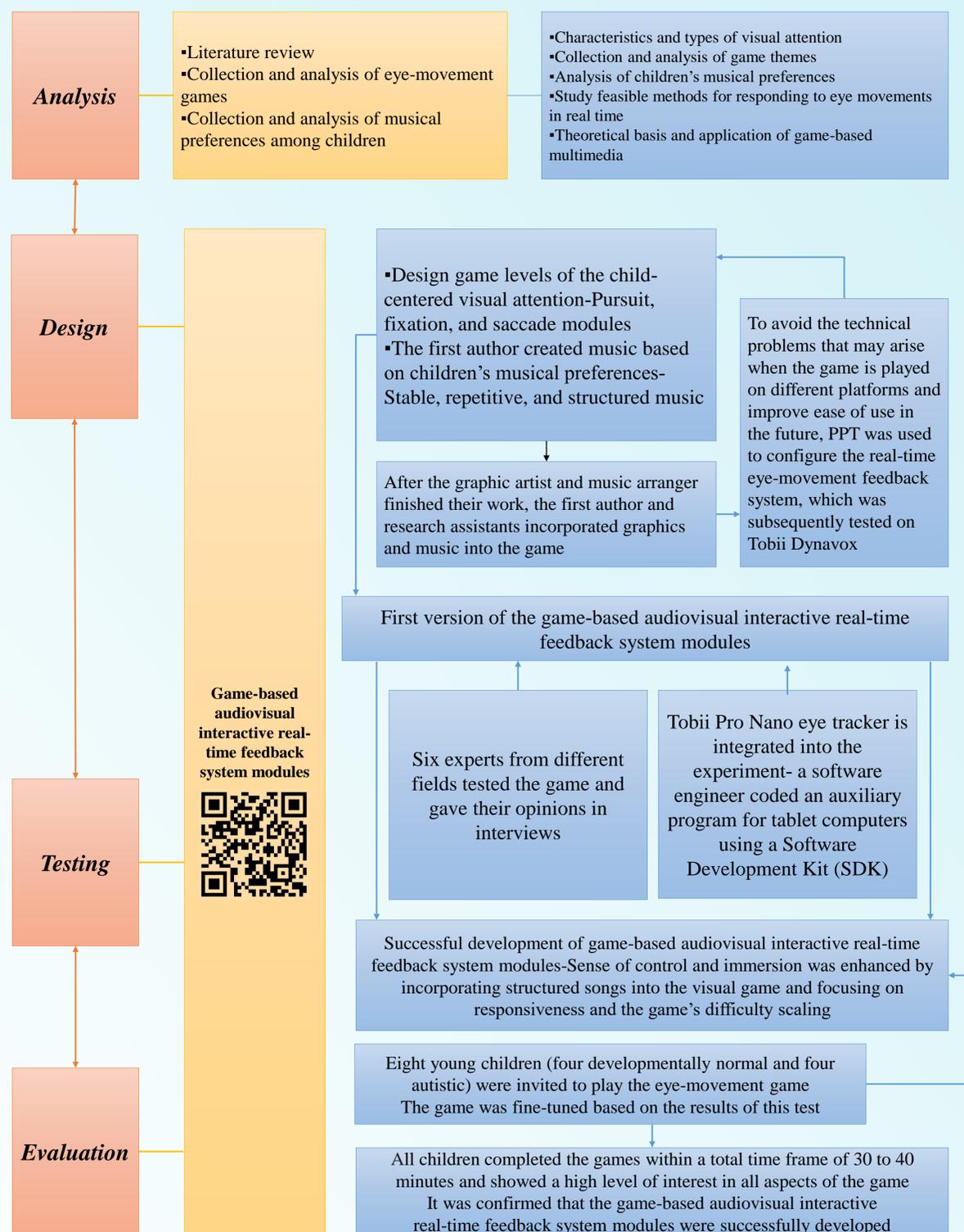
Conclusion and Applications

In this age of human-computer interaction, the role of teachers, who were traditionally viewed as providers of knowledge, has begun to change, as children are now able to learn independently by using IT and appropriate forms of media. In this work, we found that DBR, which emphasizes child-centered design, provides a novel and innovative approach to digital game design. By reviewing the relevant literature and applying an iterative design process, we succeeded in developing a DBR-based game that achieves our intended aims. This game was implemented on the iPad, which young children commonly use, and it uses eye-tracking technology and engaging multimedia elements to allow children to engage their ability to operate IT devices using visual attention via human-computer interaction. Hence, this work contributes to cultivating technological literacy among young children.

References

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Methods and Results



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