

Design of AR interface for Learning Students with Special Needs

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Abstract. In this document, an overview is provided of one of the practical options for implementing the AR interface. The purpose of this article is to use AR abilities to help children with special needs to learn. The objects are the methods and tools of education for special needs. This interface is designed to solve the problems of children's difficulties with learning. For this purpose, the system was designed with the help of tools of augmented reality. In this paper, the description of the partial practical realization of the system is also given. We conclude the investigation by highlighting the aspects that require further research and development.

Keywords: Augmented Reality, Machine Learning, Special needs.

1 Introduction

Every child is often faced with obstacles in learning and development. However, some children with special needs require special attention and assistance in treating from those around them to overcome these obstacles [1-4]. Children with special needs or exceptional children are children who are distinguished by their mental, sensory, physical and muscular abilities, social and emotional behavior, communication skills, or the combination of two or more of them, compared to other normal children. Due to the frequent occurrence of obstacles in the learning process and difficulties in the child's ability to concentrate, it is necessary that the application would be able to lead to a certain level of concentration of such children, indicating that the child should do further. These difficulties include the processing of the situation, the dialogue and the objects that surround them, as well as the inability to understand the non-verbal aspects of communication, the lack of human involvement, and the inability to interact across environments. Traditional ways to cope with these challenges facing these children include repeated one-on-one interactions, constant attention, and involvement in reinforcement strategies.

Learning Disabilities include [7]:

- Depression;

- Dyscalculia (when the person has trouble understanding math);
- Dyslexia (when the person has trouble understanding the written word);
- Dysgraphia (when the person has trouble with forming letters when writing).

A systematic review of the literature on the benefits and challenges of augmented reality for education has found an increase in AR research over the past four years and found that the most augmented reality advantage is that it enhances learning achievement. This technology has a number of benefits that can be used to work with children with special needs.

The use of AR has become more affordable as it no longer requires specialized equipment and can be easily used on mobile devices [2, 3]. Researchers in this field confirm that virtual objects or avatars can alleviate the psychological strain of social encounters and improve communication processes between people, it facilitates control over the environment and their social interaction.

AR interface can help to increase the self-esteem of patients who face difficulties in controlling social situations in real situations [5] and [12]. Researchers in this field confirm that virtual objects or avatars can alleviate the psychological strain of social encounters and improve communication processes between people. Interaction is also slower, and children with special needs have more time to think about different ways to respond to situations.

2 Description of the Information Service

The platform is designed to help children with special learning needs to improve their level of knowledge and socialization. AR has the unique ability to create immersive hybrid learning environments that combine real and virtual objects [1]. It is expected that the program will be able to support a child with autism in improving communication skills and provide effective practical value.

It is also worth mentioning that in the next version, the possibility of adding an auxiliary solution using machine learning is already included in the development. Using a certain algorithm, the program will guide the student in completing the lessons so as to reduce the maximum possible number of errors.

IDEF0 methodology was chosen to perform the system analysis. It is the clearest and simplest way to describe the functions of the system. Ten arrows were used. Inputs: "The theme of a lesson", "Markers". Outputs: "Student's self-learning", "Results of the lesson". Controls: "Ministry of Education and Science's instructions for teaching students with special needs", "Information technology tools (glasses, controllers, tablets, etc.)", "Recommendations for the education of students with special needs". Mechanisms: "Student with special needs", "Teacher", "Hardware" [8-11].

After that, the main functional block was decomposed into three processes: "Adapt to a device", "Create a profile / Log in", "Work with interface". Two new arrows have been added: "Call the form of registration/log in", "Data about profile".

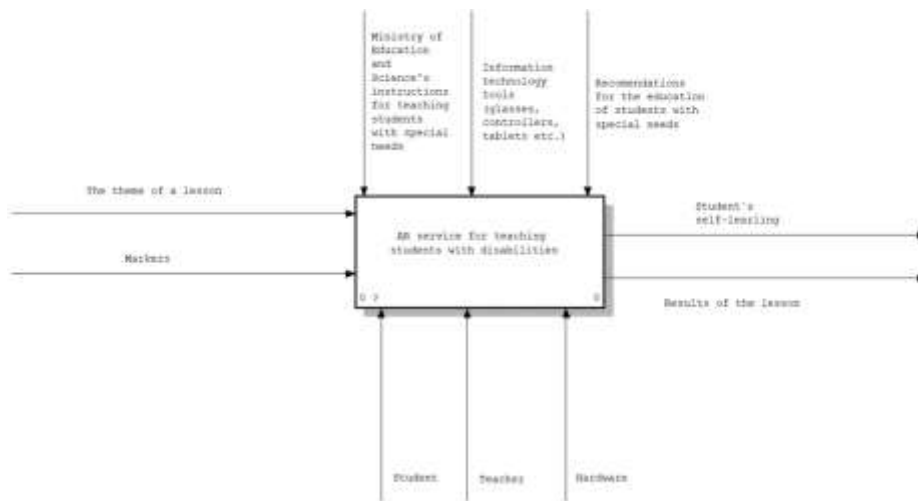


Fig. 1. Context chart A-0

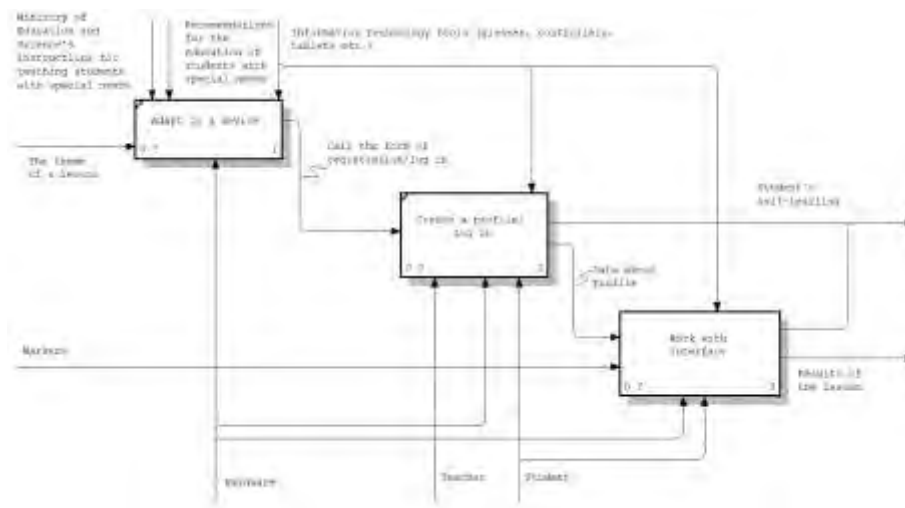


Fig. 2. IDEF0. Figure A0. Decomposition of the system.

4 Conclusions

The results of this study showed that the working AR interface that helps children with special learning needs to learn easily and socialize faster. The visualization is done with two avatars to choose from: an owl named Sovun'ka and a robot Sr. Der-Miui-Chenk. For better children's perception, choosing a suitable avatar is accompa-

nied by animation playback. All of these details help to hold the attention of a child with special needs and increase the likelihood of accelerated learning. A further goal for improving the system will be to use machine learning to generate recommendations for completing lessons.

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