ARBlocks: A Concept for a Dynamic Blocks Platform for Educational Activities

Rafael Roberto, Daniel Freitas, João Paulo Lima, Veronica Teichrieb, Judith Kelner
Virtual Reality and Multimedia Research Group
Federal University of Pernambuco
Recife, Brazil
{rar3, jpsml, vt, jk}@cin.ufpe.br; daniel@gprt.ufpe.br

Abstract—This paper describes the concept of a dynamic blocks platform, called ARBlocks, based on projective augmented reality and tangible user interfaces aiming educational activities. In it, the information is displayed by projectors, that exhibit the content only on the blocks using a projector calibration technique and the blocks are tracked through a frame marker. Despite the platform is still under development, some results regarding the frame marker tracking and the projection was achieved.

Keywords—augmented reality; education; tangible user interface; design for children

I. INTRODUCTION

For a long period of time, education was thought as transmission of knowledge. In this context, students were considered passive, being responsible only for the storage of the content transmitted by the teacher. Currently, however, these theories have been overturned in the sense that there is no teaching without learning and that knowledge is seen as a building process.

Thus, there are a lot of teaching materials that are facilitators of the learning process. From the perspective of Jean Piaget, we see how the activities carried out through these tools have become important and contribute to child development [1].

In this context, tangible user interfaces are a good instrument for the creation of a material that satisfies most of teacher’s needs. They are able to create tangible tools that can help the students’ development, contributing to motor aspects’ improvement, collaborative activities and the understanding of the world around them.

Another area in computer science that has a great potential to contribute with early childhood education is augmented reality, given its enormous potential to improve information visualization quality, which is very important, especially when it comes to children.

For these materials be successful in facilitating learning, they must be designed so that, besides attracting the interest of children, visually and tactile, for instance, they must be very intuitive to use, in a way they have an enjoyable experience with these artifacts. For this, graphic, technical, ergonomic and educational factors should have a huge importance in the design process of these products [2].

This paper introduces the ARBlocks, a concept of a dynamic blocks platform for educational activities based on augmented reality and tangible user interfaces. It can be used as an educational resource for the process of knowledge construction in children. In order to explain the concept, this paper is organized as follows: Section 2 shows related work regarding the use of tangible user interfaces and augmented reality in early childhood education. Then, in Section 3, it is explained the main concepts that guide this work. Section 4 details how the product and an application for the platform were designed. In Section 5 the results achieved so far are presented. Finally, Section 6 presents conclusions and future directions for the tool’s development.

II. RELATED WORK

The use of interactive blocks is not new in education and this type of activity soon became a great ally of the teachers by the way it stimulated children’s creativity, logical reasoning, language skills and other abilities [3].

Today they exist in several sizes, shapes and materials. For each proposed activity, there is a specific set of blocks. Thus, if the teacher wants to instruct mathematics, he/she uses a material made exclusively for this purpose, containing numbers, mathematical and geometric symbols [4], as shown in Figure 1. In another moment, when the activity has the objective to develop language skills, it will be used other blocks containing letters [5]. Thus, schools must have multiple sets of games, one for each purpose.

Figure 1. Example of mathematical game based on blocks.

When this type of resource can’t be used, the authors observed that they attempt to use several multimedia fea-