Educative Distributed Virtual Environments for Children

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ABSTRACT

This paper presents a distributed virtual reality environment for children called EVE—Environnements Virtuels pour Enfants. The virtual environment architecture is reactive agents based. The FCM-like dynamic action planning mechanism assures agent's adaptability to its environment changes. This virtual environment supports cooperation among members of a dispersed team engaged in a concurrent context. By the means of their avatars, special cases of agents, users are allowed to interact and to give decisions using cooperative mechanisms. A user-friendly interface enables teachers to create their own stories that fit with children's pedagogical requirements and generate new virtual environments according to the teacher's specifications. The implementation is based on DeepMatrix as environment server, VRML and Java as languages and Cortona VRML plug-in from ParallelGraphics. It is actually running on the Internet: http://eve.enib.fr

Keywords: autonomous reactive agents, distributed virtual reality, fuzzy cognitive map, virtual environment

INTRODUCTION

Learning to read is a difficult but important task for a child. It takes time and supposes a constant effort from its part. Like many other school activities, reading involves child's capacities as attention and memory, knowledge (of letters) and know-how as searching and discovering the word's sense in a given context. Small capacity in attention and incapacity to reinvest in a new task of already known notions are just some examples of obstacles in a child's learning process. More, a task failure can generate a fear from the child's part concerning particular notions, or notions related with the unaccomplished task.

At the beginning of primary school, some children have not achieved all the necessary acquisitions to basis tasks. For example, some have difficulties to place in order a set of labels in order to construct simple sentences. And this may have multiple causes; the child has not well memorized the oral sentence, is not able to realise a correspondence between the oral sen-

tence and the written one, or, is not able to coordinate the spatial distribution from left to right with temporal succession of already pronounced words. In order to avoid the initial difficulties to accumulate and to produce a child's discouragement, part of the activity in primary schools is organised around small groups of children, rather than individual work. More, when we talk about learning at childhood age we are usually using a story metaphor, because narrative lends itself to active exploration of a domain through challenging and enjoyable problem-solving activities, which is essential for learning.

On the other hand, the informal context in which the child learns reading has well evolved in the past three decades. New technologies such as Internet, multimedia, and virtual reality are now parts of our children's everyday life. For this reason, it is not surprising that educators grow their interest in distance learning and distributed education, and try to use these types of media in their lessons.

Our paper presents a distributed non-immersive virtual environment (VE), called EVE: Environnements Virtuels pour Enfants (Virtual Environments for Children), which helps primary school children learn to read. Based on a story reconstruction, it offers children a pleasant approach to learning by means of two games that implement emulation and cooperation.

In the following, after a brief state-of-the-art of educational computer aided environments for children, we present the EVE project from a pedagogical perspective. Next, we will make some considerations from an architectural point of view and we give some insights concerning the implementation of our project. Finally, we will make some conclusions based on the experience obtained during the project and we end with perspectives of our work.

BACKGROUND

With ever-increasing computational processing power, the rapid growth of the World Wide Web, and the ongoing construction of a digital communications infrastructure, the creation of distributed (immersive), multi-participant VEs running on the Internet starts to prove its usefulness in child education.

These learning experiences may come in many forms. Educational quiz-like or puzzle-like kids' games for ABC activities such as reading, reading comprehension, math, writing, and so forth, and digital libraries, such as QueryKids (Druin et al., 2003), are some examples of multimedia-supported learning environments. The creativity, encouragement, and great motivation supported by interactivity in a social context permits passive children to become active. More, these experiences realise cultural enrichment of a child's knowledge (Pantelidis, 1995). Dedicated Web sites, like "J@rdin des jeunes branchés" (J@ardin, 2004), provide online learning activities that are combined with games and information for elementary school projects as a help to navigate on the main Web sites.

Much of the appeal for applying VR in education is derived from the observations of educational theorists (Bruner, 1986; Piaget, 1929) who have stressed the value of actualizing learning through making it more real for students. Learning is facilitated through the construction of concepts built from the intuitions that arise out of their direct experience of the environment. The opportunities for young users to visit places and interact with events that distance, time, or safety concerns would normally prohibit, the greater understanding of concepts through the creation of multi-modal metaphors or representations and the ability to

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