Science Education and Augmented Reality: Interaction of students with Avatars Modeled in Augmented Reality

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Abstract: -This paper explores educational uses of augmented learning environment concerned of training. We analyze the research of scenarios based on augmented reality. Many examples for the purpose of high education and simulation are described. we will shown that These applications describe that augmented reality can enhancing and motivating students' understanding of certain events, the students can learn in a quick mode by interacting with some avatars or objects in the virtual environments.

Augmented reality provides students with an interactive interface allowing learning in different themed environments in a more motivating way. The teachers are aware that use of avatars or objects for introducing contents helps to learning. In fact, several research show that AR's implementation in the classroom helps improving the learning process, increases student's motivation and eases the teacher's work, Some of research is also examined in this research review.

Key words: -Augmented learning environment, augmented reality, high education, avatars

1. Introduction

Augmented reality is a scientific and technical domain using computing and behavioral interfaces to simulate in a virtual environment the behavior of 3D entities [1]. Perhaps, it is necessary to explain the terms "augmented reality." The virtual environment is defined as a "computer generated 3D simulation of a real or imaginary environment" [2].

2. Augmented Reality Environments in Education

a. Augmented reality in classroom

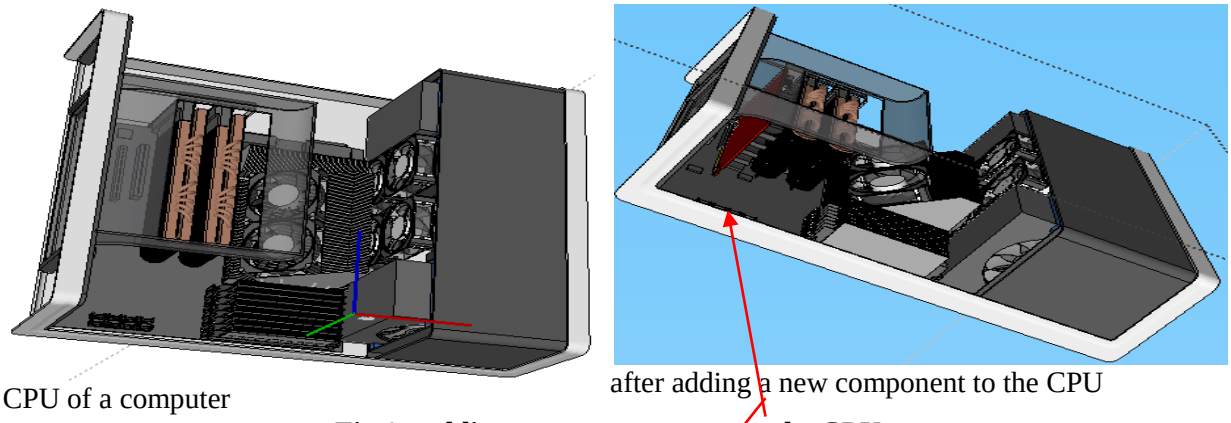
A computer, webcam and projector are needed for setting an augmented reality system on the classroom. The teacher manipulates avatars and virtual objects and can interact with students for supporting his explanations. The books or class notes from students include the right markers to interact with the augmented information and be visualized. The students will be able to visualize the information in a PC or in an AR application that has been developed.

Indeed, it facilitates the control of the environment, as well as social interactions of Students who use these environments can interact through "an avatar"; so, students can get direct responses based on their behavior in a virtual environment [3]. augmented reality has several exploitable advantages for working with students, motivating and stimulating learners' understanding of certain events, especially those for which the traditional notion of instructional learning have proven difficult.

the personality. This can contribute to increasing the interaction-esteem of student who encounter difficulties in the real classroom in learn the training [4]. The AR offers high flexibility in the sense that educational norms can be developed between users to facilitate communication. Researchers in this field confirm that virtual objects, or "avatars," can facilitate physical experiences, chemistry and mathematics..., as well as the processes of communication between people. This communication can be simpler than face-to-face in the reality [5]. Indeed, students can play major roles in a virtual environment created by augmented reality to imitate certain exercises, practical work or directed work [6]. Interaction in augmented reality does not

require a strong direct relational engagement of the student with another person.

This system can be useful for increasing emotions and recognition of emotional expressions [7]. In addition, using educational potentials of this technology, we can have the student interact with an object that is a computer (Fig.1).



CPU of a computer

after adding a new component to the CPU

Fig.1 : adding a new component to the CPU

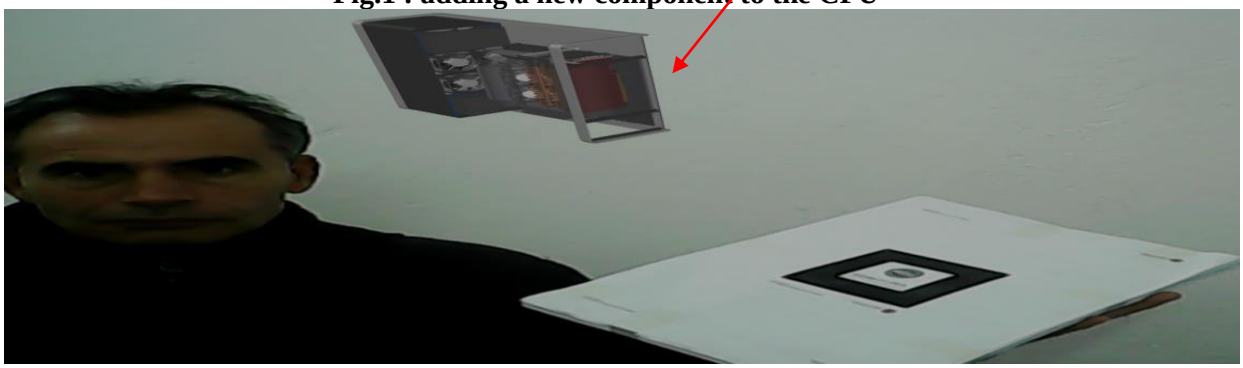


Fig.2: application of augmented reality on the CPU

It is also interesting to create situations, such as to add a motherboard in the computer case, in order to anticipate events in the real world [8]. Indeed, if it is the the teacher who chooses the real activities and the modeled ones, he/she can choose models of real buildings and real situations around the real environment of the student. This point takes up the consideration made previously related to the importance of the customization of the models (Fig.2) [9].

b. Augmented reality laboratory

The physical space available may be an issue when there is lack of space for the computer at the laboratory where practices take place t performing maintenance of those computer as financial issues may cause that labs don't have all infrastructure needed by teachers.

You have to have the markers and handheld devices (smartphone, Tablet PC) in the virtual machinery laboratory where students can interact and perform training [10]. Any machine's training can also be proposed with provided markers set in strategic places as a guide for the student aiming to perform maintenance tasks, setup, learning use procedures.

c. Augmented reality workplace

With augmented reality, the increase of information in real workspaces is possible [11]. There are few contributions where augmented reality technology is applied to machines mounting. In less accessible fields like aerospace, health, applications have been developed for supporting to follow the maintenances [12].

Actually, the mechanical teacher use AR glasses when he works on vehicles, glasses show repairs step by step, target necessary tools. This kind of experience supports learning an diagnostic as well training of specific tasks. Keith has performed a pilot experience and has shown that augmented reality can be used in the environment workplace for in situ training. The study's aim was improving the learning of the students [13]

3. Augmentée Reality Designed for Learning

Augmented reality plays a very important role in learning and training. In this part, we present some typical examples that I have developed in this article.

a. **AR_ENIT For study civil engineering**

Is an application that provides to engineering students' civil engineering a set of exercises for training spatial abilities through an augmented book.

The exercise has a civil engineering gesture related that must be performed by student for added a **drone** (Fig.3) on an environment and understanding how to solve it. The gesture performed consists in getting closer to the camera so the solution will come up as seen on photo.

Students can visualize the 3D model in AR and they can check if their freehand sketches match the 3D virtual models which they are viewing. Completion of each level on consecutive hours is suggested so it should be finished in a few.

Results of the validation study indicated that students which undertook training improved their levels of spatial ability compared to the students which didn't undertake any kind of training.

Fig.3: after applying augmented reality

b. **AR_ENIT For study mechanical engineering:** is an application provides to engineering students mechanical.

Created for being used as didactic material in mechanical engineering. It allows students viewing the objects or avatars so it supplements what is asked. This marker may help mechanical engineering students for normalization of standard mechanical elements following standardization international rules.

We have developed an application in maintenance of a mechanical system to make the augmented reality system useful as training

for mechanical Engineering students aiming to replace the troublesome maintenance objects and assembly instructions. The Augmented tool is consists of marker well spotted by our webcam of the used platform as 3D data which will be superimposed upon the real scene. (Fig.4).

The application requires very accurate position and orientation tracking and register virtual elements in the real the environment using marker-based method. The system requires a webcam for capturing the real the environment and the captured image will be recognizes virtual objects on the markers.

Fig.4 : mechanical example

4. Conclusion

Augmented reality is a reality in many teaching information and data as teacher can use expert´s tools from this technical. This allows teacher both exploring and put augmented reality in their didactic filed. The teaching program are designed for reaching already determined aims as providing knowledge, practical work, tutorials and training encouraging creativity and collaboration. Augmented reality is environment allowing teacher and students using it daily in the learning process.

The multifunction of these technical and new possibilities given by computer, tablet and iphone are the key to the dissemination of AR contents in teaching. Besides the use of technical based on AR resources are easily adaptable to teaching scenarios:

- The teacher on AR can use the didactic material to autonomous learning and collaborative tasks.

- The AR provides a authentic very rich contextual learning for learning and developing skills for students, and appeals to multiple learning styles, this fact calls to constructivist notions of education.
- In the field of teaching for future profession (mechanical engineering, civil engineering, computer engineering, etc.), there are no real consequences if mistakes are made during skills teaching.
- Our practical research it is observed that the use of AR involve an high motivation for students because it encourages them to learn and interacting with virtual objects, avatars and virtual environments. We could confirm, as some studies mention that the teaching curve is faster.
- For educational institutions it must be pointed that augmented reality is a cost-effective technical for providing students more attractive content than does paper, therefore it is of interest to extend its use to all educational levels. The schools can solve shortcomings of equipment with avatars and objects 3D models to conduct training and next the work taking place in some classrooms should allow that engineers

students to perform them properly interacting with avatars and objects.

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