

VIRTUAL 3D (MUPAI VIRTUAL 3D)¹.

Museo Pedagógico de Arte Infantil (MUPAI Virtual 3 D)

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Abstrac:

Virtual reality is currently considered a first-order resource for education and training. In this regard, artistic education, like other disciplines, is backing into this technology as a tool to overcome obstacles and contribute new ways of visualization and of providing information. And, in this case, the use of this technology presents enormous advantages for museums, especially, the more modest ones, which have few resources to disseminate and show their collections and works. Moreover, they have to resort to ingenious solutions to solve their difficulties. Therefore, the Pedagogic Museum of Children's Art (MUPAI) backs into this technology to overcome some of the difficulties it encounters and to allow interested spectators to see its works, with great realism, and to visit its facilities anywhere in the world and at any time of the day. Hence, virtual reality unfolds new possibilities in the field of education that were inconceivable only a short time ago.

Key words: Virtual museum, virtual reality, augmented reality.

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1. Introduction

The Pedagogic Museum of Children's Art was created in the cathedra of Pedagogy of the Faculty of Fine Arts of Madrid in 1981; the founder of the project was Professor Manuel Sánchez Méndez. The current Director of the museum is Professor Manuel Hernández Belver.

The Pedagogic Museum of Children's Art is a first-order pedagogic resource to promote children's interest in the world of art, and a place where the activities carried out focus on children's creativity through workshops and exhibitions.

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It is the first museum especially dedicated to children's art and its pedagogy in Spain, considering children and adolescents as protagonists inasmuch as artistic creators.

For more information, consult: <http://www.ucm.es/info/mupai>

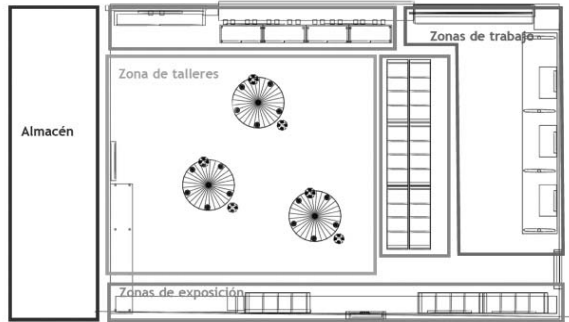


Figura 1. Vista esquemática de la distribución del MUPAI

As it is a university museum without any kind of private or public funding, it encounters a series of difficulties. Among them:

- The available physical space is very limited, practically only a few square meters in the Department of Teaching Plastic Expression. This means that the large quantity of works in this museum cannot be exhibited.
- In addition, as it is a university museum situated within a department, during semester breaks and holidays, it is impossible to visit the museum because the facilities of the Faculty of Fine Arts are closed.

Thus, the currently available space of the MUPAI is used as a research center and a place to conduct workshops. However, we hope to solve these above-mentioned problems.

Therefore, we have two complex problems: a spatial problem and a temporal problem. From here, a series of questions emerge that lead to raising the possibility of solving these two drawbacks. First, it became clear that intentions could never be a substitute for presential visits, but they could complement them. And for this purpose, we sought resources that met a series of requirements so the project would be feasible:

- Available at the user level.
- Free or very low-cost.
- Easy to manage.
- The sense of reality should be as strong as possible.
- The resource must be visualizable through Internet.

2. Nonimmersive virtual reality

For this purpose, there was no doubt that we had to look into the new technologies. And after reviewing diverse possibilities, the one that best met our requirements was nonimmersive virtual reality.

Nonimmersive virtual reality is characterized by the peripheral devices, which allow interaction and, to a certain extent, “immersion.” They are the computer screen, the mouse, and the keyboard. This type of virtual reality also provides great interactivity with the environment.

On the other hand, nonimmersive virtual reality offers a new world through a desktop window, in this case the computer screen. Thus, nonimmersive virtual reality has several advantages over immersive virtual reality, such as:

- Low cost.
- Easy to use.
- Rapid user acceptance.

In this sense, immersive devices are still currently quite expensive and users generally prefer to manipulate the virtual environment by means of familiar devices such as the keyboard and mouse, rather than to use heavy earphones or data gloves.

Moreover, nonimmersive virtual reality allows the visualization of environments that look real, from anywhere and at any time, because this technology can be used by means of the Internet. It therefore provides important advantages in long-distance training.

3. Reasons for using nonimmersive virtual reality in 3D MUPAI

Besides the above-mentioned reasons, we shall extend the benefits of the use of this technology applied to Virtual 3D MUPAI:

- It overcomes spatial barriers. It allows the visitor to visit the museum and its works with no spatial limitations. That is, any person who has a connection to Internet anywhere in the world can visit the museum. In addition, the museum can thereby show the visitor all its collections.
- It overcomes temporal barriers. In this sense, there is no established opening schedule, so it can be visited at any time.
- This allows detailed visualization both of the facilities of the museum and of the works and collections it houses.
- The visitor chooses the trajectory according to his or her interests and preferences. Therefore, it promotes first-person learning. Many authors have pointed out the usefulness of virtual reality technology in the learning-teaching process. These authors, some of whom we shall mention in this chapter, establish a series

of advantages that leads us to accept the suitability of this technology as described above.

Many applications that subscribe to the theory that knowledge is better retained when one experiences it directly than when it is only seen or heard are based on the technology of virtual reality. The basis of this theory is the concept of first-person knowledge, according to which an individual acquires most knowledge from his or her daily life by means of natural and direct experiences, non-reflective and subjective. These kinds of experience are usually characterized by the absence of deliberate reflection, because the action emerges directly from one's perception of the world. In addition, such learning is often carried out implicitly, because the individuals are not aware that they are learning something. The concept of first-person learning is the opposite of third-person¹ learning, used in traditional educational methodologies. This kind of knowledge is characterized by learning from another person's description, and it is therefore indirect (it was experienced by another person), collective, objective, and explicit.

- First-person knowledge, however, allows for certain kinds of handicaps to be partially resolved due to the possibility of freely scaling and rotating the works and collections of the museum, without any showcases or objects in-between that obstruct visualization.
- To some extent, it also overcomes linguistic barriers because the user focuses especially on visual navigation instead of on textual navigation.
- As it is so similar to the way of interacting with videogames, people are motivated to use it, especially young people. It also encourages more active participation
- Somehow, it favors immersion.
- It is compatible with diverse multimedia resources: audio, video, text, etc.
- It is multisensory. There are diverse studies that show that, the more senses that intervene in learning, the more reinforced such learning becomes.²

4. Functioning and use of the Virtual 3D MUPAI

As mentioned previously, a virtual visit is not meant to be a substitute for a physical visit to the museum. For this purpose, resources that one might not encounter in physical life are included and used to complement and contribute, but never to substitute.

In order to create a museum with a virtual reality technology that is as useful and accessible as possible, the three basic concepts that make up this technology were taken into account, both in its immersive and nonimmersive facets: immersion, manipulation, and navigation. These concepts were essential to guide us in the accomplishment of this resource. Although it may seem paradoxical that a technology called

nonimmersive should favor immersion, this is so. However, this does not reach such a level of immersion that the user feels “surrounded” by the scene.

With regard to the initial access to the museum, one feels that there is great sense of realism because the objects, besides having their own shadow, cast it upon the other objects, as shown in Figures 2 and 3. The illumination and texture of the objects also helps to create this sense of realism.

Navigation within the space of the museum is “free,” although we restrict the movements of visualizations or positions that are not the normal ones when visiting a museum. For example, one cannot turn the camera upside down. However, it does allow one to freely wander around any part of the facilities.



Figuras 2 y 3. Distintas perspectivas del MUPAI Virtual 3D.

As seen in Figures 4, 5, 6, 7, and 8, this system even allows extreme manipulation and visualization of an object. We can use the zoom to move an object nearer or farther, rotate it, and even select the most suitable visualization system. In addition, the objects are very high quality, because 500,000 polygon-objects can be perfectly seen and manipulated by means of a one-megabyte connection to Internet. That is, these resources do not weigh more than a bidimensional image. Figures of 500,000 polygons can weigh up to 800 kilobytes. This facilitates the manipulation of such figures and objects through Internet.

Some other elements of interactivity and textual information are also included to make the visit easier and more accessible for the user. Although the resource is very easy to use, the information is so accurate and clear that even a person who has very seldom used a computer can access it without any problem. For this purpose, some tests were conducted. We used the program Google Analytics to determine all the technical characteristics of our users in order to adapt all the technical parts that could cause problems or drawbacks either in the access, manipulation, or visualization.

We also subsequently incorporated a series of bidimensional works situated in exhibition halls created especially for this purpose. In contrast to the main hall, whose referent is reality, these halls were first imagined and subsequently created.

In all the works, both bidimensional and tridimensional, an explanatory card with the characteristics of each one is included.



Figura 4



Figura 5



Figura 6

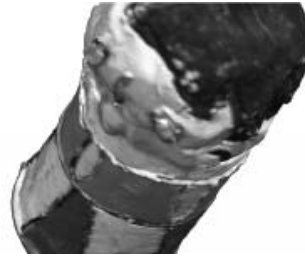


Figura 7



Figura 8



Figura 9



Figuras 4, 5, 6, 7, 8, 9. Ejemplos de las distintas formas de visualización de las obras y fondos del museo.

One of the main goals of this project was to create a resource that would be as easy as possible for the user to handle, while contributing all the above-mentioned advantages.

This resource can be consulted via Internet Explorer at: [http://www .ucm.es/info/mupai/maps/index4.html](http://www.ucm.es/info/mupai/maps/index4.html)

5. Conclusions

Virtual 3D MUPAI is a first-order resource for the exhaustive visualization of the works presented in the museum. To our knowledge, till now, there has been no virtual museum that allows one to see tridimensional works with such a high degree of detail.

Virtual reality and augmented reality are the technologies of the future. These technologies will allow us to visualize spaces and objects from our own living room with a realism that was inconceivable until a short time ago. In fact, other sectors of society that have little to do with museums have swung into action some time ago and have found in these technologies a windfall with which to improve processes, applications, productivity, etc. Therefore, museums cannot and should not stagnate and should back into these advances, which are not intended to substitute the physical visit but to complement it and to help solve the deficiencies faced by some museums.

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Notas

1. De Antonio, A., Villalobos, M., & Luna, E.: "Cuándo y cómo usar la Realidad Virtual en la Enseñanza" [How and when to use virtual reality in teaching], Enseñanza y Tecnología, January-April 2000, 26-36.
2. While this article was being written, "Virtual Cocoon" was presented in Pioneers 09 at the Olympia Conference Center of the city of London. Scientists from the University of York and the University of Warwick, in the UK, have developed virtual reality headphones that can simulate all five senses, via a project called "Towards Virtual Reality."