

APPLICATION FOR HOLOGRAPHIC PYRAMIDS IN EXHIBITION SPACES: AN EXPANSION OF THE TEACHING MODE

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Abstract: Research indicates that Augmented Reality contribute to the challenges of communicating complex research findings in an accessible language to a wider audience. This research uses the Design Science Research method divided into: (1) Characterization of current knowledge on the subject based on literature review in Scopus and Web of Science scientific databases; (2) Requirements and architecture of applicable hardware and software.

Keywords: Holographic pyramids; Augmented reality; Exhibition space; Classroom.

APLICAÇÕES PARA PIRÂMIDES HOLOGRÁFICAS EM ESPAÇOS EXPOSITIVOS: UMA AMPLIAÇÃO DO MODO DE ENSINO

Resumo: As pesquisas apontam que a Realidade Aumentada pode contribuir para os desafios de comunicar resultados complexos de pesquisas em uma linguagem acessível para um público mais amplo. A pesquisa foi desenvolvida sob a metodologia da Design Science Research e, quanto à metodologia, será dividida em quatro etapas: (1) inicialmente será realizada uma caracterização do conhecimento atual sobre o tema a partir de uma revisão de literatura integrativa resultante de uma busca nas bases de dados científicas Scopus e Web of Science; (2) em seguida serão definidos os requisitos e a arquitetura de hardware e software.

Palavras-chave: Pirâmides holográficas; Realidade aumentada; espaços expositivos Salas de aula.

1. INTRODUCTION (ARIAL 12, must start on the second page)

The augmented reality (AR) is the overlap of virtual elements and the reality, this technology got popular in 2016 with the game Pokémon GO, that brought a light over the AR, especially for the grate masses. Even though the popularity of AR has achieved extraordinary numbers in 2016, its origin comes from long before, it was created in 1992 for the scientist Thomas P. Caudell with the purpose of create a easier way of building the Boeing 747 also Caudell's invention, the project to build a monitor to guide the installation of the Boeing's parts was not successful. The fact that Caudell's monitor did not work does not cancel the fact that he is the father of AR, a technology that has a lot of potential, the AR can be used in the making of cars, in surgeries, in education, translation, facial scanners and so many others.

In Brazil the AR has already been used in museums, as in the example of the National Historical Museum in the state of Rio de Janeiro, that counts with a little system of augmented reality, this system has the responsibility of given to the visitants of the museum additional information about the pieces in exhibition, especially the exhibition of the royal carriages and cars of the empire that has been the principal pieces that are involved in the system of AR. But the museum faces some difficulties, especially in the matter of letting the visitants know that the AR system is available, other problem is the need of internet, since the walls of the museum are too thick cause it is a historical building, so still has the structure of old buildings from the XVII – XVIII century, the internet signal is too week inside the museum and also the mobile data has some trouble working inside the building (MARÇAL, 2018), all those difficulties reduce the efficiency of the AR system and reduce the number of people that know and have access to the system and the knowledge that it holds.

The use of holograms has been used in the world for many years, having started with simple and rudimentary techniques such as the Pepper ghost or Monga effect, which consists in the use of light refraction to create optical illusions, to the creation of more technologies advanced systems such as overhead projectors. Holograms are already widely used in the entertainment world, bur this image display technique has great potential for use in other areas, such as in the world of information display, where holograms can generate expansion of the way a subject is understood and exposed, expanding the absorption of the content and enabling the observation of details that were previously unnoticed. Holographic pyramids are a way more viable option for using holograms, even though it is not a hologram itself, the holographic pyramid has the same effect as a hologram projected to the eye of the same effect as a hologram projected to the eye of the observer, and this technique is very useful in exposing data and projects, and being a resource that is simpler to be handled and cheaper to build than the most advanced equipment for the projection of holograms.

The holographic pyramids belong inside of the world of the augmented reality (AR), that mix the real world with the virtual world, bringing a whole new interaction between the virtual world and the user that is being exposed to this technology, the AR brings a whole set of possibilist to the exhibition world. Inside of the AR, the holographic pyramids are a cheaper possibility to exhibit information and data, even thou the holographic pyramids are being more used in the matters of entertainment as a playful option to introduce the world of AR into children's lives, would be a great way to improve the teaching.

For that matter, the use of holographic pyramids has a lot of potential and has been already used in the field of educations, because can bring to the students a new way of seeing the subjects taught, what can bring a whole new experience and improve teaching as it is known, being able to teach subjects that was considered hard to understand in an easier way.

2. METHODOLOGY (ARIAL 12)

The methodology in this paper follows the technique of bibliographic research, going through similar papers and assimilating the main idea to create a new vision of the subject, that in this case is the augmented reality. The main research has been focused in the use of the augmented reality in exhibition spaces such as museums, but also the capacity of this technology to be used as a new tool in the education, especially in the teaching of science in general.

The holographic pyramids have a great potential inside of the classrooms, and this potential has been explored in multiples papers that bring this subject, especially the use of holographic pyramids and AR in school environment.

The bibliographic research has focused in papers published in the period of 2016 to 2021, the Google Scholar and the site SCIELO has been the main sources of research to the papers that are being used in the make of this paper.

3. RESULTS AND DISCUSSION (ARIAL 12)

After the literature review, the various applications of holographic pyramids, especially in education, were verified, holographic pyramids are able to expose subjects considered by most as difficult in a much more playful and palpable way, which makes the absorption of these subjects much easier. However, the use of this technology in classrooms comes with several variables that can reduce the effectiveness of the use of holographic pyramids, among the variables are the issue of building the pyramid, obtaining quadruple videos, and the Know-How to work with the pyramids and get the best of your performance.

3.1. The construction of holographic pyramids

There are several models of holographic pyramids, the most common formats are the basic model composed of four sides of a transparent material (glass, acrylic, among others) with a device to project the images that will be transformed and holograms that can be positioned either on the part top and bottom, in relation to the position of the projector device, the pyramids are divided into two groups, the inverted pyramids that have the projector device at the bottom and the non-inverted pyramids that have the projector device at the top. Pyramids can also vary in number of sides and can have between three (figure 1) and four sides (figure 2), the 3-sided pyramid provides more space for projection, or the 4-sided model, which is the most common, in figure 3 it is possible to see a small comparison between the three-sided and the four-sided pyramid.

Figure 1: 3-sided holographic pyramid model with overhead projector



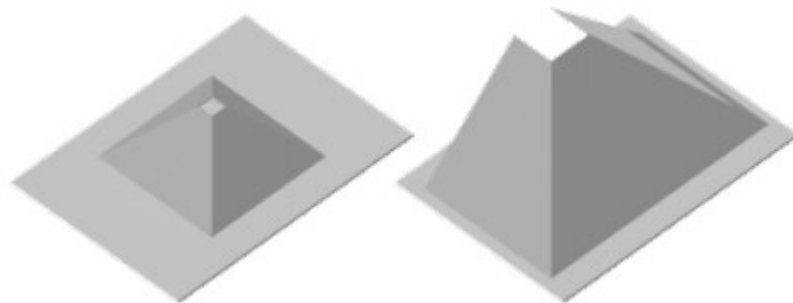
Source: Blupix

Figure 2: Four-sided pyramid model with projector on top



Source: Four season electronics

Figure3: Comparison of the area of the pyramids with 4 and 3 sides in relation to the projection screen in top view



Source: Gabriel Anciuti

Thus, in addition to the issue of projector positioning and the number of sides of the pyramid, the issue of refraction is also faced, according to Shivani in his article

"Holographic pyramids: conceptual errors and didactic potential" when increasing the size of the monitor that will be responsible for projecting the images inside the pyramids, there is a small "doubling" of the image, this duplication is due to the multiple reflection factor mentioned by Shivani. depending on the angle of incidence, dimensions and the type of material used in the construction of the pyramid (acrylic, glass, polymers, etc.). To ensure the stability of the structure by enlarging the size of the pyramid, it is necessary to build it using materials Therefore, we chose to use 4.0mm thick acrylic sheets, especially because it is lighter and offers less risk of accidents when compared to glass (SHIVANI, 2017).

Following the Shivani model, it is recommended to follow certain measures, the use of 2mm thick acrylic, to reduce the internal reflection of the images, in addition to the Schivani scaling (2018) which has a trapezium with a dimension of 24 cm at the base, 14 cm from height and 4 cm at the top, these being the base measures, and the pyramid can be built at different scales from the multiplication or division of the measures already mentioned, in addition to the measures already mentioned, it is recommended that a triple layer of an automotive film be used, to thus decrease the reflection rate, thus eliminating the appearance of double images.

3.2. Obtaining quadruple videos

Another issue for the use of holographic pyramids is the manufacture of quadruple glasses, the type of video necessary for the use of pyramids, it is necessary to manufacture a video in which the image you want to transform into a "hologram" is represented four times (figure 4), each image being positioned at one end of the video, all with the same distance from the middle that must remain free, this free medium is where the pyramid should be positioned. Thus, the making of the video must be done through some computational method, the Sony Vega is an option for its easy and intuitive handling, which would be recommended for people who are not so familiar with the area of computing and video editing. However, the user of the pyramid can make the video where he feels most comfortable as long as he uses the information above on how the images should be positioned.

Figure 4: Quadruple Video Example for Holographic Pyramids



Source: Trendy

4. CONCLUSION (ARIAL 12)

Given the above, augmented reality has a lot of potential within exhibition spaces, with even more potential within the scope of education, having the ability to make learning much more playful and efficient, by bringing the idea of the third dimension to classrooms, thus creating the possibility of exemplifying subjects considered abstract more efficiently.

Thus, the use of holographic pyramids in classrooms brings, in addition to the possibility of more efficient teaching, some difficulties, which can be overcome using the parameters already defined and the right materials.

With the writing of this article, it was possible to visualize the influence of augmented reality in everyday life and the influence of technology on education, showing that technological advances can be of great help in education, since scientific advances and education are interconnected.

5. REFERENCES (ARIAL 12)

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