

THE MAGNIFICENT ADVENTURE OF A 'FRAGMENT'. BLOCK NXLVI PARTHENON NORTH FRIEZE IN AUGMENTED REALITY

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Abstract

The aim of this study is the creation of a multimedia totem with the use of video mapping techniques, representing a particular form of augmented reality, in order to provide new means - different from the existing ones- for museum enjoyment. The object of the totem was the creation of a documentary about the full scale reproduction of block NXLVI of the north frieze of the Parthenon. With the words "augmented reality" we mean the addition of more information than what the observer would normally perceive, mediated by the use of a computer. Thus the human sensory perception is enhanced by information generally manipulated and electronically channeled that would otherwise not be perceived by the five senses. Three main aspects define the multimedia totem: indoor use of augmented reality, it's use for the enhancement of cultural heritage, and the digital anastylosis that makes it possible to reconstruct the missing part directly on the element or on a copy of it. These options provide the opportunity to engage different age groups with the expressive potential of augmented reality also in terms of performance, with the possible transformation of any surface into a dynamic display.

Keywords

Parthenon, 3D model, Museum Sciences, Augmented Reality, Video mapping, Historical Contents, Edutainment, Multimedia Graphics

1. *From the exhibited object to the narrated object. An introduction. (A.C.)*

In this contribution we present a case study illustrating the application of AR to a fragment of the Parthenon¹, aiming to investigate the role played by the introduction of digital technologies in communication strategies for the enjoyment of cultural heritage and in the formation of a new concept of "sensory environment", intended as a space where the combination of physical presence with virtual elements generates unprecedented means of experience and education.

Over a little more than decade the way we experience cultural heritage has changed. The

scenario we face today prompts the consideration of a new notion of exhibition, accepting the broader meaning to this term, as a "complex device", a somewhat hybrid product within the fields of visual language and communication strategies; a place where material and immaterial cohabit, overlap and combine.

Among the most evident reasons for this shift, due primarily to a new notion of "access to cultural heritage" in knowledge-based society, no doubt an important role is played by the introduction of new digital technologies that have definitively transformed the field of cultural heritage, an area apparently resistant to contamination by digital culture and language for a long time. However, "technology on its own remains an abstract factor if it is not culturally 're-elaborated'" (Irace, 2013), that is if it remains unable to provide truly satisfying answers to changing collective needs and requests.

Indeed the greater challenge technology faces today is not so much the need to provide

¹ We are dealing with a small portion of the frieze, a unique panel referred to as Block NXLVI. It is pentelic marble, and measures 1 meter and 2 centimeters in height per 98 centimeters in length, it depicts 4 horsemen, 2 of which are in the foreground and 2 in the background; the legs and the necks of the two horses from the panel NXLVII are visible, visually recalling the continuation of the ride.

'technical' solutions as much as creative ones for the unexpected and increasing urge for experimenting new means of access to knowledge, aimed at broadening the user's 'intellectual sphere', that is an indispensable condition for the creation of a truly knowledge-production oriented society.

With the widespread dissemination of digital culture within the sphere of museum, libraries, archives and such, the new 'rhetoric' concerning data access has opened unexpected dimensions of intellectual elaboration, somewhat legitimizing the radical shift of perspective reversing the balance between positions focusing on the conservation and safeguard of cultural heritage and those, stronger today, focusing on the enhancement, enjoyment and communication of cultural heritage.

Specifically, we would like to point out how, more and more, exhibitions are expected to perform as 'narrative habitats' in which personal experience, interaction and emotional involvement surpass the traditional form of museum displays. Such is the important passage from the concept of 'museum collection' to that of 'museum of narration', to quote the metaphor used by Paolo Rosa in summing up the meaning of the stage-production work carried out for years by studio Studio Azzurro, the study he founded, with its many intense arrangements of interactive multimedia spaces. Places where memory becomes narration and where the concept of visiting an exhibition is transformed into that of active participation to a cultural event and performance.

The work here presented is set within this precise critical framework and deals with the planning of an evocative (on a communication level) and sophisticated (on a technological level) 'visual display' in augmented reality (as in video mapping) in which the history of the block NXLV of the north frieze of the Parthenon, representing a splendid group of riders galloping), was literally brought to life.

Archeological sites and generally fragments of ancient ruins often suffer a communication deficit due to their modest physical consistency, that can only partially convey the depth of the cultural and historical heritage they superbly testify.

The idea of working visually on the fragment in Augmented Reality, beginning with the reproduction of a real scale model, arose from

the desire to experiment with different strategies of visual display for the transformation of museum environments in "ecosystems of knowledge, immersive locations for experimentation, landscapes of memory" (Rosa, 2011).

Today we are familiar with the concept of augmented reality in relation to technologies for virtual rendering characterized by the overlapping of real elements with additional levels of information (multimedia and virtual elements, geo-localization data etc.) sometimes displayed via specific visual devices.

Thus, we are dealing with a kind of technology that is able to 'augment' reality by providing a digital rendering in which the elements of the digital reconstruction are superimposed over the real ones, providing an immersive impression of a unique sensory experience.

In this way augmented reality contributes significantly to fascinate and interest the user to the content, in a performance that gives new meaning to the philosophy of *edutainment* and *learning by doing*.

The case study here presented places augmented reality into context within the indoor museum experience; it does so with attention not so much to the "spectacularization" of the perceptive experience that so often accompanies the proliferation of levels of information, as much as with specific attention to the clever construction of an "information itinerary" aimed at broadening the experience in terms of access to knowledge and informed enjoyment of the good.

In the following paragraphs we shall illustrate the technologies and the planning strategies implemented. It is important to underline the cultural dimension of the operation carried out. It's ability to become a suspended moment of reality in which the evocation provided by a philological and scientific reconstruction enhances the realm of imagination.

This represented an intense task involving professional skills and as well as emotions from a range of distinct disciplines and competences, the meaning of which lies essentially in the experimentation of modalities and languages for the contemporary enjoyment of archeological heritage.

2. Cultural assets in Italy and fields of application (D.M.)

2.1 Legislation, introductive principles and the A.R.I.M. system

The definition of the concept of “cultural heritage” spurred a broad debate with the enforcement on May 1st 2004 of the Code of the Cultural Heritage (entirely transposed in the Italian legislation by the legislative decree 42/2004 as amended). To this regard we would like to focus on one specific aspect, that is the legislator’s precise intention of strengthening the idea of identity in cultural heritage, so much that the traditional definition of cultural heritage intended as “things ... testifying the values of civilization” was modified as follows: “the founding and representative element of national identity”. This definition expresses the intent to include the vast category of “immaterial things” and broadens the framework in which the measures of protection and safeguard of cultural heritage are set. Specifically, Art. 6 of the Code of the Cultural and Landscape Heritage states the fundamental principles for the development of cultural heritage, defined as follows:

“[...] the exercise of the functions and in the regulation of the activities aimed at promoting knowledge of the cultural heritage and at ensuring the best conditions for the utilization and public enjoyment of the same heritage, with the aim to promote the develop culture [...]”.

This function sets the framework for the present study. Our ultimate goal is the creation of a prototype via a comprehensive approach, with the aim to provide a possible protocol for the achievement of specific aims related to the enhancement and enjoyment of cultural heritage. Such protocol is referred to with the acronym A.R.I.M. (Augmented Reality In the Museum) and represents the first application of the method that may be applied to a wider category of “indoor” cultural enhancement activities (Fig.1).

The purposes defined by the A.R.I.M. fully fall under those set out by law in terms of enhancement of public heritage. They are based on the use of technology linked to a system of video projection and their achievement promotes sustainable cultural development,

open to a potential public of museum visitors who are interested in applied technology to cultural heritage. Reality can be “augmented” through different devices such as cell phones, webcams, sensors, earpieces, or, such as in the case of this work, through a system of video projection. Contrarily to what takes places in virtual reality (VR), where electronically added or subtracted

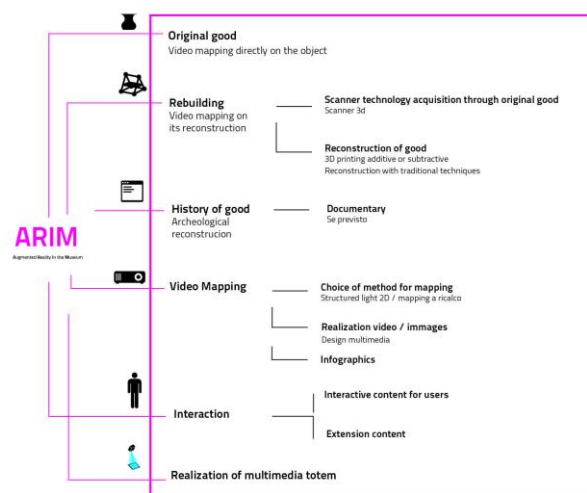


Fig. 1: A.R.I.M. System

information is prevalent, with augmented reality the observer continues to perceive the physical reality he interacts with acquiring additional information. These are the considerations and premises underlying the creation of the prototype.

2.2 Limits of Augmented Reality

As of today the term Augmented Reality is mostly used with reference to the QR codes for mobile devices. This kind of technology presents clear limits within a museum setting, mainly:

- reality is often simply “augmented” without the addition of meaningful content or interpretative data concerning fruition.
- the requirement of a mobile device.
- the requirement of a connection to a perfectly functioning (a requisite not to be given for granted in Italy) wireless network;
- In the case of systems like google glass (or VR), the requirement of another additional device for visualization;

- The visitor must immediately be able to understand how the device functions without further complication (children, elders, digital illiterates...).

2.3 Proposed Model

The present study is aimed at the realization of a general methodology that uses augmented reality, intended as video mapping, to create a documentary for museum enjoyment that may contribute to the explanation of the history of the archeological asset.

The limits found in augmented reality in the classical sense have allowed us to focus our attention on this technique, that can undoubtedly provide some advantages:

- It transforms any object into a Dynamic Display;
- Basic video mapping techniques allow the realization of even complex installations;
- The possibility to use close 3D reconstructions allows us to extend and generalize the method to a vast range of archeological findings.

If correctly used, the video mapping technique becomes an excellent method of communication and enhancement. New technologies have indeed interested a new kind of user that contemporary museums should not underestimate, that is a public interested in the enjoyment of technology.

During the past years we have witnessed a variety of cases in which video mapping has been used to this purpose.

Examples are the video mapping that took place in 2014 at the Ara Pacis in Rome where the marble surfaces were colored to recreate the total and realistic effect of the original polychromy without posing a threat to its conservation (Fig.2); the 2013 interactive installation with leap motion at the Allard Pierson Museum in Amsterdam (Fig.3) where visitors were encouraged to interact with a bas-relief from the Egyptian era to understand its original coloring; the Museo Vivo di Cerveteri (the Live Museum of Cerveteri)²; the A.R.I.M. system (Augmented Reality In the Museum)

devised in 2013 by Studio gloWArp³ where the technique was applied to the reproduction of axisymmetric vases of Greco-Roman era (Fig. 4); or the GLOWFestival⁴ devised in 2013 by Studio gloWArp (Fig. 5–One of the Festival locations – Museo delle Civiltà Preclassiche della Murgia Meridionale, Ostuni (Br)) with the aim of indoor



Fig. 2: Ara pacis, 2014



Fig. 3: Allard Pierson Museum, 2013

enhancement of less known cultural assets for the enjoyment of a wider public.

The use of such technique in the context of museums has led to the engagement of an elevated number of visitors intrigued by the use of ancient and contemporary means.

³ Studio gloWArp (www.glowarp.com) is a multimedia project studio that focuses on applied new technologies in the sphere of art and is specialized in applications in museum contexts for the promotion of cultural heritage.

⁴ Studio gloWArp is the curator of the GLOWFestival (www.glowfestival.eu), the first international festival of indoor video mapping for the enhancement of less known archeological and cultural sites.

² www.youtube.com/watch?v=Cscej0_1fw

2.4 A.R.I.M. Applied to block NXLVI of the north frieze of the Parthenon

With reference to Fig.1 we here explain the proposed methodology and application:

Original Good: the cultural good on which the application and the video mapping will insist is identified; it can be the original work (if permission is granted) or a close replica (in full scale). Our study chose block NXLVI of the north frieze due to its reasonable dimensions which allows comfortable transportation, and the quantity of information that can be used to reconstruct the asset’s history.

Rebuilding: during this phase any scanning system can be used to obtain a 3D model for the metric reconstruction with traditional techniques or with a 3D printer.

We used a full scale replica in polymeric resin available on the market. This choice presented unquestionable benefits, considering the difficulty to reproduce the original work with any scanning system, due to the museum limitations imposed by the British Museum of London.

History of Good: a brief documentary is produced on the basis of archeological studies of the good, with the aim to explain its history and justify the use of the video mapping technique as means of communications.

Video mapping: selection of the mapping method and creation of the video, of images and info-graphics.

Interaction: eventual interaction with the public (for example the video can be activated by movement or the physical presence of a spectator. Such an option has not been considered for this prototype) and extension of future content.

Creation of the multimedia totem: this phase interests all the necessary instruments for its creation such as: reproduction of the good, video projector, computer and/or mini midi map, warping program, acoustic speakers, extension cords and adaptors, wooden cases to contain these components.

2.5 Video mapping applied to block NXLVI of the north frieze of the Parthenon

Video mapping requires three geometrical transformations corresponding to three work phases necessary for the virtual model to

coincide with the original good: homothetic transformation, homography and anamorphosis (Maniello, 2014). Specifically, homothetic transformation is the particular type of geometric transformation of a surface or space that dilates or contracts objects maintaining their angles and shape;

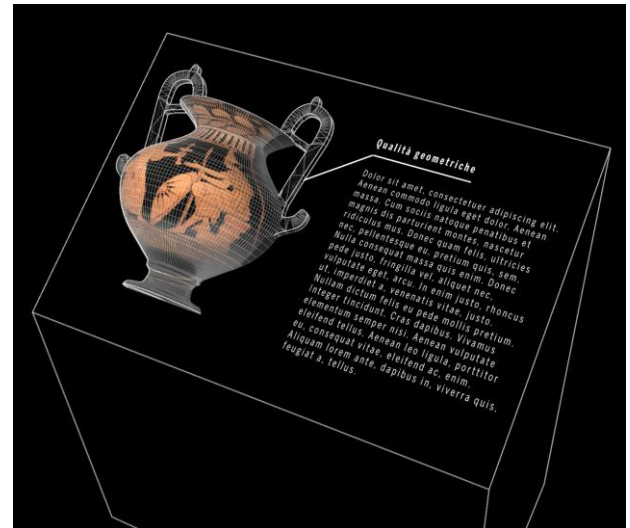


Fig. 4: Proposal for a multimedia totem, 2013



Fig. 5: GLOWFestival, II°Edition, 2014

homography is the relation between points in two different planes, such that each point in one plane corresponds only to one point in the

second plane; anamorphosis is a type of transformation that creates an optical illusion such that an image can be distorted by its projection onto a surface, making the original subject recognizable only by looking at it from a set position. These three phases are not always evident when working on the scale used for indoor mapping and micro-mapping on archeological material of small and medium dimensions, because the optical distortions are unimportant compared to the general dimensions. A relief of the piece available beforehand could not be used for the creation of a mapping file to achieve this aim. It is also true that the vast majority of architectural reliefs that make up the specific sectors of architecture and archeology reliefs can be employed for video mapping only on rare occasions, for instance when the projector is placed at such a distance that we could, with much approximation, consider its perspective as coinciding with infinity (similarly to what happens in orthogonal projections). It is clear that this rule cannot be applied in cases -such as this one, given the short distance between the projector and the totem. Indoor video mapping techniques on a small scale, such as in this case, do not differ from the techniques used for architectural mapping, if not for the precision required for detail, because of two factors: firstly the distance at which the observer stands, secondly because of the projection scale that will probably not be very great. This aspect is very important because it effects the success or the failure of the mapping file. Small discrepancies between the real and the virtual models at the usual distance at which the observer will stand transmit annoying visual imperfections. The first step was to position the block on a white wall and empirically move the projector in order to obtain the desired dimension of the projection screen. Being an indoor projection, we employed a quadrangular projector with high contrast to enhance the brilliance of the colors and detail (35000:1) and contrast 1024x768, 4:3 Xga. Alternatively, knowing the make and model of the video projector, it is possible to assess the projection distances and relative dimensions by using appropriate on line programs⁵. Next to the block

on which the video mapping would take place, an area dedicated to informative info graphics relative to the exhibit was set up (Fig.6).

Considering the complexity of the block, three mapping methods were used separately: *Structured light mapping* (Fig. 7): once the position and distance of the video projector are set, this method allows the creation of an image that appears as if it were being "seen" by the video projector (Fig. 8-a). This is the first image from which the mapping process starts. A file generated this way can encounter two kinds of problems: whites off range and the loss of levels of detail (a fundamental aspect of indoor mapping and on a small scale), and noise due to the generation of the file with structured light. The levels of detail, if significant, can be recovered using the other two mapping methods while an attempt to clear noise effect can be made with Photoshop. In fact the block being white and the projector's light frontal but the source low, levels of detail are lost that only split lighting can provide. For this reason the following mapping methods are useful.

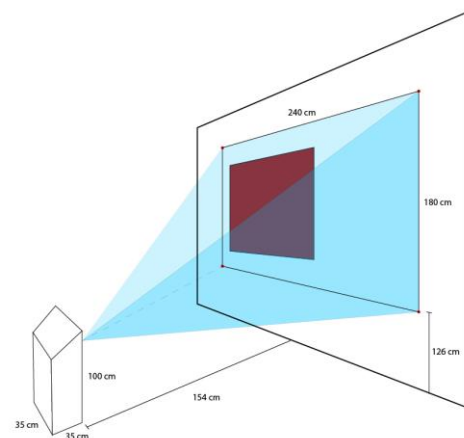


Fig. 6: The project

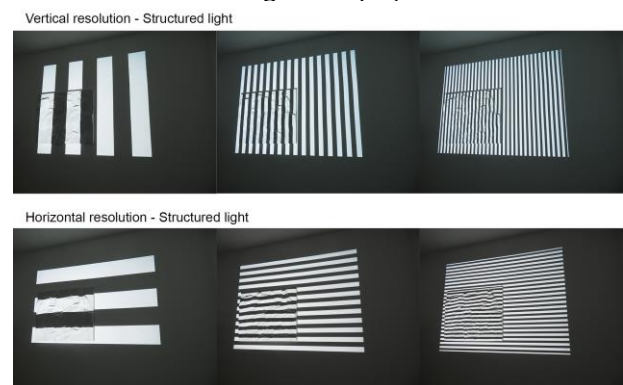


Fig. 7: Structured light mapping

⁵ Retrieved from www.projectorcentral.com/projection-calculator-pro.cfm

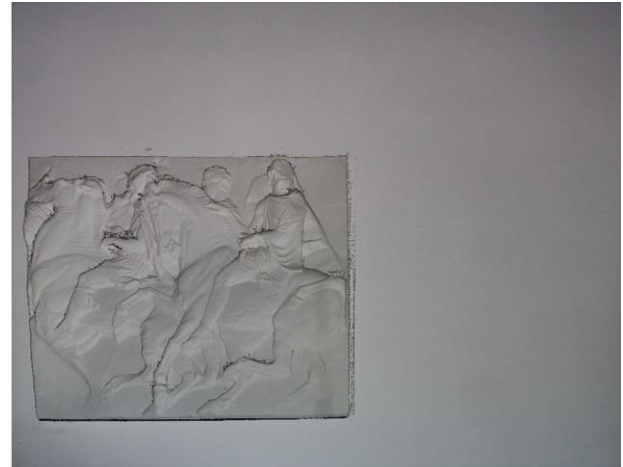
Trace mapping: once the image to be traced has been obtained, this technique allows real-time tracing of the detail lost with the previous method with the use of Photoshop.

Photographic mapping: once the image has been corrected with the previous techniques, this method is based on the use of a photograph shot in the appropriate scale and then modified (with warping techniques) to make it perfectly coincide with the mapping file previously created. This procedure provides a perfect texturizing, where all the details rest perfectly on the tridimensional original model, the colors enhanced by the model's whiteness. With the above mentioned methods and the real-time correction of imperfections here and there we have obtained the definition of the final image (Fig.8-b), a stage followed by the creation of the layer masks with Illustrator (Fig.8-c). The creation of these masks was carried out in conjunction with the archaeological study of the exhibit, as this provided useful means for understanding the shapes and details and their spatial configuration and depth. This is a very delicate step because the layer masks represent a synthesis of the shapes from which all the files necessary for the creation of the documentary are derived. The creation of a 3D file was not necessary for this type of work.

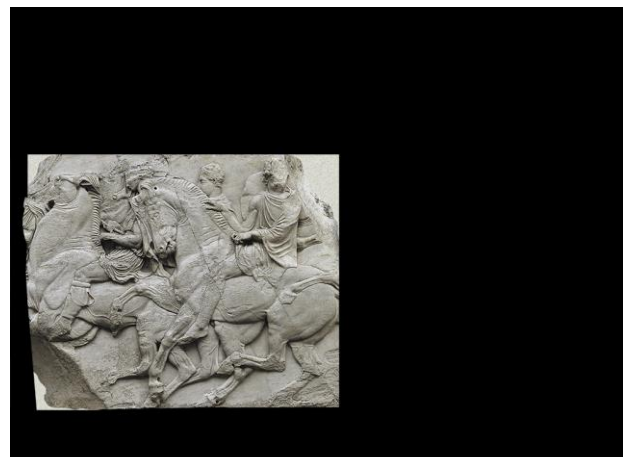
2.6 Warping

Although the mapping techniques illustrated above sometimes make it possible to avoid the warping phase, ours was not the case: not only was this phase costly in terms of the time, but necessary. The warping technique, which consists in dividing the virtual model into an ordered series of quadrangular mesh with mutually modifiable angles (Fig.9-a) to be used with appropriate programs, allows to correct deformations and make the created video coincide with the real model. To facilitate this final operation, we created a rectangular edge on the virtual model, whose extremities coincided with those left on the wall holding the block (red dots) (Fig.9-b). This operation initially only allowed us to deform these extremities while postponing work on the block.

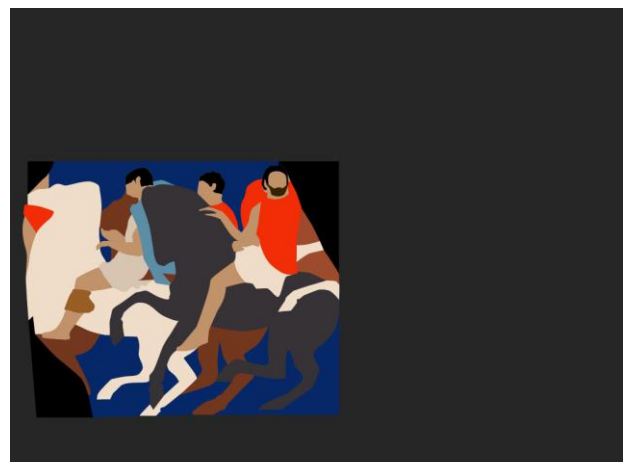
It is worth noting that this operation must be carried out each time the block is moved or the projector's position changed.



a)



b)



c)

Fig. 8: From real model to layer masks

For this reason we chose to place the video projector and the computer inside a wooden case and to draw its position on the pavement.

2.7 Benefits

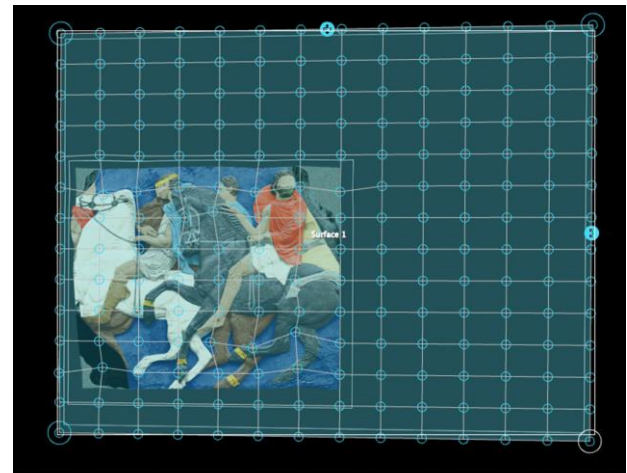
There are undoubted benefits in this method, substantially related to the following aspects:

- the content is projected directly onto the reconstruction of the cultural asset or on the original piece (when this is possible);
 - the user is independent from any technological medium;
- the undeniable benefit of amazing the user with the creation of a documentary illustrating the history of the cultural asset;
- relative ease in the management of the totem;
- planning scalability;
- minimum projection resolution: 1024x768 px format 4:3.
- possibility to perform digital anastylosis to reconstruct and project the missing parts.

2.8 Considerations and thoughts for future reference

The documentary⁶ of the duration of close to ten minutes was projected in loop directly onto the block (Fig.10, Fig.11, Fig.12, Fig.13) and dubbed into Italian.

The decision to use augmented reality within a museum context derives from a constant increase of the interest shown by museums and institutions for the use of new technologies. The video mapping technique offers sure advantages because it enables the creation of content with a predictable effect and visual impact that ensure the enjoyment of the exhibit also when it intended for a non-adult public. We must also consider the economic aspect of this proposal: it only requires a video projector, a portable computer, acoustic speakers and the reproduction of the good. So far the choice to use only one video projector has been functional one, the search for a simple solution for a multi-projector systems is left open for further publications to investigate. Future improvements will involve the dubbing of the documentary into English and eventual interaction with the user.



a)



b)

Fig. 9: Warping phase



Fig. 10: Picture of documentary screened

⁶ Retrieved from <https://vimeo.com/140790589>



Fig. 11: Picture of documentary screened

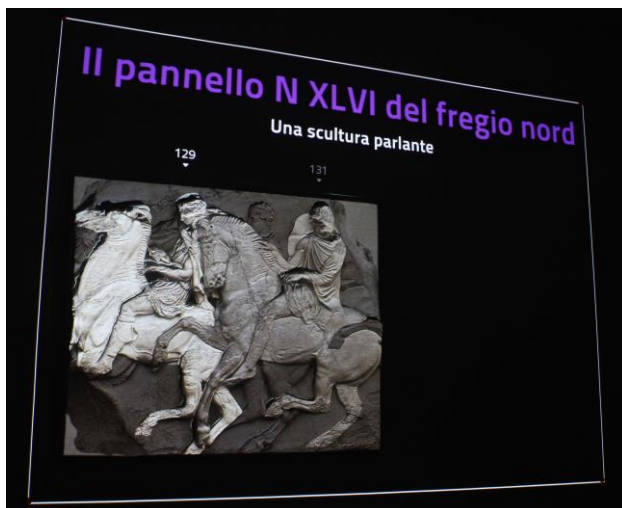


Fig. 12: Picture of documentary screened



Fig. 13: Picture of documentary screened

3. Historical and artistic analysis, storyboard & storytelling (V.A.)

3.1 Methodology and storyboard

The creation of a text - although brief and summary - preparing the creation of the contents for a multimedia totem relative to a portion of the Parthenon, required an in depth bibliographical, historical and artistic research, providing the most relevant information to the users. We opted for a comprehensive vocabulary with a low degree of technicality, with the aim to engage the widest range of users possible in the narration.

To write a brief educational text concerning an iconic monument may appear easily done. Actually, the monument's iconic character itself, about which much has already been written, determined an extreme economy of language with the choice to concentrate its description in about 10 minutes of text, imposing certain narrative styles. Initially we considered breaking up the narration into multiple points of view: the goddess Athena's (the divinity's point of view), Fidia's (technical aspect) and the horsemen themselves (the political and military grandeur of V century Athens), together with one more voice focusing on style.

This approach, albeit interesting because of its theatrical and emotional potential, was discarded due to the lack of fluidity it would have resulted in: the project took shape with the intention of using the video mapping techniques with the aim to engage a museum public, and the multi-structured text would not have achieved this mission, because it probably would have fragmented an homogenous transmission of content. We therefore decided to intentionally condense all the indispensable elements related to this monument within a single narration⁷.

This story could not ignore the double medium: the full scale 3D reproduction of part of the frieze of the Parthenon on the one hand, and on the other a necessary expansion of the image in the area on the right of the reproduction.

These two distinct levels demanded two different levels of narration; one more general and introductory, accompanied by explanatory

⁷ This narrative stratagem was not abandoned, but we chose to set it aside for further investigation of the content with a second interactive and multi-voice storyboard.



Fig. 14: Lawrence Alma-Tadema, Pheidias and the Parthenon (opus LX, 1868), Birmingham Museum and Art Gallery

images of the context, the other more linked to the medium and to its inherent stylistic, historical and interpretative traits.

3.2 *Storytelling and research methodology*

The introductory part of the text needed to contain the basic information about the monument's commissioner, the materials, the building techniques. These notions were drawn from the fundamental literature on the monument (Servi, 2011; Cosmopoulos, 2009; Neils, 2005; Woodford, 1981), and specifically from a website created by the Hellenic National Documentation Center and the Museum of the Acropolis⁸. This choice was determined by the official nature of the above mentioned website, an excellent and recent *summa* of old and new research carried out on the Parthenon: the state of the art of this study could not have disregarded this work of synthesis.

A particularly interesting attempt, despite the limited text dedicated to it, was that of providing the general public with the tools for

understanding the importance of geometry and harmony in Greek art, a factor that would influence architectural proportions in epochs to come, thus inductively providing basic historical, artistic and structural notions to the user⁹. As to avoid complicating the topic, we limited the explanation to noting some of the optical corrections applied by Fidia and his pupils on an edifice with an apparently simple volume, with the aid of a graphic medium. With regard to this, the topic of the visibility of the Parthenon and of the frieze itself was highlighted in the text. This edifice, the emblem of Pericles' politics, was intentionally built as outstanding hence the monumental proportions and the chosen location, as an example of the political, cultural and military stature of Athens (Rodhes, 1995).

Despite this, such studied visibility is counterbalanced by the fact that the panel under consideration was part of a very ornate frieze and was practically invisible. It was in fact placed behind a row columns blocking a clear and

⁸ See <http://repository.parthenonfrieze.gr/frieze/>

⁹ Retrieved from <http://www.goldennumber.net/parthenon-phi-golden-ratio/>

continuous vision from the outside (Stevens, 1940). It was also scarcely visible from inside the portico because it was at an angle and in shade from the viewer's standing point, being positioned directly under the coverage (Marconi, 2009). Many scholars have addressed this issue: the most renowned work on the subject is the painting of Alma-Tadema (1836-1912), who places Fidia on an improvised scaffold, intent on inaugurating his work before an assembly composed of Pericles, Aspasia, Alcibiades and the Athenian elite of the time (Fig 14).

Lately the scarce visibility of the frieze has been interpreted as a the lack of a reason for a strong visibility, since the piece was an *agalma*, a gift dedicated to the goddess. However, it was also a *mnema*, a warning to men and a reminder of the greatness of Athens (Marconi, 2009).

The panel under examination was placed on the northern side, facing the entrance of the Propylaea, and was one of the last to portray a superb ride that generated an array of interpretations: some saw in it the procession of Panathenaic festivals that were held every four years in honor of the eponymous goddess of the city (Moore 2003; Stevenson, 2003; Beschi, 1984); some saw it as a reference to the archaic Athenian tribes (Harrison, 1982); some as the depiction of the sacrifice of the daughters of Ereteio and of the chthonic cults of the city (Connelly, 1996); a well known theory states that the sequence of 192 horsemen is a *mnema* of the 192 Athenians who died in the battle at Marathon, and that therefore they are the symbol of freedom from barbarism and a symbol of Greek supremacy on barbarians (Boardman, 1985). Each of these hypothesis is briefly explained in the documentary, accompanied by mostly vascular iconographic material, on the lateral panel.

This overview provides a moment of passage between the historiographical introduction and the actual mapping applied to the reproduction of the panel. Block NXLVI of the north frieze of the Parthenon is conserved at the British Museum as part of the so called "Elgin collection" and is the object of a centuries-old controversy concerning its restitution to the country of origin¹⁰. A copy is kept at the Acropolis Museum in Athens, where its original position is

reproduced, next to the original pieces that remained *in situ*¹¹. The original frieze was composed of 115 panels which extended for 160 meters.

This study concerns a part of the famous monument, but not one of the most famous. The pure beauty of the piece is visible to the naked eye aside from specific competences, but some of the stylistic detail of the composition – the quick succession of the hooves and legs, the nervous contraction of tendons and muscles or the folds of the cloth and the manes – was highlighted with the video mapping projection technique.

Hence we used a technological instrument for educational purpose together with the potential of augmented reality, creating a balance between spectacle, narration and the cultural education of the viewer. The art work, magnificent in itself, was enhanced and brought to life under the spectator's eyes, generating an emotion preparatory for knowledge (Amoretti, Cirafici, Di Fratta, Di Natale, Lallone, Mascia, 2014).

3.3 Garments, colors, bright objects

The riders' equipment was used as a "pretext" for briefly treating the topic of clothing in ancient Greece: the projector highlighted each detail on the piece, while information on the style and costumes in the Greek world were projected on the external panel at the same time, providing further points of consideration for the viewer (Lee, 2003, 2004, 2012). The most fascinating phase was the reconstruction of the original coloring. The frieze has been the object of study by the British Museum¹² as well as the Acropolis Museum of Athens¹³, and both these institutions have confirmed its polychromism – a common case in ancient monuments, both Greek and Roman (Rossini, 2010)¹⁴, where it was used

¹¹ Retrieved from

<http://www.theacropolismuseum.gr/en/content/frieze-0>

¹² Retrieved from

http://www.britishmuseum.org//explore/highlights/articles/a/ancient_colour_on_parthenon.aspx

¹³ Retrieved from

<http://www.dailymail.co.uk/travel/article-2676413/Athens-Acropolis-Museum-celebrates-fifth-anniversary-digital-programme-colour-Parthenon-Marbles.html>

¹⁴ Retrieved from

http://www.nbcnews.com/id/11945940/ns/technology_and_science-science/t/scientists-retrace-parthenons-brilliant-hues/

¹⁰ For a recapitulatory introduction of the "Elgin marbles" please see Hitchens (2008).

to enhance artistic and architectonic detail¹⁵ - elaborating a hypothesis of the original coloring in some parts. The two totally independent reconstructions differ in a few details, but are fundamentally coherent. The fact that they both examine portions of the northern frieze bordering with the block that is the object of this study -and not the block itself- has given us the freedom to reconstruct the original color composition, modeled to maintain a good color contrast for facilitating visibility. The result can be placed in between the two "official" reconstructions, with an ample use of ochre, reds and blacks on the brilliant blue original background¹⁶. The stylistic exam of the piece required the 3D copy to be compared to pictures of the original, showing how some details if the copy were flattened and smoothed out as regards to the volume. Specifically, a few crevices present in the original piece were almost invisible - in the areas of the hooves, the reins, the horses' faces, the hands, and a few of the riders' heads -. They were scarcely notable even in the official photographs of the original piece, but well documented in other informal pictures on the web, since they had been taken from different angles by visitors at the British Museum.

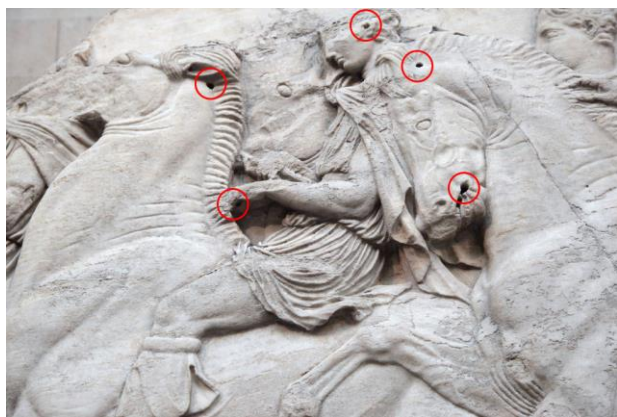


Fig. 15: Detail of the block conserved at the British Museum. Holes carved for the insertion of metallic objects should be noted.

These holes can in fact be perceived better from different angles than from a frontal view¹⁷ (Fig 15). With the use of video mapping techniques we adequately highlighted these holes, that were meant to hold metallic objects lost over time (Jeppersen, 2007). They were intended to brighten the frieze in shade, at the same time adding movement to the story.

The projection was able to reconstruct the harnesses, the horse bights and the reins in the raiders' hands, the detail of the hoofs, some headdress and cloth, with great precision; we based the reproduction on both the versions mentioned, the British Museum one and the Acropolis Museum one, because of typological affinity. The result, other than being philologically accurate, creates a strong emotion that impacts the spectator easing the learning process and the enjoyment of the work of art, albeit not the original piece¹⁸.

4. Conclusions (A.C., D.M, V.A.)

In conclusion it is worth noting that the story told by fragment NXLVI captivates the spectator in a so called dramatic dimension by combining physical and virtual space and storytelling in a matter of fact screenplay. Intertwined in the flow of images and narration, sounds and words free the fragment from an isolated dimension and give it the strength to go beyond its own physical, historical and formal dimension, letting onto the scene the universe of events that it has undergone in time. Attention shifts from the object to the narration surrounding the object, recomposing the life around it, freeing it from the "stillness of sacredness". Something magical happens, where oral culture, excluded for a long time from museum experience, is able to greatly amplify the 'human density' of ancient culture. This is a precious occasion for transforming a 'container' of memory into the space where the elaboration and definition of the meaning of collective identity take place.

¹⁷ Retrieved from http://farm8.static.flickr.com/7364/15858827724_1abec7363c_m.jpg

¹⁸ The fact that the model is separate from the original makes the totem transportable, with a clear advantage from an education point of view.

¹⁵ Retrieved from <http://www.italipes.com/schedadidattica11.htm>
Retrieved from http://www.sovraintendenzaroma.it/cosa_facciamo/studie_ricerche/i_colori_di_augusto

¹⁶ See footnote 6.

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