

Augmented Video-Environment for Cultural Tourism

Ornella Zerlenga
Rosina Iaderosa
Marco Cataffo
Gabriele Del Vecchio
Vincenzo Cirillo

Abstract

In this paper a series of reflections on the topicality of smart glasses for the tourist-cultural field are illustrated. Although this technology has received a setback in the consumer market in the past, nowadays it is back in the limelight thanks to the involvement of world leaders in fashion and social networks. The objective of this paper is to show that such wearable devices can be a resource for the dissemination and enhancement of the Cultural Heritage. This assumption forms the basis of the project proposal for an 'augmented' video-environment for cultural tourism, which is presented below. It is a theoretical-experimental project and proposes an approach to the augmented reality by using geolocation technologies and 3D mapping of the territory, overcoming the simple tourist approach to Cultural Heritage, perceiving, and displaying multimedia contents that enrich the real experience of the user in the artistic sense.

Keywords

smart glasses, augmented video-environment, cultural heritage, cultural tourism, visual poetry.



Introduction

Nowadays, there is an increasing demand for experiential facilitation of the contents of museums, art galleries and recently the historic centers of towns. In terms of study and practice to invent, design, build and/or use miniature computational and sensory devices carried by the body (wearable computing), Augmented Reality undoubtedly constitutes a potential for creating realistic learning environments [Clini et al. 2017, pp. 201-227; Trunfio et al. 2021, pp. 1-19]. As regard that, smart glasses, a technological innovation launched in the digital industry market by Google in 2013 – although they suffered a setback in the past – could still represent an interesting means of supporting for cultural tourism [tom Dieck et al. 2015, pp. 463-476]. In fact, they would make it possible to give life to real spaces by exploiting the potential of Augmented Reality, by providing, in this way, more advanced experiences and innovative contents respect to those available on smartphones, tablets and audio-guides. By means of smart glasses, the Augmented Reality would become the vehicle for substantially transforming an 'external' physical environment that includes perceptions and actions. So, the real world, ontologically inclusive, would provide a series of information that could guide actions and, at least in part, it appears as a 'processed' environment: a real space furtherly defined by the information that the prism contained therein would superimpose at the request of the user. If it is applied to the field of cultural tourism, this concept would involve an engaging experience and would make culture more accessible and desirable to the visitor, also it keeps the center of attention what really matters: the element, the exhibition or the urban space. That is possible because smart glasses, respect to virtual reality viewers, allow you to contextualize the experience during the visit in the real environment, offering the possibility of experiencing this space enriched by holograms and multimedia contents, which would allow you to narrate the events of the ancient battles by the same figurative characters or to return the deteriorated frescoes to their former glory. Some tests of application of this digital technology in the field of interest have already been conducted, for example, in the Museum of Santa Giulia in Brescia and the Villa Reale in Monza, where the smart glasses have been used by visitors to walk between the archaeological areas and move freely in the environments, by acquiring additional information relating to the historical events of the places and the characters who have lived there. Furthermore, the two exhibitions *Gladiatori* and *Assiri all'ombra del Vesuvio* of the MANN, in which the characters depicted on the *Vasus Patrocli*, animating themselves in the form of holograms, tell the origin of the fights between gladiators, going back in time to reach the ancient duels carried out in honor of the dead. It is not present only narration, but also digital reconstruction, for example of the tombstones of the Gaudio Necropolis in Paestum, carried out to explain the iconography of the finds. Through these cases, it is highlighted that the use of smart glasses would have the enormous advantage of disseminating high scientific content through language and digital representation. Furthermore, it would have offered static museums the opportunity to incorporate movement, dynamism, and interactivity. These assumptions constitute the objective of this study in which a project proposal for an 'augmented' video-environment for cultural tourism will be described, superimposing multimedia content on the architecture or surrounding context [1]. The experience, conducted in the Neapolitan territory, had as protagonists both symbolic city monuments and urban environments of considerable interest. The multimedia elements superimposed on these elements described above were the lines of some poems by the multimedia artist Anna Maria Pugliese. Through the technological application, the user can not only enjoy his experience of the place, but also understand the emotions of the artist, by seeing and reading the words among the dense nature or the cracks of an ancient building. So, it was decided to use both input and output wearable tools, smart bracelets, and glasses. As regard the use of smart glasses at the service of cultural tourism, the existing scientific literature has highlighted the action that this technology exerts on network sharing practices, opening them to the dimension of 'real time' and to a spectacular impression of immediacy. On the other hand, the opportunity of this technology as a tool capable of giving rise to specific forms of "associated" environments appears little discussed [Montani 2014, pp. 169-182].

Smart Glasses and Augmented Reality for Cultural Tourism

Since Augmented Reality (AR) is the place where the physical world and the digital contents connected to it meet, it is possible to affirm that itself AR is also the place where new meanings and perceptions are born. Thus, the physical world is enriched with digital information, such as holograms and virtual objects both 2D and 3D to which we would not have access if we only used our senses. AR spread to the commercial public in 2009, when it was launched Lyar, the first augmented reality software for smartphones. The latter together with tablets, mobile devices and webcams were the hardware initially used for AR. Sometimes bulky objects and whose use does not allow you to fully perceive an augmented world, for example by freeing your hands to interact with the surrounding environment. In 2012, to meet this need, it was decided to reproduce 3D images by using miniature projectors positioned on the frames of the glasses to which they were connected. In this way, a light, wearable, and easily manageable product was obtained, just like a classic pair of glasses (Smart Glasses), which can be defined as an extension of the smartphone within easy reach. These devices offer the opportunity to move within real environments and at the same time, through human-technology interaction, acquire more information about them without taking your eyes off what you are observing. Strictly speaking, the product conceived by Google X Lab, that were strongly desired by the creator and founder of Google, initially aroused a lot of fervor and an anxious wait which ended in 2013 with the launch of Google Glass at the developers and in 2014 on the market commercial. The first problems immediately arose related to both the protection of privacy and the excessive cost of sale, two mountains that seemed insurmountable and that decreed the end of the spread of Google Glass as a consumer product at the beginning of 2016. Since then, the company designated this product exclusively to the professional and corporate field with the production of the Google Glass Enterprise Edition, but in recent years a strong interest in smart glasses has spread again both from leading companies in technological production and from high fashion brands, passing through the creators of social networks. An example is even by the Ray-Ban Stories which are defined as the first Facebook smart glasses. The devices were officially presented on September the 10th, 2021 and have sanctioned the multi-year collaboration between Facebook and Luxottica. According to most people, they represent the first step towards the spread of the metaverse and they are a springboard although far from the idea of smart glasses with integrated augmented technology through which to see additional information and 3D digital objects appear in real space. In fact, it is well known that Facebook's Reality Labs (world-class team of researchers, developers and engineers who develop projects for connecting within augmented and virtual reality) have been working for some time on smart glasses for AR through the *Project Aria*, for which it is still estimated a work of 5-10 years for the public market. Furthermore, the release of Facebook's so-called smart glasses has resulted in an acceleration of the production of similar hardware in competing companies. A few days after the presentation of the Ray-Ban Stories, Xiaomi also launched its smart glasses on the market. Respect to Facebook glasses, they focus everything on augmented reality by allowing information to be superimposed on the user's field of vision, for example showing notifications, messages, driving directions, reviews, etc. Xiaomi is not the only company to work on this field: other companies such as Google, Microsoft, Apple, and Epson are working in this direction, too.

Although the future development of this technology is not yet well known, recent studies that were conducted in the field of cultural heritage [Bonacini 2014, pp. 89-121; Cennamo 2021, pp. 123-127] show that smart glasses represent an interesting means of supporting of cultural tourism, highlighting how they represent an ad hoc innovation to respond to the request for experiential facilitation of the contents of museum collections, art galleries and town visits [Brusaporci, Maiezza 2021, pp. 2044-2053]. In these searches, as well as in the international Google Glass Museum Zoom experience at Manchester Art Gallery or in our local OK Venice! the visitors experienced museum collections and urban environments without any obstacle in their hands and seeing to appear in their visual field multimedia informations pertinent to what they were observing. In this way, awareness of the historical and cultural heritage increases by making it easier for those who are not experts in the sector to understand it [Kalay et al. 2007; Voinea et al. 2018, pp. 93-106].

'Augmented' Video-Environment for Cultural Tourism in Naples

The use of devices equipped with image acquisition and projection technology allows to accompany an experience lived off a screen through a graphic interface. The latter allows to code the result of previous experiences, to translate them into contextual graphic suggestions and to the user of the AR (Augmented Reality) display device to benefit of "binaries", that is signals capable of directing attention to an order of operations given by the priority of their performance.

The problem of defining digital objects and their spatial relationships in a scene requires a pool of multidisciplinary skills which encompasses themes such as physics of light, computer vision, artificial intelligence, and object-oriented modeling. In this case, with regard to the production of content (in particular Kinetic Typography located in places of cultural interest), the augmented reality experience, which allows the user a complete immersion in the artistic space, requires: mapping of the selected site; appropriate digitizations; modeling of kinetic geometries and their animations; real-time analysis of light conditions; triggering of virtual props based on the user's dynamic position. This type of work involves preliminary data collection operations on the site and adequate mapping and digitization of it, even in a pre-design phase with respect to the contents. In this regard, current digital technologies present themselves as a convenient solution for various reasons, including the possibility of carrying out multiple use tests in a simulated environment that exploits the rendering capacity to display the content in its fruition form while it is being used prototyped.

In fact, the best option to carry out research and development is to simulate the test environment with a model that is sufficiently realistic to be able some form of evaluation. In this direction, the project presented here in a theoretical-experimental way and in the field of videoart, proposes an approach to augmented reality by using geolocation technologies and 3D mapping of the territory. The 3D contents interact with the three-dimensional part of the territory since they provided feedback in the real part which can be viewed by the user. This basic concept would allow third-party developers to create contents and applications in various fields such as social networks, directions, reviews, artistic applications.

The technologies identified for the activation of the process are (Fig. 1):

- a reference device for data storage (smartphone or tablet) equipped with a processor capable of processing a 3D;
- an input tool that allows to control the interface without using a smartphone (it can be a band sensor, a bracelet or a microphone for voice inputs);
- an output tool (necessarily a pair of glasses with a technology capable of projecting the interface from which content and applications can be accessed on the retina);
- a software that manages, together with the smartphone operating system, the 3D interface and the superimposition of the two realities.

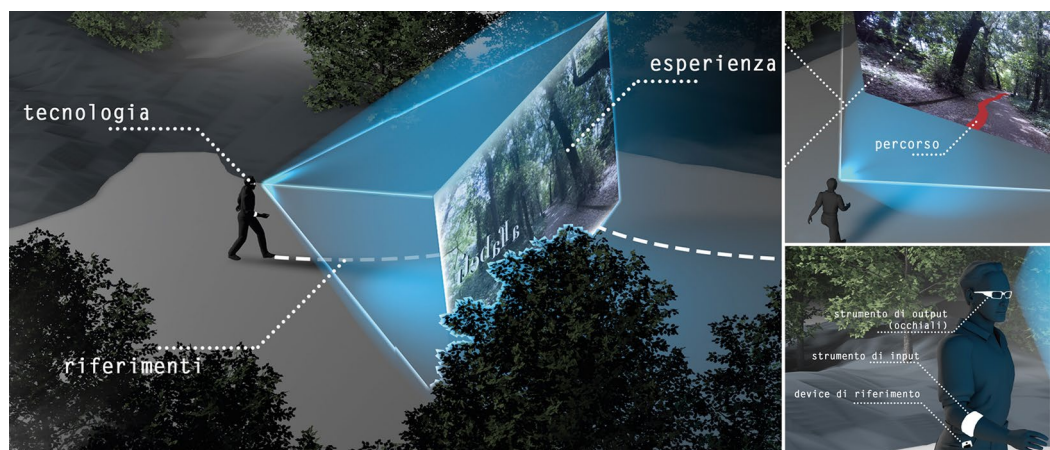


Fig. 1. Theoretical representation. Augmented video-environment: analysis of the necessary elements and technologies (by Gabriele Del Vecchio).

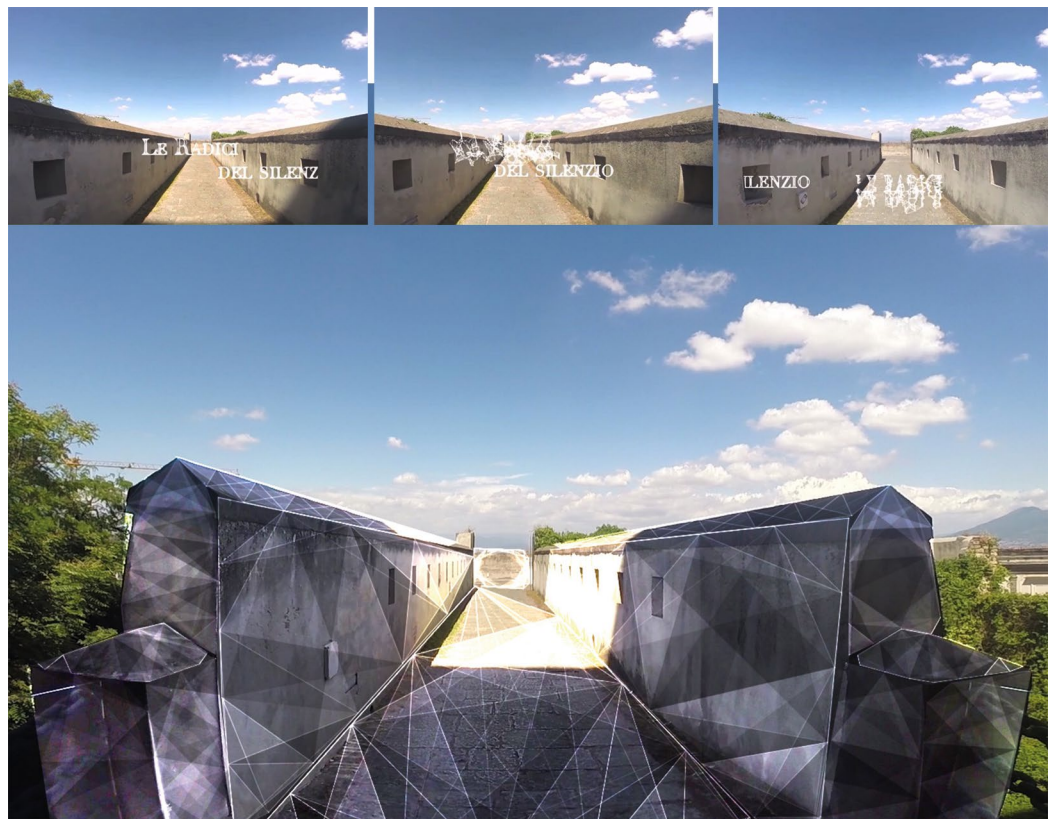


Fig. 2. Theoretical representation. Augmented video-environment for Castel Sant'Elmo in Naples (by Gabriele Del Vecchio).

Furthermore, support and an active community of users and developers is considered necessary in order to have more content to insert and more applications to develop.

These experiences are set in some Neapolitan places that are characterized by a strong historical, architectural, and environmental connotation, such as the Real Bosco di Capodimonte, Forte Sant'Elmo and Piazza del Gesù Nuovo. In them, while the user walks in the real environments, the verses of some poems by Anna Maria Pugliese appear among the branches of the trees, along a bastion of the fort and around the spire of Immacolata Concezione dissolving thanks to a sound spatialization designed in rhythm with the visual contents of the media experience [Zerlenga 2020, pp. 124-127]. The latter is made up of whispers or light musical accompaniments, in rhythm with the visual contents, without however excluding what is the context in which one person finds himself. In a specific way, the individual experiences were simulated by shooting video with a high-resolution camera and using a fish-eye effect in video editing to reproduce the vision of the human eye.

On the top of the Vomero's hill stands the majestic fortress of Castel Sant'Elmo, a mighty building, partly obtained from the living rock, which originates from a Norman observation tower called Belforte. Due to its strategic position, the castle has always been a coveted possession from which to have complete control of the city. For such an evocative place of history and collective identity it was decided to associate the poem *The Roots of Silence*. By using Kinetic Typography, the poetic lines slide towards the observer, dancing and dissolving as he advances with effects that respond to the essence of the words themselves; for example, the word 'nomad' escapes from one side of the screen to the other or 'silence' enters like all other words and then becomes silent, and it is reduced to a series of points until it dissolves. In order to obtain these solutions, there was a need to superimpose a three-dimensional model on the actual physical consistency, thus letting the words interact with the surrounding environment. A wireframe effect was used as an application that breaks down and reassembles in a different way depending on the meaning of the word (Fig. 2).

The poem *The Alphabet of Trees* has been associated with the Real Bosco di Capodimonte, a park full of nature in the palace of the same name that covers about 134 hectares. In this



Fig. 3. Theoretical representation. Augmented video-environment for the Bosco di Capodimonte in Naples (by Gabriele Del Vecchio).

application, poetry “grows” with nature, appears, and dissolves, following the path of the observer and becoming one with nature. It was necessary, compared to the previous case, to perform a geolocation of the coordinates to obtain a correct insertion of the words in the natural environment (Fig. 3).

The last application was carried out in the heart of ancient Naples, along the path of the Greek and Roman roads, involving the majestic spire dedicated to the Immaculate Virgin. Its thirty meters high together with the marble decorations, make it the tallest and richest spire in Naples. Also, in this case the prose verses appear to enrich the real environment, placing themselves in concentric circles around the spire and wrapping it in full respect of its morphology and following its profile (open figure).

The proposed experiences are the result of a composition of elements where, for them to interact with each other and with the surrounding space, the program must interface with the environmental 3D model superimposed on the real one, since it is necessary to scan it. The path to be followed will be understood from the experience of the content entered and no default symbol or map will be prepared. Furthermore, moving away from it, the program goes to stand-by and, if the content has not yet been sent out, notifications will help the reconfiguration and recovery of the path. In addition, there will also be a way in which the contents will be placed on the 3D scan carried out by the user in that moment, making the experience unique as it is generated by the user himself.

Conclusions

The enhancement and dissemination of Cultural Heritage, as well as the accessibility and use of cultural sites, are increasingly entering the digital sphere. In the same way, albeit not with the same speed, in the technological field people are increasingly aiming to develop software and hardware that allow the digitalization and continuous connection of the physical world, thus making great strides towards a world in which digital will overlap in all fields to physical reality. This is also demonstrated by the fact that, as previously illustrated, the world’s leading production giants are all betting on augmented reality wearable devices. This translates into new and important possibilities in the field of cultural tourism. Smart glasses represent an op-

portunity for visitors to make exciting and highly cultural and educational experiences, knowing not only what it would be possible to learn from reading traditional information installations, but also the incessant and copious research work behind a restored work or historical attribution. Furthermore, by these must accommodate many users, aspects such as practicality, the ease with which it is possible to wear them, the ability to customize or disable the controller keys or that, through the advanced features, should not be underestimated, to enable the automatic display of content in Augmented Reality, without any input from visitors: all while having your hands free. Fundamental features for a device that can be used by the most expert people to beginner ones, thus obtaining a cultural, virtual, multimedia, multisensory experience and without having to delete the real images of the path that is taking place but superimposing digital content on it. However, it must be considered that, despite the widespread use of digital devices, people are still not used to wearing smart devices and this aspect could be a reason for failure. The CEO of Facebook understood this well and, asking the important fashion brand Ray-Ban for help for his glasses, showed that he wanted to proceed in stages, first getting people used to these new accessories and then gradually introducing new one's functionality little by little that technology is miniaturized. This would allow you not to stumble upon a bankruptcy experience like those of companies that have previously tried to make similar products, for example, Google, Bose, and Snapchat. The other reason that could lead to the failure of this initiative is the very discussed issue of privacy, probably one of the reasons for the initial disappearance of this technology from the consumer market. Since the very beginning, apps that make use of facial recognition and video and photo recording have been of particular concern. To overcome this problem, manufacturers are developing aesthetic designs of the devices that show when these actions are in progress and are arranging for the use of clear voice commands needed to activate them, to make people feel nearby what is happening.

Use and involvement seem to be the key words for the use of this technology in the field of interest. To achieve this, it is desirable that, as in the field of corporate production in which smart glasses have spread and are expanding for years, customized functions are optimized based on specific and previous needs. In this way, touch or voice commands and the same morphology of the glasses can be performed and customized according to the scope of application: indoor or outdoor environments for tourism.

Only in this way can augmented reality for visitors to art galleries, museums, exhibitions, and towns will be a valid support to their imagination, for example to have a possibility to understand how an extinct animal walked, what was the original appearance of a mutilated work or the original configuration of a building. Furthermore, it could represent how to make a further enrichment of the Cultural Heritage through artistic applications.

In this regard, the project presented overcomes the simple tourist approach to environmental assets, perceiving and displaying multimedia contents that enrich the real experience of the user in an artistic sense by superimposing on physical reality (places, monuments) virtual contents [Cirillo 2020, pp. 169-170]. So, the user will be able to live simultaneously experience of the place and the artistic context designed therein.

Notes

[1] This contribution is the result of a multidisciplinary team. The chapter *Introduction* was written by Ornella Zerlenga; the chapter *Smart Glasses and Augmented Reality for cultural tourism* by Rosina Iadecola; the chapter *'Augmented' video-environment for cultural tourism in Naples* by Marco Cataffo and Gabriele Del Vecchio; the chapter *Conclusion* by Vincenzo Cirillo.

References

- Bonacini Elisa (2014). La realtà aumentata e le app culturali in Italia: storie da un matrimonio in mobilità. In *Il Capitale Culturale: Studies on the Value of Cultural Heritage*, 9, 2014, pp. 89-121.
- Brusaporci Stefano, Maiezza Pamela (2021). Smart Architectural and Urban Heritage: An Applied Reflection. In *Heritage*, 4 (3), 2021, pp. 2044-2053.
- Cennamo Gerardo Maria (2021). Advanced Practices of Augmented Reality: the Open Air Museum Systems for the Valorisation and Dissemination of Cultural Heritage. In Giordano Andrea, Russo Michele, Spallone Roberta (eds). *Representation Challenges. Augmented Reality and Artificial Intelligence in Cultural Heritage and Innovative Design Domain*. Milano: FrancoAngeli, pp. 123-127.

Cirillo Vincenzo (2020). Il disegno delle video-esperienze. In Cirafici Alessandra, Zerlenga Ornella (eds.). *WordLikeSignMovie. Content Switch*. Napoli: La scuola di Pitagora, pp. 169-170.

Clini Paolo, Quattrini Ramona, Frontoni Emanuele, Pierdicca Roberto, Nespeca Romina (2017). Real/not real: pseudo-holography and augmented reality applications for cultural heritage. In Ippolito Alfonso, Cigola Michela (eds.). *Handbook of Research on Emerging Technologies for Digital Preservation and Information Modeling*. Hershey: IGI Global, pp. 201-227.

Kalay Yehuka, Kvan Thomas, Affleck Janice (2007). *New heritage – New media and cultural heritage*. London: Routledge.

Montani Pietro (2014). Ma Google Glass è uno schermo?. In *Rivista di estetica*, 55, 2014, pp. 169-182.

tom Dieck Maria Claudia, Jung Timothy, tom Dieck Dario (2015). Google Glass Augmented Reality: Generic Learning Outcomes for Art Galleries. In Tussyadiah Lis, Inversini Alessandro (eds.). *Information and Communication Technologies in Tourism*. Vienna-New York: Springer Computer Science, pp. 463-476.

Trunfio Mariapina, Della Lucia Maria, Campana Salvatore, Magnelli Adele (2021). Innovating the cultural heritage museum service model through virtual reality and augmented reality: the effects on the overall visitor experience and satisfaction. In *Journal of Heritage Tourism*, 10, 2021, pp. 1-19.

Voinea Gheorghe Daniel, Girbacia Florin, Postelnicu Cristian Cezar, Marto Anabela (2018). Exploring Cultural Heritage Using Augmented Reality Through Google's Project Tango and ARCore. In Duguleană Mihai, Carrozzino Marcello, Gams Matjaž, Tanea Iulian (eds.). *VR Technologies in Cultural Heritage*. Cham: Springer International Publishing, pp. 93-106.

Zerlenga Ornella (2020). Scrittura & Workshop. Video-esperienze. In Cirafici Alessandra, Zerlenga Ornella (eds.). *WordLikeSignMovie. Content Switch*. Napoli: La scuola di Pitagora, pp. 124-127.

Authors

Ornella Zerlenga, Dept. of Architecture and Industrial Design, University of Campania Luigi Vanvitelli, ornella.zerlenga@unicampania.it
Rosina Iaderosa, Dept. of Architecture and Industrial Design, University of Campania Luigi Vanvitelli, rosina.iaderosa@unicampania.it
Marco Cataffo, Dept. of Architecture and Industrial Design, University of Campania Luigi Vanvitelli, marco.cataffo@gmail.com
Gabriele Del Vecchio, Dept. of Architecture and Industrial Design, University of Campania Luigi Vanvitelli, gabrieledelvecchio@gmail.com
Vincenzo Cirillo, Dept. of Architecture and Industrial Design, University of Campania Luigi Vanvitelli, vincenzo.cirillo@unicampania.it