



PROCEEDINGS

DRS LEARN X DESIGN 2019

insider knowledge

Fifth International Conference for
Design Education Researchers
9-12 July 2019
Middle East Technical University
Ankara, TURKEY

Editors
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Dalsu Özgen Koçyıldırım
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Editors

Naz A.G.Z. Börekçi
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Dalsu Özgen Koçyıldırım

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Mediating Cultural Values in a Multimedia Installation

Mauro CECONELLO

Politecnico di Milano, Department of Design
mauro.ceconello@polimi.it

Davide SPALLAZZO

Politecnico di Milano, Department of Design
davide.spallazzo@polimi.it

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Abstract: This paper sets out approaches and trends in interactive and smart solutions designed to foster and promote cultural heritage through a multimedia educational approach. The research presented aims at envisioning novel strategies to facilitate learning by encouraging visitors to interact directly and physically with the heritage on display, and to communicate cultural messages. Analysing the interactions between the user and different media and their narrative potentialities, we describe an installation which allows visitors to meet a life-sized simulated hologram and interact with it. The project is set in the field of Human Computing Interaction (HCI), looking at the world of digital encounters and interactive systems based on embodied interaction, investigating if and how the designers, as a mediator between different media and tools, succeeded in achieving their aims and proving the envisioned user experience. Relying on user tests and direct observation, we discuss how the interactive exhibit and the digital character affected visitors' behaviour, effectively capturing their attention and fostering interaction. Furthermore, we examine how visitors perceived the digital character and the gestures they asked them to perform, directly or indirectly, to trigger actions. In conclusion we generalize the results in terms of possible translations for teaching design basics in higher education.

Keywords: *digital encounter; design; embodied interactions; cultural heritage*

1 Introduction

Technology is constantly evolving and creates innovative experiences in the cultural sector. Using targeted messages, technology has the ability to provide content to an ever-growing audience, and museums and institutions have not missed the chance to experiment with this opportunity. Today, content reaches us everywhere. This concept is expressed well by the term *ubiquitous computing*, (Greenfield, 2006) coined specifically to indicate how ICT technology, which is found increasingly in new contexts and forms, will continue to affect daily life in unforeseeable ways. We therefore find ourselves in the midst of the panorama outlined by Mark Weiser, who over twenty years ago coined the term: his idea was highly precise in prefiguring the pervasive and invisible use of hidden technology that is "woven into the fabric of everyday life until it disappears and becomes indistinguishable" (Weiser, 2001).



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The days of man-machine interaction seem so distant in comparison to user-device interaction, and with new tools we take a leap forward that is not only technological, but also speculative. This basic aspect has revolutionized our notion of interaction and has shaped the ways in which users can take advantage of or interact with content and installations. For this reason, the way in which digital systems approach the user is different; interfaces need to be easy and intuitive, and the interaction with them must be natural so that the user could focus on contents. User-centricity, one of design fundamentals, is one of the core values of the translation process, as information in digital-based systems needs to be translated from codes and instructions to visual representation and codified symbols (Baule & Caratti, 2017, p. 26).

Indeed, over the last decade the research on the link between the physical and the digital worlds has bloomed, giving rise to research fields such as tangible and embodied interaction. This situation is in sharp contrast with the past, where the physical/digital relationship was inevitably mediated by two distinct elements: the input device and the output device, the interactive space (keyboard, mouse) and digital processing space (screen). Conceptually and symbolically, this new field of human-computer interaction can be traced back to the abacus, which Ullmer & Ishii (2001) argue constitutes the true precursor of smart objects as both an input and output device.

Often, in the context of Digital Humanities, the discipline of Design has strong relationships with Translation Studies, as the designer needs to develop the idea and define, through the design process, a user experience that must be translated into languages consistent with tools and media he intends to use to achieve the desired effect. Translation has taken on an intercultural dimension and stands between different contiguous or related disciplinary fields. "The process that crossed translation theories has made plausible those interdisciplinary contact points that are the prelude to the construction of a translation paradigm that can be adopted by other study fields, and has multiplied them" (Baule & Caratti, 2017, pp. 14-15).

Design includes theories and practices that belong to related and contiguous areas that often translate themselves into material or immaterial artefacts. The design of interactive systems for the enjoyment of cultural heritage often deals with design specialties that are complementary and interrelated as product, interaction, service and communication design. Furthermore, the designer must interpret and foresee a user experience capable of transferring cultural contents in an effective and pleasant way. In this sense, Design as a discipline, approaches the cultures of translation as a mediator between different languages, in the creation of artefacts and communication systems that use different media and supports.

2 Body as a Mediated Interface

To design interactive installations, the designer-translator implements a series of practices to achieve the desired results (Caratti, 2017, p.141). In the case of digital encounters, through the user experience, he defines step by step a sort of script that the user and the system must follow. Like a director, he defines a sequence of actions and reactions to create a digital storytelling, in which the physical interaction activates multimedia contents. We could consider this script as a synesthetic representation built on correspondences between heterogeneous sensory data; in some artistic products, the synaesthesia is the result of transcoding operations that, although with different levels of definition, relate semiotic, sound, visual and sometimes tactile and gestural data (Ricco, 1999, p. 76). Different kind of sensors and bespoke code control and activate the system and sometimes the installation itself seems to have a life of its own acting independently and persuading the user to behave accordingly.

To contextualize these assessments, we analyse and discuss *Leonardo Plays Leonardo. Milan. Life. Nature.*, an interactive installation about Leonardo da Vinci and his Milanese period that aims to introduce users to the world of the Master through three digital holograms of a human-sized Leonardo da Vinci who welcomes visitors and tell short stories dealing with (i) his Milanese period (ii) his life and (iii) his relationship with nature (Figure 1). Located in the cloister of Palazzo delle Stelline in Milan to highlight the genius loci, the spirit of the place where Leonardo lived and worked, the installation belongs to the domain of embodied interaction, which takes place when the human body itself is used as an interface (Dourish, 2001), and utilizes the presence of visitors and their movements to dialogue with technology, thereby generating engaging experiences potentially meaningful from an emotional point of view.



Figure 1. One of the three interactive installations at Palazzo delle Stelline in Milan.

Digital encounters with important figures from the past or even life-size characters, such as the permanent installation at the Palazzo Ducale in Gubbio created by designer Paolo Buroni, offer an emblematic example of this. Thanks to holographic technology, Federico da Montefeltro comes to life, engaging in a brief dialogue with an angel in which he talks about interesting aspects of the building while recounting anecdotes from his personal life. Here, the technological system is completely hidden. Users have the impression to dialogue directly with the character, even though, given the physical separation between audience and the scene, in reality their position is more similar to that of audience members passively viewing a performance. In this case, visitors' bodies are detected by sensors and they serve to activate the performance.

The same mode of implicit interaction is found in the installation *Ripopolare la Reggia* (Repopulating the Palace) by Peter Greenaway, which uses projections to populate the beautiful baroque palace of the Royal Palace of Venaria Reale. Visitors taking the eleven-room-long tour route are transported back into another era: in this case as well, full-scale projections fill the space with the personalities of the time: courtiers, squires, servants and musicians tell their stories to create a highly evocative user experience. The British director transports visitors to another era, casting them as passive spectators that interact implicitly with the projections which are activated by their movements. In comparison with the project at the Ducal Palace in Urbino, *Ripopolare la Reggia* offers visitors a less realistic feeling of having met real-life figures, but it does stimulate their attention and curiosity with an immersive performance that takes them on a walk-through time.

Studio Azzurro also takes up this idea of interacting with life-size figures in the *Sensitive City* (Studio Azzurro, 2010; 2011) installation at the Italian Pavilion of the 2010 Expo in Shanghai. About eight hundred people from different Italian cities move along on rear projection screens. When visitors raise their hand, the nearest character stops and speaks directly to them, describing his or her city. Here, places and fragments of memory are explored while images and drawings animate the background and enrich the story. *Sensitive City* thus introduces a fundamental component, namely that of explicit interaction between the user and virtual character, thus giving the visitor full control over the digital world. This world is depicted on the screen through continuous projections, apparently independent of the surrounding environment; nevertheless, a single gesture is enough to modify the interaction: by raising one hand, visitors are able to stop the citizens and become a part of their digital city. In *Sensitive City*, therefore, visitors are free to enjoy the content at their leisure, not as a passive user of multimedia content but as the author of a completely explicit interaction.

Another approach can be seen in the *New Dimensions in Testimony* project, which was born out of collaboration between the Shoah Foundation and the Institute for Creative Technologies (ICT) at the University of Southern California. This project puts young students in dialogue with Holocaust victims through seven different cameras and recordings that contain an infinite range of answers to questions typically asked of survivors. The medium used for the interaction in this case is the spoken word, a fact which makes the experience even more realistic. The distinguishing trait of this project lies in the ability of the digital character to understand the questions and respond accordingly, in

an appropriate and consistent way. By creating an interactive exhibition in which students can initiate conversations with Holocaust survivors, this project opens up an interesting perspective that neutralizes the temporal element. Even students of the future who arrive after the last survivor has passed away will still be able to interact and dialogue directly with survivors and reflect on all the information contained in a first-hand account of this kind.

The above, are just a few of many possible examples. Despite their differences, one commonality is the way that they hide technology behind the simulation of realistic encounters with digital characters that transport visitors to other worlds and eras. It is worth stressing that, in the first two cases, the interaction is implicit; that is, the presence of the visitor activates the content. In the last two, in contrast, visitors control the digital world by deciding whether to access it, thus creating an explicit interaction. Sensitive Cities as well as other projects by Studio Azzurro use the human body and its movements to create a gestural interface, thus allowing visitors to enter the digital world through embodied interaction. Embodied interaction thus fosters an encounter in which humans can interact with digital content in a natural manner. The technological device is shifted into the background, making room for its effects and bodily movements to take centre stage, replacing commonplace interactive devices.

3 System Description, Designers' Choices and Users' Perception

The interactive exhibition here discussed is characterized by a digital encounter with a life-size character, a gestural interaction, and an actor instead of a virtual character: visitors use gestures to interact with a holographic representation of Leonardo who discusses his life, work and relationship with nature through brief accounts. It is intended as a choreography meant as a scenic movement in which the user is an active part of the scene, so what must be designed concerns a series of behaviours of the end user who is both actor and author of the scene itself (Anceschi, 1992, p. 28).

The project Leonardo plays Leonardo entails internal dynamics that are both implicit and explicit. Physical movements activate the contents through implicit interaction and are also used to make navigation choices through explicit interaction. Indeed, when entering the cloister of the building, visitors catch sight, at a distance, of a man dressed in Renaissance-style clothing moving into and out of the three screens. Every time he enters the stage, he wears a different outfit and displays a different mood: sometimes he is thoughtful and wearing luxurious clothes, at other times he appears wearing work clothes and gives the impression of being very busy, still other times he invites bystanders to come nearer. When visitors approach one of the screens, Leonardo appears. He speaks Italian and asks the user to choose his or her preferred subtitle language: visitors can choose Italian by raising their right hands and English with their left (Figure 2). Once a language is selected, a first video begins to play, chosen randomly by the system from among the five contained in each installation. A brief introduction displays the title of the piece, then Leonardo appears and talks for about two minutes, addressing the bystanders directly. When a story ends, users can choose to listen to another one – by raising their right hands – or to end the interaction – by raising their left. All five of the videos use the same mechanics of interaction and, once they have finished, Leonardo kindly bids the user goodbye and begins moving in and out of the screen once again.

This short description highlights how interactions take place within the system: the first is an implicit interaction that is outside the user's control, aimed at creating the element of surprise as if Leonardo were waiting for him or her. The other interactions – such as the choice of the language for the subtitles and of whether or not to continue – are explicit and entail user engagement.

The research discussed here is grounded in quantitative and qualitative data gleaned through diverse methods of inquiry. The first set of available data is the usage statistics provided by the system, which records every interaction performed at each of the three installations. The data collected provide information about the date and time of the interaction, the number of users, the number of videos watched and the language selected. We are not going to analyse here the quantitative data, but we like to point out the importance of gaining insights from users who tested the system. We conducted interviews using the think-aloud protocol (Someren et al., 1994; Dorst & Cross, 2001) with a consistent set of post graduate expert users, who were recorded while interacting with the system and then involved in an informal post-experience focus group. The same sample of users also completed a questionnaire designed to verify the consistency of the opinions they expressed in the interviews and focus their attention on the experience of use and how much they enjoyed it. Furthermore, direct observation of the aforementioned expert users as well as casual visitors allowed us to gain useful insights into the relationship between these people and the digital Leonardo.



Figure 2. Language subtitle selection approaching the right (for Italian) or left (for English) hand near to sensors while an explanatory graphic appears on the screen.

Three out of eight expert users expressed an opinion about the structure during the think-aloud session. All of them expressed aesthetic appreciation for the installation but two out of three would have preferred a structure more in line with the historical character. For example, R3 reported: “The frame is too rough, industrial and contemporary. I’d change the style, given the historic figure”. Indeed, from designers’ point of view, the project presented some difficulties, given its location in a cloister, one of which was the constant rays of light that made it impossible to conceal the technological apparatus. The aforementioned projects had environments enveloped in darkness, and therefore had no trouble hiding the equipment. Thus, we decided to turn a problem into an opportunity and create a very evident, high-tech and industrial sort of portal that would suggest a timeless space in which visitors could encounter Leonardo. Indeed, the edgy stainless-steel structure, greyish screen and clearly visible sensors were intended to create a marked impression of detachment between the contemporary structure and the historical character, dressed in Renaissance clothes. Evidently users did not pick up on the idea we wanted to evoke of a time portal or did not consider it relevant.

The eight expert users focused specifically on the digital character, which was designed with the aim of capturing visitors’ attention and making them feel as if they were face-to-face with Leonardo, in the flesh. The choices we made in order to convey this intended sense of realism were, first of all, to use an actor rather than a virtual character, secondly, to project him life-sized and, finally, to have the actor direct his speech towards the camera in order to maintain eye contact with viewers. All the expert users reported having experienced a sense of having a real person in front of them, addressing them directly; they particularly appreciated the realism of the digital character. In the think-aloud session R2 said “It seems the character is right in front of me” while R7 stated: “The interesting thing is that Leonardo seems to be a real person in front of me and telling about his works”. At the same time, our intention that the character maintain eye contact was appraised by evaluators, who report a resulting sense of interaction and intimacy. R1 said “it’s nice that the character looks in my eyes while he is telling the story. It seems to augment the interaction and the involvement”. R4 focused more on the intimacy triggered by the eye contact: “The real size character is ok, and it seems he’s talking to you intimately, with direct contact. I like the actor and that it seems he’s talking only to me”.

These results are confirmed by the questionnaires the respondents filled out following the experience. Indeed, they gave the feeling of interacting with a real person quite a high score (2 very high, 5 high and 1 average). The informal focus group that followed the test session further confirmed this impression even while adding an unexpected insight: every one of the users was confused by Leonardo’s appearance. That is, they expected to see a tired, old man with a white beard, as Leonardo is traditionally portrayed, not an energetic man in his fifties with a short red beard, as we imagined he probably appeared during his last period in Milan. Another point worth addressing is how users perceived interaction with the digital character. When designing the mechanics of interaction that were to have characterized the system, we decided to employ a mix of implicit and explicit interactions, both of which take advantage of the human body as an input system. The first type of interaction occurs without any intention on the part of users: they

simply pass in front of the installation and, in so doing, unwillingly trigger a reaction in the digital system, namely the whimsical appearance of Leonardo inviting users to act. This is an implicit interaction based on motion detection and aimed at surprising visitors and giving them the impression that Leonardo was there waiting for them.

The other kind of interaction is instead activated by deliberate gestures on the part of users: they must raise their right or left hands and approach the screen to choose the subtitles language (right hand for Italian and left for English) and to make the stories continue (right hand) or stop (left hand). The first kind of interaction, the implicit one, was easily understood by all the expert users, who were naturally drawn to approach the screen and surprised when Leonardo appeared and immediately made contact with them. Regarding this point, R6 states: "Entering the corridor I see three panels with a character moving. He attracts me. When I approach the screen a sort of contact is established, and Leonardo invites me to enter his life". The second kind of interaction, the explicit one based on hand gestures, entails different considerations. All of the testers immediately understood the mechanics of interaction and appreciated them, as they made clear in the questionnaires as well. Indeed, the majority of expert users felt confident using the system (5 high confidence, 3 very high confidence) and they generally appreciated the use of the body to interact with it (4 neutral, 3 high, 1 very high), but four respondents complained that the degree of interaction offered was limited.

During the process of designing the system, we actually decided to limit users' freedom of interaction in order to enhance the sense of having an encounter with a real person and empower the narrative approach. Just as would be the case with a real person, once Leonardo begins telling a story he carries it through to the end, without being interrupted. Furthermore, Leonardo – that is, the system – decides which story to tell, in order to simulate the behaviour of a sentient character as much as possible. This choice, and the motivations behind it, were perceived as limiting by expert users. However, R2 states "It's interesting the modality of reaching out a hand to interact with the system, but it seems limiting the possibility of choosing only the language and whether to continue with the story or not". In other comments respondents go further, suggesting other forms of interaction: R5 would have preferred to "choose the topic to better interact. It would be nice to have Leonardo asking questions and, by answering them, to get other topics".

4 Mechanics of Interaction and Users' Behaviour

The above comparison between the designers' intentions and users' perceptions and understanding highlights both problem areas and strengths in the system's ability to fully communicate its meaning and how it functions. Nevertheless, in order to fully understand the agency of the designed system on users we must assess the capacity of the interactive installations to foster the "correct" behaviour. In other words, to understand if the designed system is able to translate the designers' will in the installations and consequently to guide users' behaviour.

Direct observation of the expert testers during the think-aloud sessions, as well as observation of other casual visitors, showed that almost all of them immediately understood how the system worked and behaved accordingly. In particular, the mix of implicit and explicit interaction proved to represent an effective means of engaging users gradually, as it is capable of attracting their attention and then fostering interaction. The whimsical and unexpected way Leonardo appears when user approach (implicit interaction) worked well to surprise them and kindle their curiosity. During direct observation, mainly in the first days of the exhibition, we noticed that most people stopped and listened to Leonardo and some of them decided to start interacting with the system. In other words, the system persuaded users to behave as they were expected to, namely to be intrigued by the digital character and to stop in front of it.

Once engaged in the interaction, most of the users followed the instructions provided by the digital Leonardo and used their hands to launch the narration. The presence of a person, albeit digital, who modelled the gestures users were asked to perform turned out to be very effective in avoiding incorrect actions and misunderstandings. These results are in line with what emerged from the tests with expert users and the questionnaires, as discussed in the previous section. Hence, from the point of view of interaction itself the system proved to be efficient in persuading users to act as we had foreseen: they were indeed attracted to the screens and did not encounter any major problems in the interactions. In terms of involving users in the interaction, however, the results were not as satisfactory: specifically, the aim was to retain their attention and convince them to listen to all five of the videos at each installation. Quantitative data gleaned from the system logs show that the vast majority of users listened to either one video or all five of the stories. Indeed, the percentage distribution is: 46% 1 video, 4% 2 videos, 4% 3 videos, 2% 2 videos and 43% 5 videos. Therefore, the data highlight two very distinct behaviours: on the one hand, there are users

called by Leonardo to interact but evidently not very interested in the stories or bored by them, while on the other hand, there are visitors keen to listen to the digital character.

Direct observation as well as the test with expert users shed light on this percentage distribution. Specifically, we noticed that many passers-by were surprised by Leonardo's appearance and drawn to interact but, once the story started, they immediately left: it is true that the three installations were located in a passageway and most of the visitors were not there to view the exhibit. Furthermore, the data show that a significant component of the interactions involving just one video were in English (about 25%), which is not surprising since the language spoken by Leonardo is Italian. R4 commented that reading the subtitles prevents the viewer from looking the character in the eye, and R6 added that it would be nice to listen to Leonardo in English. Hence, the design choice of maintaining a philological approach may have hindered non-Italian users from listening to all five of the stories.

Comments by expert users, on the other hand, may clarify why the majority of users listened to more than one video and a great many of them all five of the stories. R3 said that "the stories are not too long, enjoyable and not boring" and R5 added: "it's nice to listen to his stories regarding nature... it's both didactic and entertaining". Other comments focused on the ability of the actor to retain viewers' attention and the quality of the scenography. R6 said that "it's nice the way the actor interprets what he's reading or thinking or writing. I like his facial expressions and the scene props". As a matter of fact, the quality of the scripts and the professional actor's ability to interpret the Master played an important role in keeping visitors interested. Furthermore, comments highlighted a great appreciation for Leonardo's costumes: R3 said that "the character speaks well and it's nice that he changes clothes in the different stories" and R4 added "I like the change of clothes. It lets me understand that the setting changed".

In an effort to summarise, we could argue that the mechanics of interaction – designed as a mix of implicit and explicit interaction – proved efficient in modifying users' behaviour in accordance with the designers' will but that the digital character played a fundamental role in communicating how the system functions and retaining viewer's active interest.

5 Discussion

Leonardo plays Leonardo falls in the domain of Digital Humanities and Interaction Design and uses embodied interaction in an implicit and explicit way to let the user access cultural contents. To provide a productive and amusing experience, designers acted as a mediator translating the idea and the user journey according to languages coherent with tools and media used to gain a proper result in terms of usability and effectiveness. Languages used are different and affect not only interfaces and mechanics of interaction but even the physical appearance of the technical equipment. The use of the body and gestures, icons and text as well as video and audio are part of a flow which cross four translation typologies: intersemiotic translation as the transposition of sign systems to another sign system, synesthetic translations as the translation mode through different sensory modes, metatextual translation as the creation of an artefact of synthesis, transmedia and cross-media translations as the declination of products in the transition to digital that include a specific multimodal directorial practice (Caratti, 2017, p. 126-127).

The gesture-based system of interaction proposed was considered easy and enjoyable by all the users and the choice of making the digital character on the screen mimic the gestures to be performed was very effective in avoiding written instructions that usually accompany system based on embodied interaction. During the tests with users we observed that testers constantly referred to Leonardo as a real person with whom they were experiencing an authentic encounter. Furthermore, the questionnaires confirm that most users had the impression that they were interacting with a real person, standing before them in the flesh. Another point worth noting is that most users immediately understood how to interact with the system by imitating the gestures of the digital Leonardo. This aspect may seem secondary, but it is particularly relevant for systems based on embodied interaction (Dourish, 2001), which are usually rich in labels and other paratextual apparatuses intended to train users to interact with the system and inform them of how it functions.

Finally, during direct observation sessions we frequently identified behaviours that are typical of in-person communication. During sessions with a lot of background noise, several users brought their ears closer to Leonardo's mouth to hear better, a meaningless behaviour given that the two stereo loudspeakers were very visible at the base of the system. Furthermore, we noticed that most users tended to maintain a distance from the digital Leonardo that proxemics (Hall, 1990) would define as personal – from 1 to 1.5 meters – and only drew nearer, to an intimate distance, in order to interact with the system. Moreover, observing the mechanics of interactions and considering users interviews and questionnaires, we could assess if the choices we made were consistent to our will, creating

“inherently persuasive” design products that embed and embody the arguments of the people who designed them (Redström, 2006) and are able to influence visitor's behaviour. Despite these considerations, we can remark that digital characters such as our Leonardo, tend to stimulate behaviours that go beyond those fostered by common interactive systems, an aspect that deserves to be taken into due account by interaction designers and, in particular, by those involved in the teaching of design basics.

As a matter of fact, the results of the research here discussed, achieved through design (Findeli, 1998; Koskinen, Zimmerman, Binder, Redstrom, & Wensveen, 2011) of an interactive exhibit may be translated in the teaching of design basics. Looking at the field of interaction design in particular, our results can be generalized at different levels and become matter of discussion with design students. The translation of the user experience into a balanced mix of implicit and explicit mechanics of interaction is an example in this sense, as well as the employment of gestures as main interface. Gestures, indeed, ended up being real mediators of cultural values, since they allowed generic visitors to access cultural contents beyond linguistic issues connected to paratextual apparatuses.

Furthermore, the employment of a real size digital character was very efficient in catching and keeping visitors' attention: a result to be taken into due account for future interaction designers that will face a world increasingly populated by artificial sentient intelligences, that someone is addressing as the new raw material of design (Antonelli, 2018).

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About the Authors

Mauro Ceconello is an architect and Associate Professor at the Design Department, School of Design, Politecnico di Milano. His research activity focuses on tools and apps to enhance cultural heritage and tourism using mobile technology, serious games and interactive systems. He held courses about augmented reality and mobile

experience. He is the scientific coordinator of many research projects concerning valorisation of culture through digital technologies and interaction tools.

Daide Spallazzo is Assistant Professor at the Design Department, School of Design, Politecnico di Milano. His research and teaching activities mainly deals with Interaction Design, with a particular focus on the employment of digital technologies for the valorisation of Cultural Heritage. His research projects explored digitally-enhanced storytelling and gaming as well as tangibles to foster collaboration and learning during cultural experiences.