ISSN 1828-5961

The Accessible Communication of Spaces and Their Meanings

This contribution illustrates some methodologies used to develop a communication of cultural heritage in a multisensorial and accessible way. The considerations within this article guided the inclusion of items displayed in the exhibition "A Line Between Heaven and Earth: new accessibility for the ancient sundial of the University Palace" (Genoa, 21st December 2023-21st January 2024). Both the exhibition and this article center on an ancient astronomical device located within the University Palace building at the University of Genoa. Implemented in the eighteenth century, during the time the building housed the permanent headquarters of the Genoese Jesuit College, the sundial has recently been restored to working order.
In this article, we illustrate an approach addressing the paradigm shift in the creation of accessible content based on two fundamental principles. Firstly, we start from a consideration of the relationship between a disabled person and the context, in which the latter – not the former - is understood to be the cause of inaccessibility. Secondly, we acknowledge that every cognitive fact is linked to the space in which it takes place. Thus, we consider the importance not only of sight, but also substitutive perceptions and those elements that link the body in its totality to the memory of the experience and to the dynamic exploration of the space itself.
In order to enhance the accessibility of the aforementioned exhibition, a virtual tour was developed accompanied by explanations both in written and audio formats. A podotactile path and tactile models were also created to provide the correct support for the mental reconstruction of spaces, with the aim of illustrating spatial and knowledge paths adaptable to different needs.

Cristina Càndito
Associate Professor at the University of Genoa (Italy) and Ph.D. in Drawing and Surveying, she holds degrees in Architecture and Modern Literature. Her teaching and research activities include History of Representation, Geometry, Inclusive Perception and Communication. She is in the promoting committee of the international conference DAI – Drawing for Accessibility and Inclusion (since 2022).

Ilenio Celoria
Architect and adjunct professor at the University of Genoa (Italy). He is also teacher of Technologies and techniques of multimedia communications in the high school. He collaborates in research in the field of photographic and multimedia representation linked to architecture. He also creates artistic-photographic projects that have been exhibited in several Italian and foreign cities.

Alessandro Meloni
Architect, Ph.D., research fellow and adjunct professor at the University of Genoa, Department of Architecture and Design. His research fields concern Drawing, Descriptive Geometry, Visual Perception, accessibility and inclusion. He was a member of the organizing (first edition) and scientific committees of the international conference DAI – Drawing for Accessibility and Inclusion (since 2022).

Keywords:
Architectural Heritage Interpretation and Presentation; Architectural Heritage Visual Storytelling; Architectural Physical Heritage; Tactile Modeling; Accessibility.

DOI: https://doi.org/10.20365/disegnarecon.32.2024.19

ISSN 1828-5961

1. PEOPLE AND SPACE

Considering the complex relationship between a person and space allows us to broaden the field of action able to be taken when it comes to enhancing the value offered in the experience of space, whether accessed through direct attendance or mediated through digital tools. Contemporary research on expanding accessibility should, in fact, allow the greatest number of people possible to follow physical and cognitive paths independently, without having to give up the opportunity to learn about spatial and cultural complexity. The advances stemming from work done within the sociological and medical disciplines - and partly implemented by European and Italian legislation - can provide a guide to updating this field of study and inform subsequent achievements.

Before proceeding, it is necessary to address some of the commonly raised objections when it comes to investing time and money into accessibility. First and foremost, these objections generally fail to understand the number of people who can benefit from accessible approaches. It is no longer acceptable to consider only motor disability when considering accessibility. Rather, it is necessary to deal with a more varied range of issues linked to different types of sensory as well as cognitive disabilities. One must also consider limitations more broadly, including those that are temporary, and those to which anyone might be subject and which might constitute impediments to the full enjoyment of spaces and cultural content. In other words, successfully designed and communicated spaces must be inclusive of all phases of life, and must also accommodate, for example, the presence of children and elderly people.

When considering accessibility, it is necessary to start with the evaluation of the relationship between a disabled person and the context. Here, it is important to note that it is the environment that must be identified as the cause of any inaccessibility - not the user. Therefore, it is the environment that must be seen as an object that can be modified in order to suit different needs (International Classification of Functioning and Health, 2018; Persson et al., 2015).

In the context of the valorisation of cultural heritage, it is essential to consider the infrastructural context and the effective possibilities of access to the structure itself. This is necessary to avoid the paradox of offering contents which, however accessible, cannot be reached independently. A scientific basis for these arguments can be found in the issues of wayfinding and the related analyses of orientation which combine perceptive behavioural studies with those linked to the shape of the territory and which constitute the basis for more contemporary developments.

Compared to the core of this discipline, which is based on visual perception (Lynch, 1960; Arthur & Passini, 1992; Golledge & Stimson, 1997), it is possible to advance the field by considering the role of multisensoriality in spatial recognition with particular attention to the perceptual logics of the blind (Devlieger et al., 2006; Meloni, 2021; Càndito & Meloni 2022). As is known, blind people base their orientation on the tactile path system, a codified and universal way to move safely in a certain space (Empler, 1997), in addition to combining sound and tactile stimuli to understand the spatial layout.

When a historical context is involved, some objectives may conflict with the conservation of the building itself, which cannot be modified without betraying its cultural character. Especially in these cases, the maximum effort must be made in reconciling conservation with possible improvements in accessibility.

In fact, interventions linked to the description of the available routes and services are always possible, illustrating the difficulties and possible solutions (Càndito, 2020). Such interventions place each individual as protagonist in the evaluation of the opportunity of paying a visit to cultural sites or participating in a cultural event. Rather than referring to accessibility features through generalized abstraction, they also provide important accessibility details, such as the actual dimensions of the width of passage and manoeuvring, so that each person can establish whether these measurements are compatible with their own means of wheeled transport and whether accompaniment is needed, keeping in mind that accompaniment is not always available on site.

Furthermore, it is important to consider the promotion of autonomy as a priority. On the one hand, attention must be paid to a wider user base considering the possible difficulties; on the other hand, it is necessary to be aware of the useless and counterproductive aspect of cataloguing people according to their specific disability, considering that these differences are as varied as the differences between the so-called able-bodied individuals. The interest and consequent propensity to transpose cultural messages can be conveyed through a vast range of methods that should be considered as both alternative and integrative.

In the same way, instead of generically defining a cultural asset as "accessible to the blind", it is more appropriate to communicate the presence of tactile and sound elements, so that each person will be able to evaluate their own interests and identify potential features for use. It is important to remember that the interest and potential use of such features may be much more extensive than imagined. For example, the multimedia channel, often neglected in cultural communication, finds various applications not limited to audio-visual productions alone. In fact, it can be productively extended to the tactile channel which emphasizes some elements in favour of people with diverse learning characteristics, as can also be verified in the field of teaching (Mammarella et al., 2005).

In certain respects, even those who do not understand or speak the local language can be considered disabled, since they are limited in their enjoyment of cultural content. However, this difficulty can be overcome not only through translations, which, it should be noted, may neglect linguistic minorities, but also through evocative, visual, tactile, sound, and olfactory contents, which enhance the understanding of the content being conveyed.

A second aspect to consider is that which links every cognitive fact to the space in which it takes place. This relationship might seem to be conveyed by visual perception alone, though additional and deeper elements may have different origins

DOI: https://doi.org/10.20365/disegnarecon.32.2024.19

ISSN 1828-5961

in the substitutive perceptions of hearing and touch. These are often overlooked by so-called able-bodied people. It is crucial to overcome the dichotomy between the real and the virtual, which overshadows the perceptive effects capable of placing knowledge in mental spaces whose definition is no less real than that of physical spaces. As with the previous principle, concrete elements are recalled that allow, on a cognitive level, the creation of a mental image of space (Grassini, 2015) as a place in which meaning can be assigned to the elements with which one comes into contact with. In this sense, however, considerable help is provided by those elements that link the body in its totality to the memory of an experience and to the dynamic exploration of space itself (Pallasmaa, 2012; Mallgrave, 2015).

2. COMPLEXITY AND ACCESSIBILITY

The application of the two abovementioned principles in a design experience which resulted from the collaboration between different professionals, will now be discussed. This collaboration required the development of elements for an exhibition and aimed to support access to and cultural communication of the cultural asset from an inclusive perspective.

Fig. 1. The main elevation of the University of Genoa Palace, with the windows of the Sundial Hall highlighted.

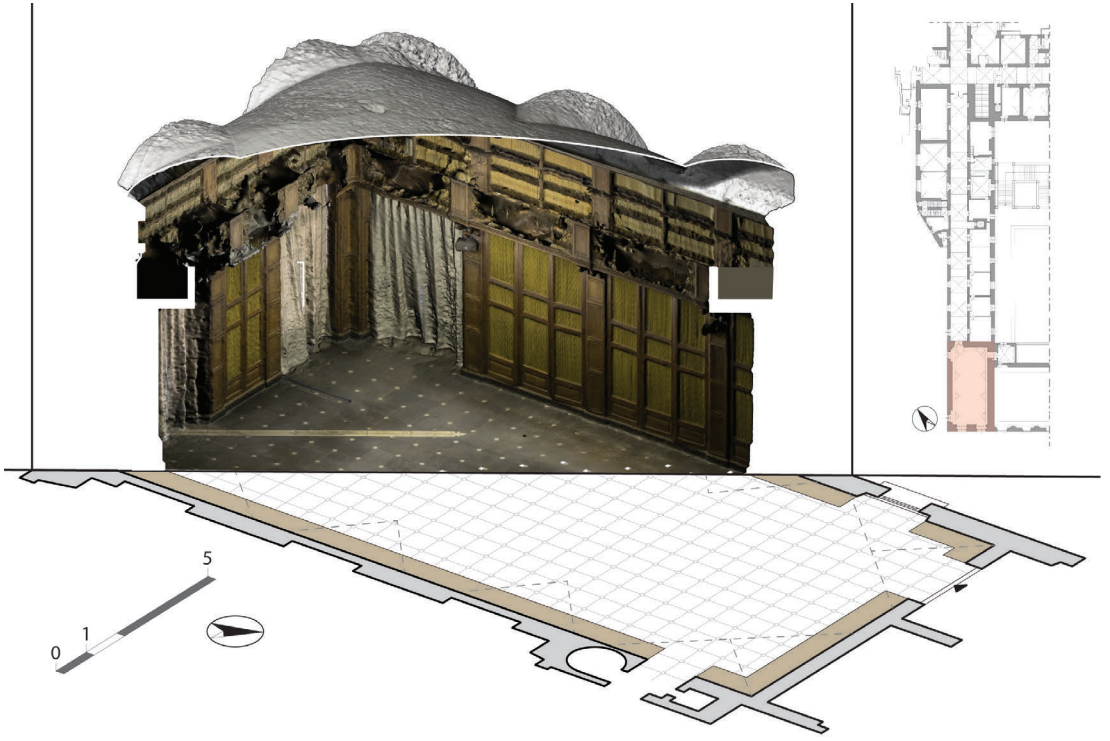


Fig. 2. The model obtained with photogrammetric survey procedures and its section parallel to the floor meridian line.

2.1. THE GNOMONIC HOLE SUNDIAL OF THE UNIVERSITY PALACE OF GENOA

The exhibition "A Line Between Heaven and Earth: new accessibility for the ancient sundial of the University Palace" was held at the University Palace of Genoa from 21st December 2023 to 21st January 2024 [1]. During that period, it was possible to visit a particular type of sundial - a camera obscura type - accompanied by multimedia and tactile explanatory materials.
This event was an opportunity to put the ancient astronomical device, created in 1771 by the Jesuit François Rodolphe Corréard for the Palace during the period when it served as the permanent headquarters of the Genoese Jesuit College, back into operation (Fig. 1). Construction of the Palace building began in 1633 thanks to an agreement between the Order and the important Balbi family of Genoa. It was designed by the architect and military engineer Bartolomeo Bianco (Lamera & Pigafetta, 1987; Colmuto Zanella, 1996; Bösel, 2012).
The Sundial Hall, which houses the device, features a marble and brass line running across the floor. It is inclined with respect to the walls, and oriented exactly north-south (Fig. 2). This line constitutes one of the two components of a sundial with a gnomonic hole, able to indicate both the

DOI: https://doi.org/10.20365/disegnarecon.32.2024.19

ISSN 1828-5961

time and date. In this type of astronomical device, the other component is made up of a hole, called gnomon, which allows for the projection of the solar image and takes on the function that is normally performed by the rod, projecting the shadow on the dial of a sundial. The gnomonic hole was reconstituted thanks to astronomical calculations and was equipped with an artificial light projection device supported by a mobile wooden element.
Here we do not intend to illustrate the scientific tool, but rather the paradigm shift considered in the accessible presentation of content that arises from the principles previously illustrated.

2.2. INTERACTIVE MULTIMEDIA COMMUNICATION

For the accessibility implementation project of the aforementioned exhibition, a multimedia tool was developed that allows you to see images, as well as read and listen to explanations in order to understand the context and functioning of the sundial, without neglecting the description of the fundamental services. This kind of approach allows people to independently evaluate the possibility of reaching a historic building with a complex configuration and enjoy the exhibition (Clark & Mayer, 2023). At the University of Genoa, this was implemented via a virtual tour in which the succession of different panoramic views was accompanied by simple explanations in written and multilingual audio formats (Fig. 3).
During the different phases of the valorisation of the Sundial Hall and the University Building, the problem of the organization and management of the iconographic and textual materials within the interactive multimedia tool presented issues of a methodological and conceptual nature. In particular, multimedia communication addresses two significant moments: that of representation and that of accessible description. These allowed the creation of a narrative in which the representation used traditional images and images that can be explored 360°, while the description relied on both the written text and a multilingual commentary activated by opening textual windows. Using this tool, it was also possible to have an overall view

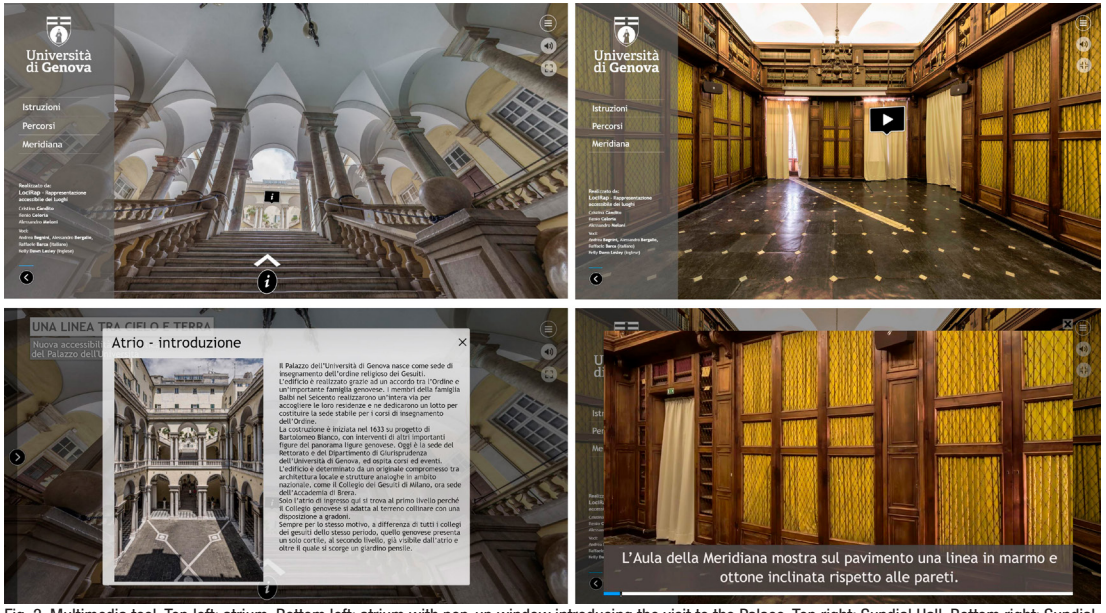
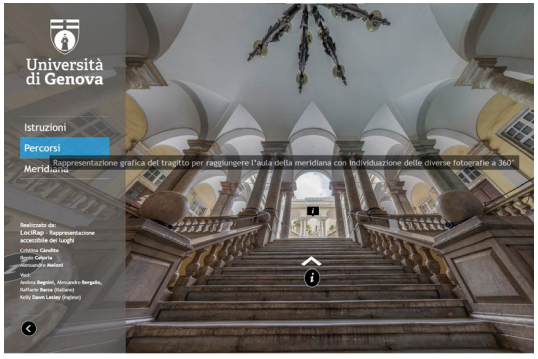


Fig. 3. Multimedia tool. Top left: atrium. Bottom left: atrium with pop-up window introducing the visit to the Palace. Top right: Sundial Hall. Bottom right: Sundial Hall with subtitled video relating to the functioning of the Sundial.

of the routes using a link displaying an interactive axonometric cross-section of the building (Fig. 4).
The heart of digital technology is interactivity, which allows you to move within the virtual space aided by individual devices which transform the visit into a cognitive and experiential activity. The rapid diffusion of technology has profoundly transformed the society we live in and rapid changes have influenced the new logics of knowledge. The development of technologies and tools via photography (Cabezos et al., 2023), and beyond, together with the possibility of application in experiments and innovations, draws us increasingly closer to people with disabilities, enriches the knowledge offered in the cultural sector, and supports the use of artistic and architectural heritage in increasingly accessible ways.
The different navigation methods, combined with the potential offered by mobile devices, increase user information opportunities by offering new stimuli for learning and knowledge. In particular, the dual relationships of the 'technology-architectural asset' and the 'architectural asset-use of heritage' can reinvent the ways we perceive and our process of 'knowing.' Through multimedia communication, the strategies of understanding and interpretation become part of the cultural asset itself.
Using the multimedia tool created for the exhibition of the reactivated ancient Sundial, it is possible to follow essentially two routes: one that goes up the staircase and another that, through the courtyard, leads to the Sundial Hall via an elevator (Fig. 5). The nodes through which the visual narrative develops are appropriately chosen to offer the visitor significant perspective views; they are the translation of a gaze that combines photography and architecture, thanks to single shots, and they offer an immersive perception that provides the user with a 'sense of space.'

DOI: https://doi.org/10.20365/disegnarecon.32.2024.19

ISSN 1828-5961



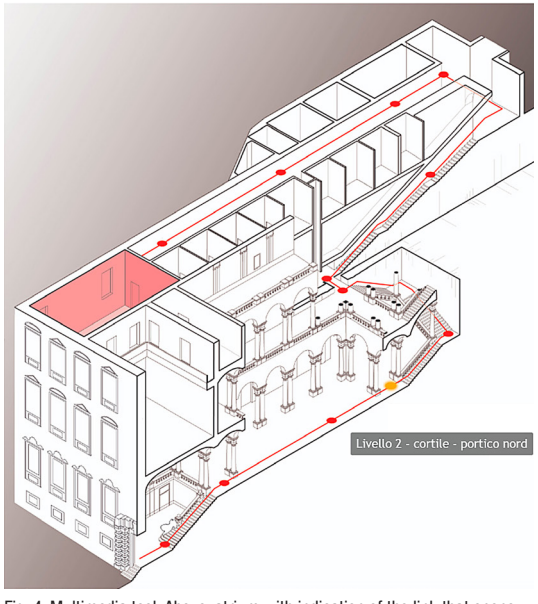
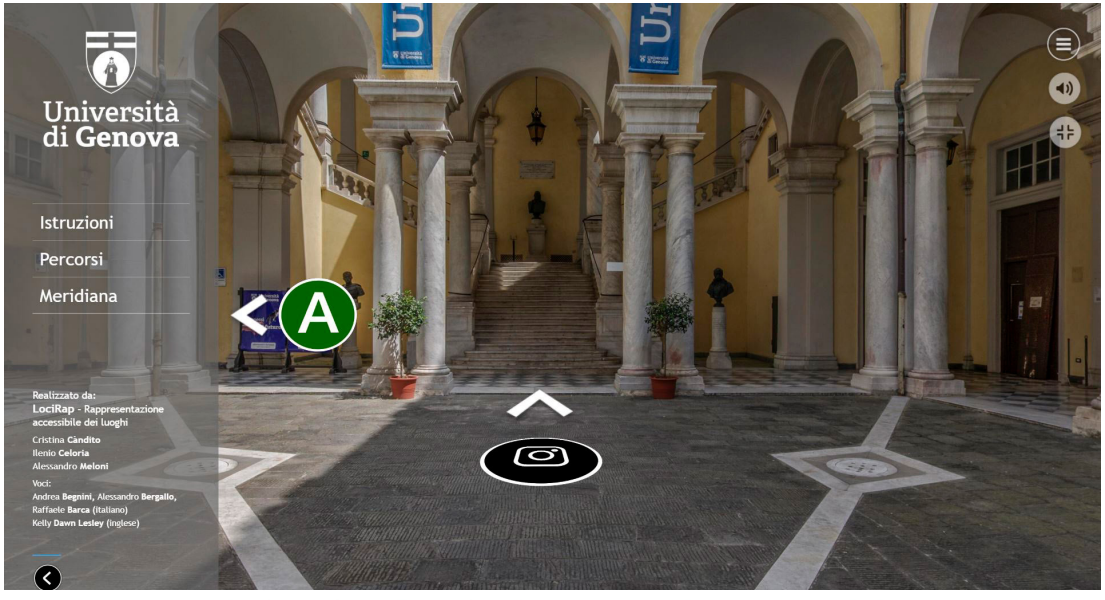


Fig. 4. Multimedia tool. Above: atrium with indication of the link that opens the axonometric section. Below: axonometric section with indication of the path that leads to the Sundial Hall.



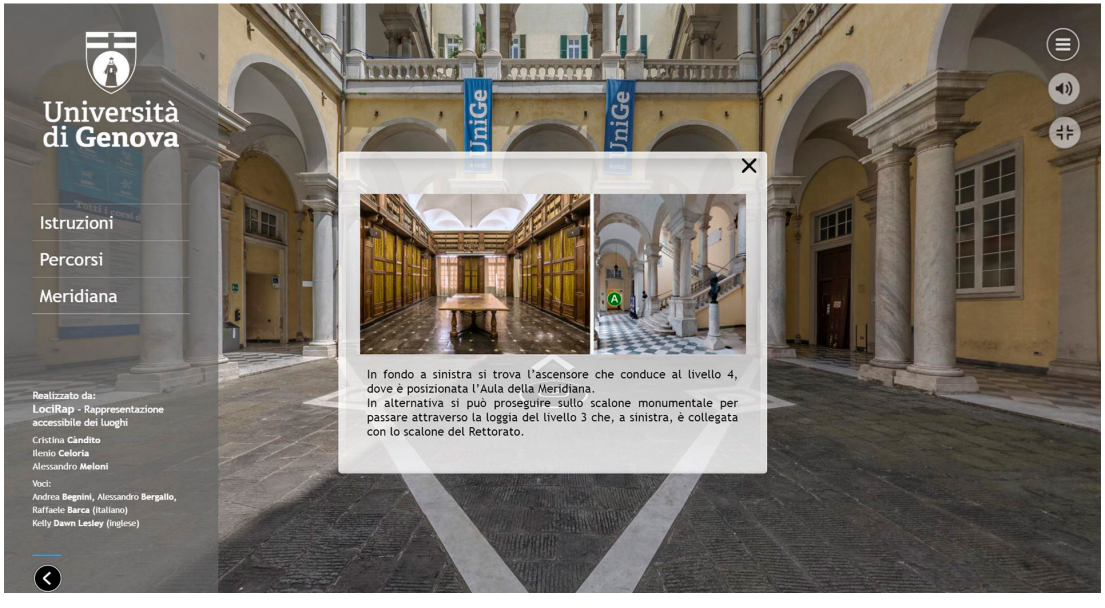


Fig. 5. Multimedia tool. Above: courtyard with indications relating to the two routes: stairs and lifts. Bottom: courtyard with pop-up window explaining the routes.

DOI: https://doi.org/10.20365/disegnarecon.32.2024.19

ISSN 1828-5961

The use of the multimedia tool does not limit itself to involving the viewer by leading them to the Sundial Hall but offers them the possibility of experimenting with new perceptive paths and different ways of relating to the architectural space (Fig. 6). Through image and text processing systems, the cultural object becomes accessible to a greater number of people. The architectural organism, mediated by technology, interacts with the reader's knowledge by adding audio-visual information to reality: each person, even in the presence of disabilities, is able to choose the exploratory mode according to their perceptive abilities.
The virtual routes can be viewed on the screen of a computer, tablet or smartphone; however, it is also possible to enjoy them through virtual reality viewers. This allows us to emphasize the sense of presence typical of immersive technologies. The interface was designed to allow you to experience increasingly less mediated and more direct emotions, as if the viewer were truly present within the spaces conveyed through spherical photographic images. The multimedia tool is not just a succession of spherical photographs but the creation of an order that synthesizes culture, knowledge, experience and the emotional relationship with the place. The tool was formed, little by little, by observing, travelling and experimenting with the architectural space, while searching for the points that best convey the sense of space itself. The photographic shots have become documents, traces and memories of the encounter between photography and architecture. They are a reading of space, a mode of understanding, and a translation through a medium that generates new knowledge.
Photographs have a single, monocular point of view. They cannot give us depth perception like human vision, which is binocular. When a three-dimensional space is projected monocularly onto a surface, relationships are created that did not exist before the photograph was taken. The elements in the background are juxtaposed with those in the foreground, and if the point of observation is changed, these relationships also change (Shore, 2009).

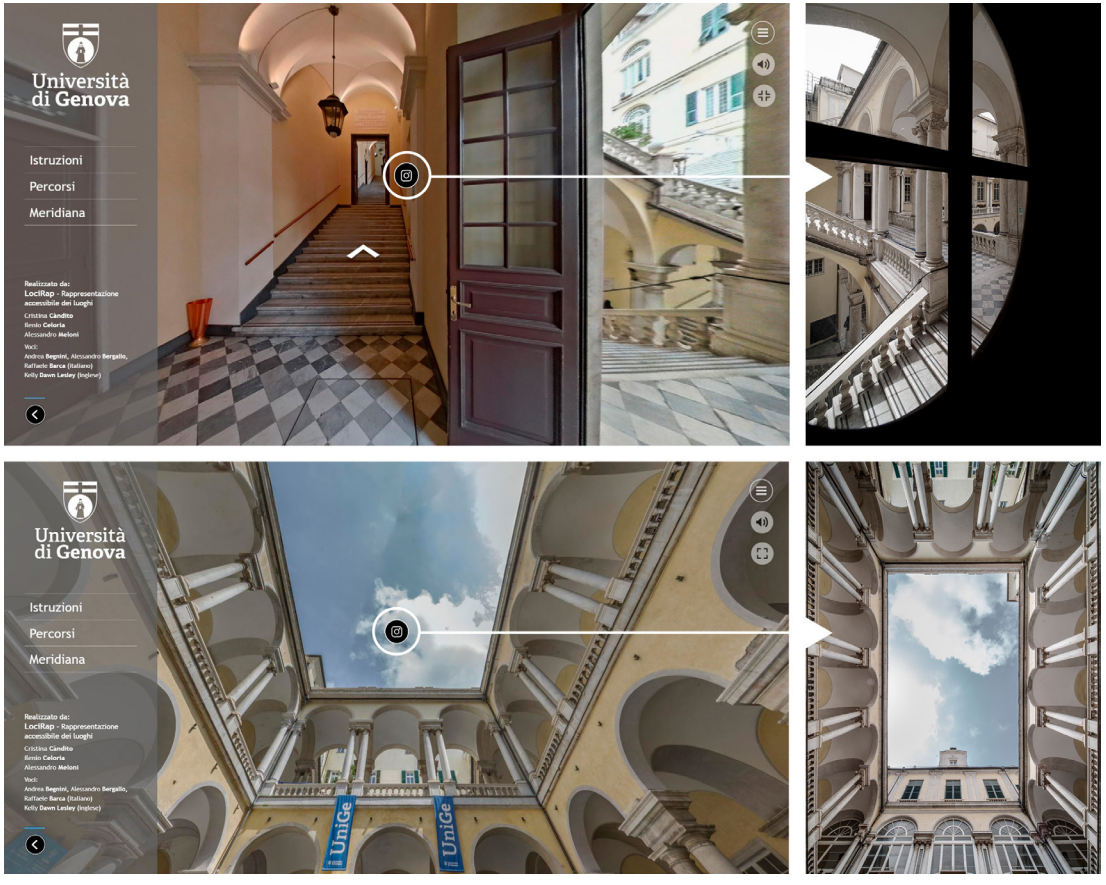


Fig. 6. Multimedia tool. Top left: staircase leading to the corridor of Saint Ignace. Top right: window through which you can see a glimpse of the loggia. Bottom left: courtyard. Bottom right: zenithal photograph of the courtyard.

can be called "suspension of disbelief": that is, we suspend our critical faculties to enjoy that digital space while ignoring its inconsistencies. We are so emotionally involved in what we see that our neurons stop constantly reminding us that it is fiction. We are therefore faced with a technology that tells stories in an extremely realistic way. They are stories that transform the user from observer to protagonist through an interaction that allows them to make choices about the path to take.
Stating that new visual relationships are created does not mean that the shape of space changes in front of the camera but that, for example, the symmetry offered by frontal vision is the result of photographic vision. It is precisely this aspect that sometimes allows us to "measure" space and understand its architectural qualities.
The multimedia tool was designed as an experiential technology so engaging that it fools our brain into thinking it is in another place. This illusion

DOI: https://doi.org/10.20365/disegnarecon.32.2024.19

ISSN 1828-5961

If virtual reality recreates real spaces, playing fully on the concept of suspension of disbelief and leveraging immersion to tell stories or to allow the user to have particular experiences, heightened sense of reality, on the other hand, is a tool, exactly like a wheel, a lever, a petrol engine or a mobile phone. Like all tools, it seeks to increase the potential to make us better, smarter, and faster. In augmented reality the main sense to be improved on is sight and, for this reason, in its most common meaning, it is a technology that adds - in real time - a digital layer on top of what we see (Cappannari, 2022). That is, augmented reality is an expansion or integration of the reality that surrounds us, an enrichment of our senses thanks to digital information.
When technology allows us to learn through interaction, we are no longer simple users but protagonists capable of making choices and enriching our experience in a personal way. As we have seen with the multimedia tool, you can choose two routes: the one that uses a system of stairs to get to the beginning of the corridor of Saint Ignace and the Hall of the Sundial, located at the end of the corridor, or the more accessible route in which, via the lift, you reach the corridor of Saint Ignace directly. The virtual movement experience carried out in the Palace also allows you to move from the main path to observe the courtyard from the loggia or other significant points of the Palace (Fig. 7).

2.3. A CONSCIOUS AUTONOMOUS USE

Autonomy is one of the prerogatives of accessibility and is pursued here in the hopes of allowing blind people, and more generally, all potential users, active, conscious and as autonomous participation as possible. These intentions have led to the definition of further strategies to enrich the visitor experience, with particular attention given to the blind. Two main aspects were analysed in the project [2]: the achievement and functioning of the Sundial Hall. A podotactile path was thus created, as well as a system of tactile models and communication materials regarding the astronomical instrument and the Palace.

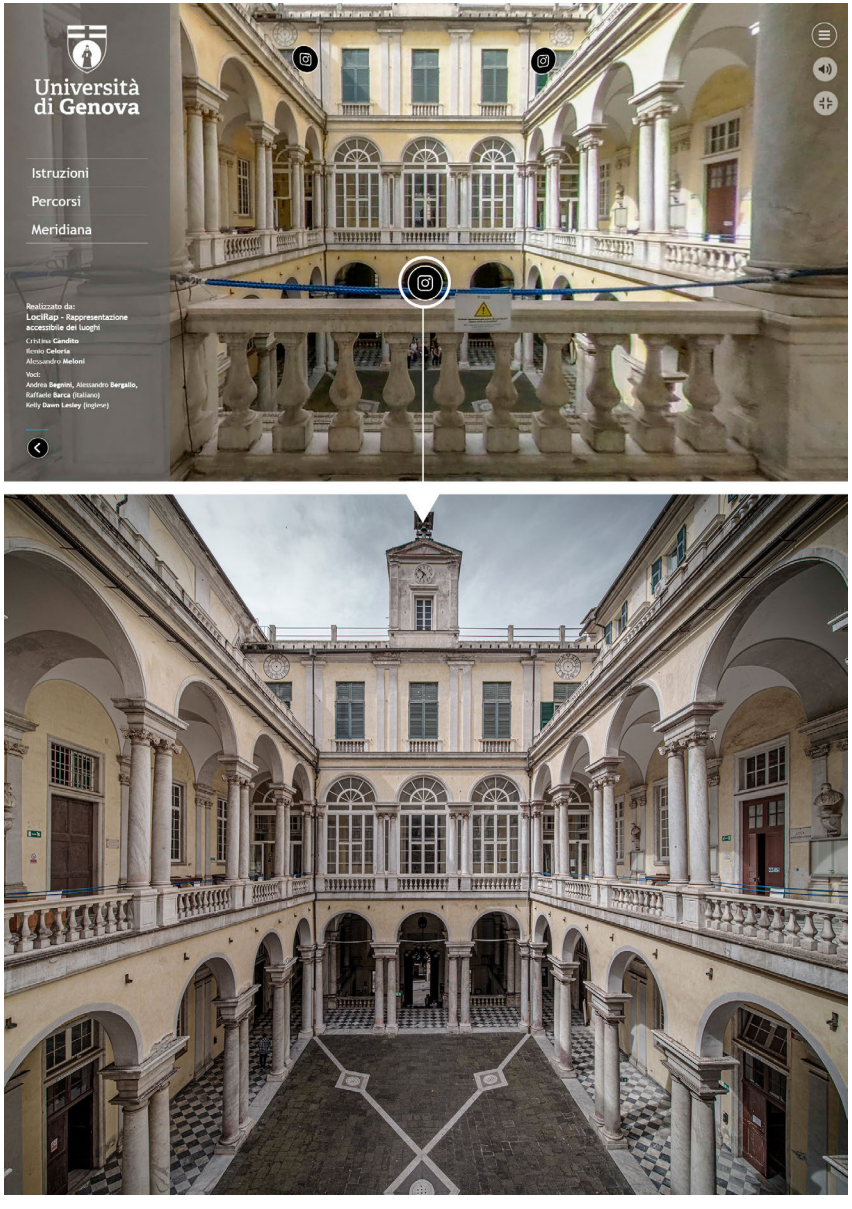


Fig. 7. Multimedia tool. Above: loggia. Bottom: courtyard seen from the loggia.

DOI: https://doi.org/10.20365/disegnarecon.32.2024.19

ISSN 1828-5961

The objective was to combine the dynamics of orientation of the internal space with the design limits outlined by the context. The lack of facilitated paths that lead to the Palace, such as external podotactile paths or Beacon-type geolocalization systems, constitute structural interventions that would have gone beyond the possibilities of the project itself. Once having reached the Palace, however, it is possible to access the exhibition space with an acceptable degree of autonomy depending on certain conditions [3].
The podotactile path aimed to lead blind people to the Sundial Hall and was made up of a non-slip and completely removable material that guided visitors to the elevator leading to the courtyard floor and subsequently to the elevator for the corridor of Saint Ignace (Fig. 8). The reduced visual impact due to respect for the historical context - in particular, the checkerboard flooring of the portico - appears unsuitable for visually impaired people, who prefer a clear contrast, but it was a compromise between the protection of the architectural heritage and its overall appearance and a need for inclusive approaches. The choice was nevertheless effective thanks to the evident material difference, capable of guaranteeing the tactile recognition of the path, through the use of a stick. The QR-Codes present along the route allowed you to access key information about the Palace and, above all, understand the layout of the essential services that are crucial for accessibility. The graphic code used is perfectly accessible to blind people, who can interact with the QR-code recognizing their position, thanks to its square shape which interrupts the linear development of the podotactile path, thus promoting the recognisability of this place (Fig. 8).
After reaching the exhibition area, it became possible to concentrate on the educational materials capable of illustrating some of the architectural qualities of the Palace, in addition to providing specific materials on the astronomical instru-

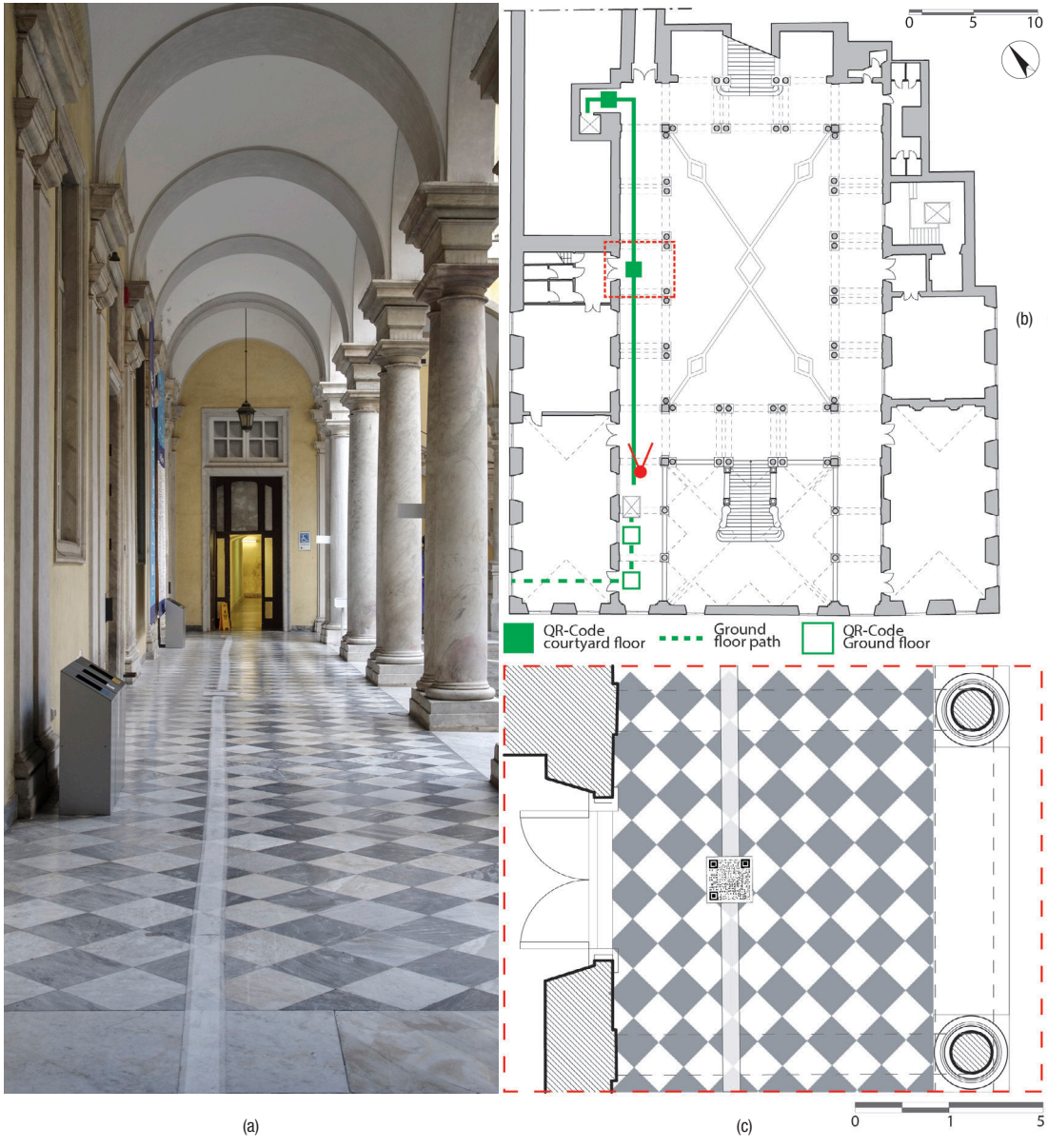


Fig. 8. The podotactile path: a) the installation along the western arm of the portico; b) the planimetric development of the route (courtyard plan); c) example of QR-code positioning.

DOI: https://doi.org/10.20365/disegnarecon.32.2024.19

ISSN 1828-5961

ment (Fig. 9). The former Jesuit college was thus described through different expressive methods where communication is hybrid and audio descriptions or three-dimensional models accompanied by texts in Braille overlap with the visual images. The posters, arranged in a roll-up, present the drawings produced during the curricular teaching [4] and the research and dissemination activities. Among the latter, a project carried out with the Cometa Blu Foundation, together with the participation of individuals with autism spectrum disorders, was featured [5] (Fig. 10) in order to underline the role of architectural design and the commitment to defining inclusive teaching methodologies (Càndito & Meloni, 2023). The drawings made by a group of students from a foreign institution, carried out in the context of Erasmus projects [6], were also presented. The QR-codes placed on each poster allowed visitors to obtain an audio description of the content and the codes were presented in the explanatory introduction of the exhibition and were implement on the podotactile path using dimensions and positions (approximately 1.10m high) which facilitate the acquisition of the material even for blind people.
To describe some architectural characteristics of the Palace, three-dimensional models were created supported by descriptive sheets in Braille and high contrast words. The first high relief represented the section of the entrance to the Palace (Fig. 11) in order to describe its characteristic altimetric development and some architectural elements such as the columns, the vaults and the access portal. These subjects are visible but difficult to perceive through touch, but thanks to this model, could find a tangible place in the imagination of the blind person. Another considerable architectural feature of the palace is the presence of porticoes and loggias along the perimeter of the courtyard. In particular, the loggia, which constituted the reference for the activity carried out with the Cometa Blu Foundation, was reworked according to a tactile interpretation key, which allows us to appreciate the perspective sense of the scaled floors according to the perspective of depth (Fig. 12).

Fig. 9. Setup of the Sundial Hall: photographic shot of the exhibition as a whole, on the right of the image the arrangement of the Roll ups, on the table on the left the tactile material.

The tactile mode of communication finds its expression in the representation of the astronomical instrument, as its present functioning - with the luminous projection on the meridian line - is aimed exclusively at sighted users. The tactile material relating to the sundial therefore has the objective of tangibly conveying the functioning of the instrument and, at the same time, providing didactic and educational support useful for everyone. The gnomonic hole sundial of the University of Genoa Palace was represented tactilely through a complex physical model, which used a formal language aimed at explaining not only the general functioning of the device but all of the contextual components and recognizable elements along the line in marble arranged on the floor. To enrich the tactile experience, the south-west corner of the Chamber was represented using a cross-section aimed at enhancing the recognition of the important spatial qualities. The work accomplished is twofold; on the one hand, the architectural characteristics were described, and on the other, the system that regulates the meridian line was explained. From an architectural point of view, the main formal characteristics were taken care of, carrying out appropriate simplifications aimed at facilitating tactile reading. The elements of the internal façade which houses the Sundial window (Fig. 13) were illustrated, with the bookcases arranged along the walls albeit in a simplified

DOI: https://doi.org/10.20365/disegnarecon.32.2024.19

ISSN 1828-5961

form, conducive to tactile perception. The wooden gallery, reduced to facilitate interaction with the maquette, was also depicted. To understand the meridian line in its functional characteristics, we proceeded to give shape to the light ray that allows the projection of the solar disk onto the pavement through a thin wooden stick that slides along a groove arranged and oriented in the same way as the real meridian line, to simulate the path of the sun at midday throughout the year. This choice lead to a necessary re-modulation of the proportions of the meridian line which, however, did not affect the global perception. The groove corresponded to the central brass line, while the marble component was rendered in relief (Fig. 14). The presence of the solar ray stick led to the modification of the shapes of the window, and the gnomonic hole, which originally was very small in size, took on a complex and rather impactful shape in the tactile version, but was fundamental for the effectiveness of the simulation. In addition to describing the movement between the two extremes of the line in order to recognize the solar projection, it was essential to describe the four main moments of the year, solstices and equinoxes, and the zodiac signs present. Formal language, along with textual descriptions, was crucial for the effective communication of the message. Two types of shapes different in geometry and relief were created: a square, to describe equinoxes and solstices, and an ellipse, for the zodiac signs (Fig. 14); on both types we included alphanumeric indications in Braille. The different shapes were employed to allow visitors to easily identify the type of material with which they were interacting, and the Braille alphabet was used in reference to a legend where the specific names of each element involved were indicated, offering a simplified reproduction of the existing space (Grassini, 2015; Secchi, 2018; Sdegno & Riavis, 2020), focusing on the message to be transmitted and therefore on the consequent simplification of the forms.

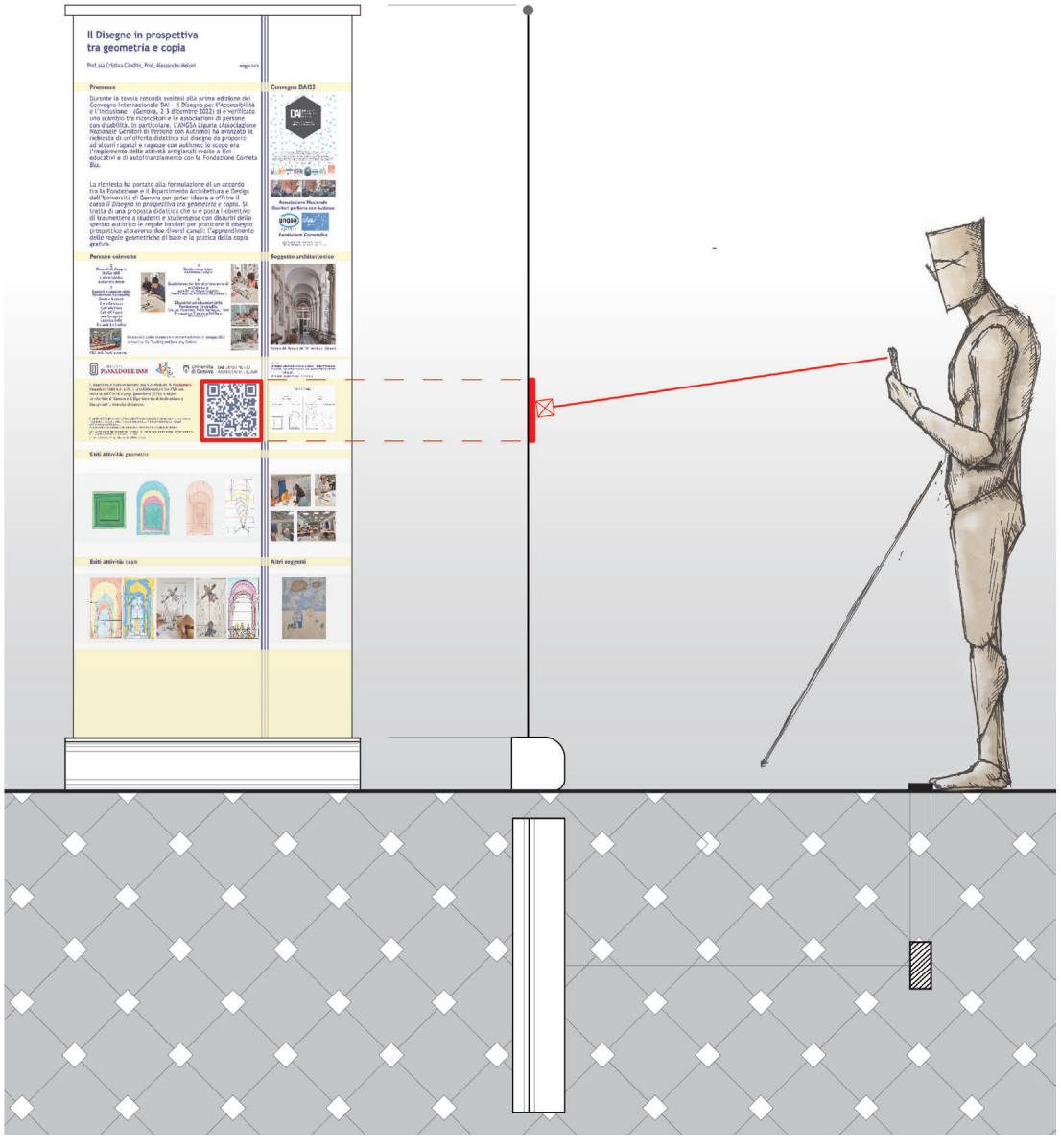
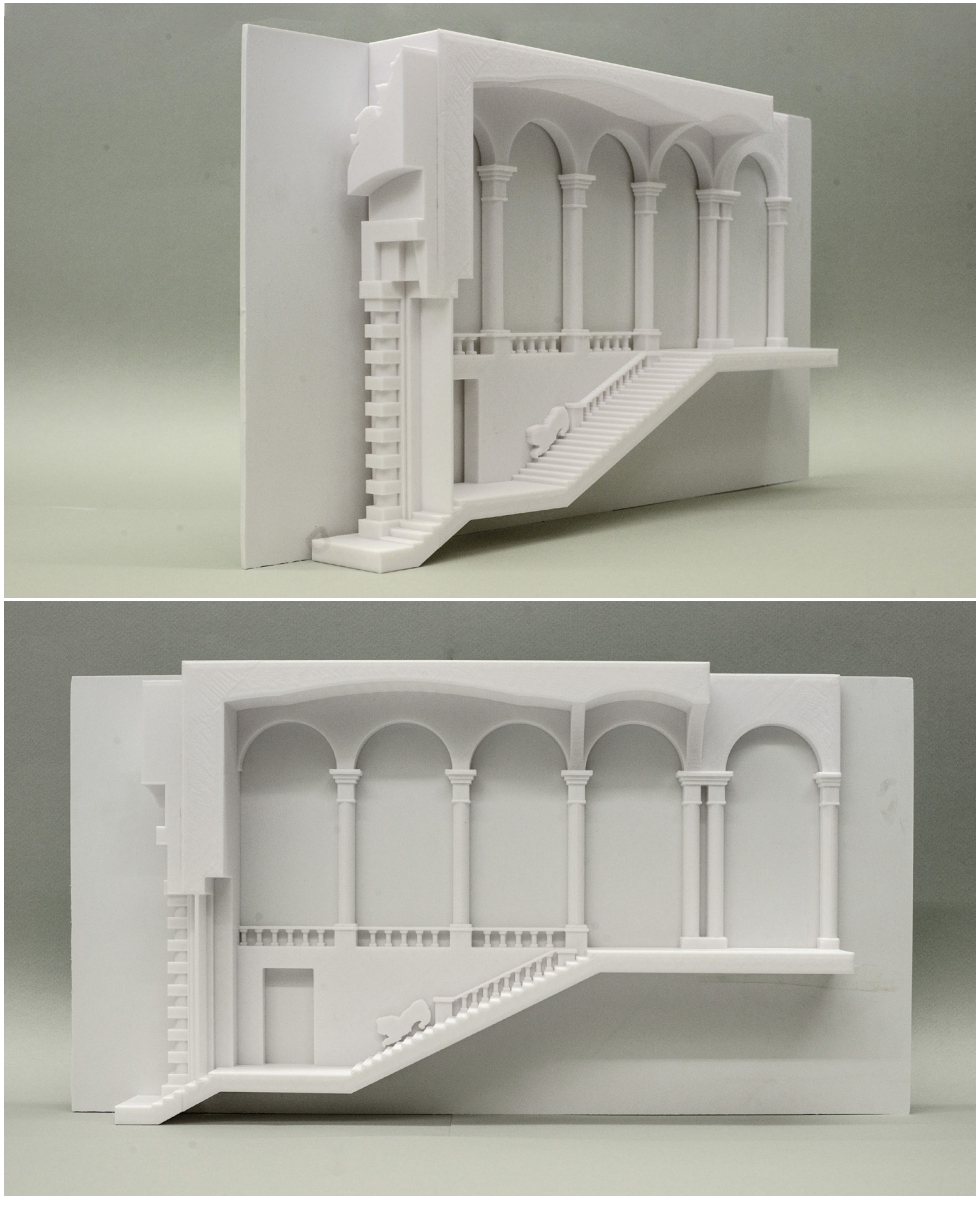


Fig. 10. The use of the exhibition materials: detail of the poster dedicated to the activity carried out in collaboration with Cometa Blu; above the prospectus and the interactive mode for a blind person, below the plan drawing of the podotactile element necessary to correctly identify the QR-code..

DOI: https://doi.org/10.20365/disegnarecon.32.2024.19

ISSN 1828-5961



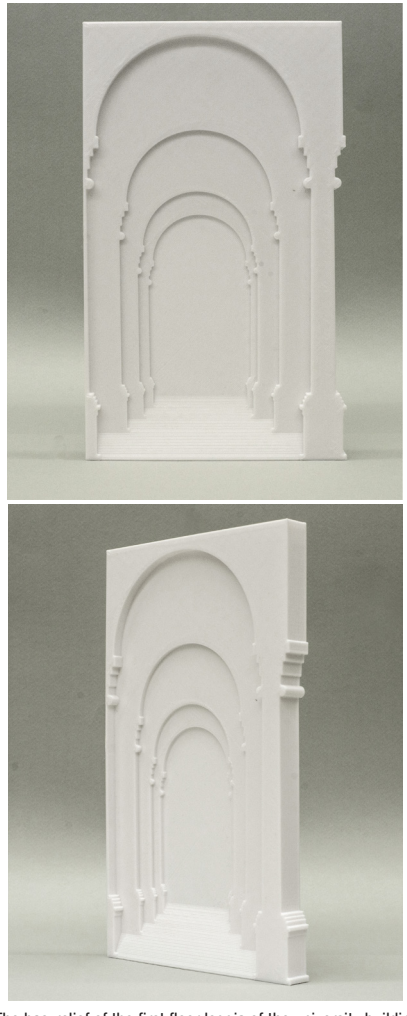


Fig. 12. The bas-relief of the first floor loggia of the university building in its tactile version.

Fig. 11. High relief of the University Palace: section representing the difference in height between the access on via Balbi and the courtyard level..

DOI: https://doi.org/10.20365/disegnarecon.32.2024.19

ISSN 1828-5961

3. CONCLUSION

The multisensory communication proposal of the Palace and the Sundial Hall is part of a broader context which involves not only the accessibility of cultural heritage, but also its communication through multimedia tools, such as elements of education in the perception of architectural space, and teaching and dissemination. Each element of the project was designed to allow as autonomous a visit as possible, encouraging spatial orientation, the use of essential services and the acquisition of fundamental information through the positioning of QR-codes. The same perceptive channel was exploited through the creation of tactile models capable of representing the space not necessarily in its dimensional or material completeness but by providing the correct support for enabling a haptic exploration of space capable of generating the mental reconstruction of the environments.
An accessible use of spaces and cultural contents must be informed not only on the level of substitute perceptions, for example by considering the appropriate reliefs to obtain a tactile reading. It is also necessary to make use of updated regulatory and social advancements that provide for a change of point of view that intervenes on the context and provides the information necessary to obtain illustrations and cognitive paths adaptable to different conditions and needs.

Fig. 13. The tactile model of the Sundial Hall: below the internal space, below the external view with the wooden element representing the solar ray.

DOI: https://doi.org/10.20365/disegnarecon.32.2024.19

ISSN 1828-5961

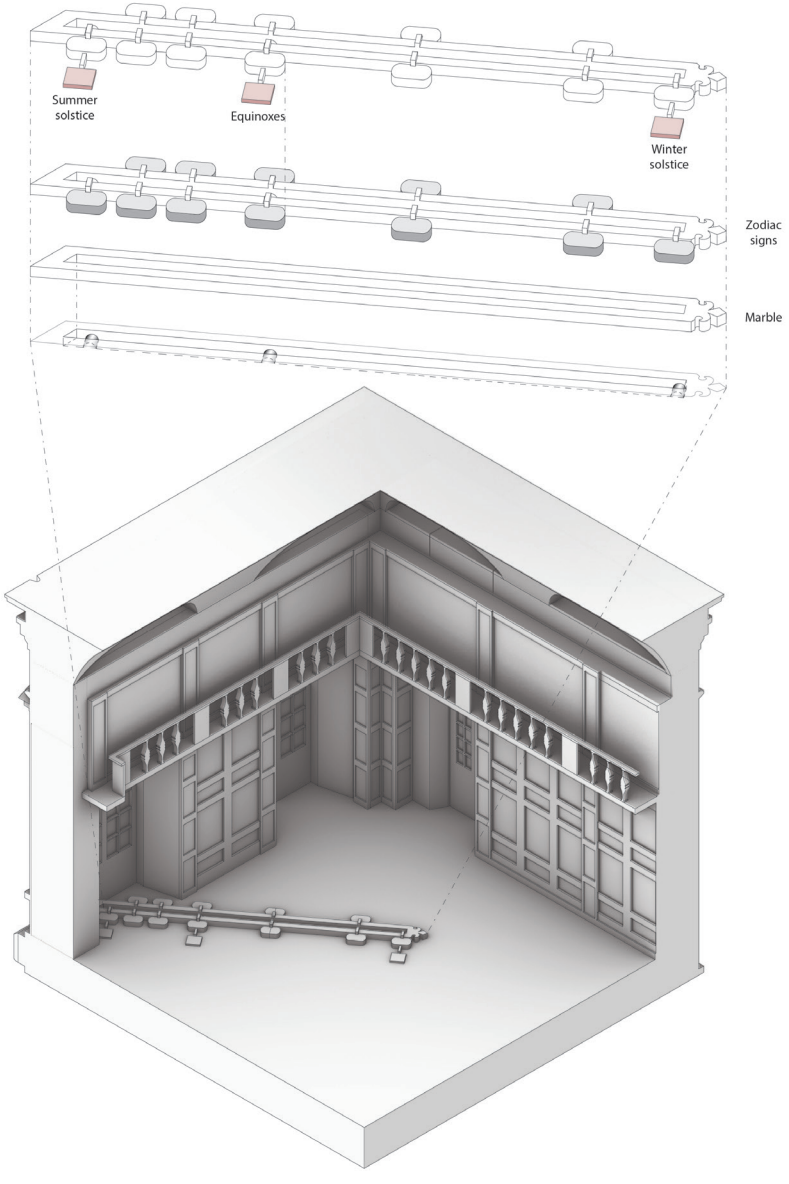


Fig. 14. Descriptive axonometry of the different components that define the tactile meridian line.

ACKNOWLEDGEMENTS

The study was conducted partially with P.R.A. research funds. 2023 (Research Projects of the University of Genoa, entitled "Projective and perceptive phenomena for accessibility in architectural representation") coordinated by C. Càndito, with the participation of A. Meloni.
The project was partially funded by STEP – Stem and Equality, Diversity and Inclusion: an open dialogue for research enhancement in Portugal. HORIZON-WIDERA-2021-ACCESS-03-01, project n.101078933.
The images were created by the authors.
The astronomical aspects were handled by: Walter Riva. A mobile wooden apparatus to mask the hole was designed by: Valter Scelsi and Manuel Gelsomino, with construction by O' Bancà. The multimedia tool, the accessible path, the tactile models and the teaching materials were created by: Cristina Càndito, Ilenio Celoria and Alessandro Meloni.
Although the text was conceived in collaboration between the authors, the section "Interactive multimedia communication" was written by Ilenio Celoria, "A conscious autonomous use" was written by Alessandro Meloni and the sections "People and space", and "The gnomonic hole sundial of the University Palace of Genoa" were written by Cristina Càndito.

DOI: https://doi.org/10.20365/disegnarecon.32.2024.19

NOTE

[1] The exhibition was created following the formation of the working group established by the University of Genoa, of Fabrizio Benente, Cristina Càndito (coordinator), Gisella De Simone, Lauro Magnani, Stefano Schiaparelli, Valter Scelsi, Giacomo Montanari, Walter Riva and Michela Santamaria.

[2] The "Project for the implementation of accessibility of the exhibition organized by the Working Group of the University of Genoa" was created by A. Meloni (responsible for the financing granted by the Passadore 1888 Foundation), together with C. Càndito, I. Celoria, with the collaboration of Stefano Mantero, delegate for culture and tourism of the council of the Genoa provincial section of the Italian Union of the Blind and Visually Impaired (UICI).

[3] However, it is essential to carry out a phase prior to the visit, which consists in consulting the rules for access to the exhibition, described in the informative material.

[4] Illustrations were presented of the final exercise carried out by the students of the Course of Study in Architectural Sciences, as part of the Representation Laboratory 1A - a.y. 2022/23 (prof. C. Càndito and A. Meloni).

[5] The course was held in May 2023 in accordance with an agreement between the Cometa Blu Foundation and the Architecture and Design Department, under the scientific responsibility of C. Càndito and with the collaboration of A. Meloni.

[6] Drawings were realized by students from RWTH Aachen University through the agreement with the Department of Architecture and Design of the University of Genoa. Contact person: C. Càndito.

REFERENCES

Arthur, P., & Passini, R. (1992). *Wayfinding: People, Signs, and Architecture.* New York: Mc- Graw-Hill.

Bösel, R. (2012). Episodi emergenti dell'architettura gesuitica in Italia. In I. Álvaro Zamora, J. Ibáñez Fernández, J. Criado Mainar (Eds.), *La arquitectura jesuítica. Actas del Simposio Internacional. Zaragoza 9-11 diciembre 2010*, (pp. 71-89). Zaragoza: IFC - Institución Fernando el Católico.

Cabezos-Bernal, P.M, Rodriguez-Navarro, P., Gil-Piqueras, T., Martin-Fuentes & D., Rossi, A. (2023). Creating Virtual Art Galleries to improve dissemination and accessibility. In *Proceedings of DAI23 – Drawing for Accessibility and Inclusion* (pp. 228-243). Alghero: Publica.

Càndito, C. (2020). *Rappresentazione e Accessibilità per l'Architettura.* Morrisville, NC: Lulu.

Càndito, C., & Meloni, A. (2022). I due volti dell'orientamento urbano. In Bianconi F., Filippucci M., Ceccaroni S. (Eds.), *Città centrifughe. Città come sostanza di cose sperate* (pp. 261-274). Rimini: Maggioli Editore.

Càndito, C., & Meloni, A. (2023). Un disegno prospettico accessibile. Aspetti percettivi e tecniche didattiche nell'ambito dei disturbi dello spettro autistico. In *Proceedings of DAI23 – Drawing for Accessibility and Inclusion* (pp. 394-408). Alghero: Publica.

Cappannari, L. (2022). *Futuri possibili. Come il metaverso e le nuove tecnologie cambieranno la nostra vita.* Firenze: Giunti Editore.

Colmuto Zanella, G. (1996). *L'architettura del Collegio tra XVI. e XVIII secolo in area lombarda.* Milano: Guerini studio.

Devlieger, P., Renders, F., Froyen, H., & Wildiers, K. (Eds.) (2006). *Blindness and the Multi-Sensorial City.* Antwerp – Apeldoorn: Garant.

Empler, T. (1997). *Progettare il comfort urbano e d'interni: Guida ad una progettazione plurisensoriale.* Rimini: Maggioli.

F. Lamera & G. Pigafetta (Eds.) (1987). *Il Palazzo dell'Università di Genova. Il Collegio dei Gesuiti nella strada dei Balbi.* Genova: Università degli Studi di Genova.

Gagliardi, M.L. (2010). *La misura dello spazio. Fotografia e architettura: conversazioni con i protagonisti.* Roma: Contrasto.

Golledge, R.G. & Stimson, R.J. (1997). *Spatial behavior: a geographic perspective.* New York: Guilford Press.

Grassini, A. (2015). P*er un'estetica della tattilità: ma esistono davvero arti visive?* Roma: Armando Editore.

International Classification of Functioning and Health (2018) (https://www.who.int/standards/classifications/international-classification-of-functioning-disability-and-health).

Lynch, K. (1960). *The image of the city.* Cambridge: MIT Press.

Mallgrave, H.F. (2015). *Architecture and Embodiment. The implication of the new sciences and Humaties for Design.* London: Routlgedge.

Mammarella, N., Cornoldi, C. & Pazzaglia, F. (2005). *Psicologia dell'apprendimento multimediale. E-learning e nuove tecnologie.* Bologna: Il Mulino.

Meloni A. (2021). Wayfinding and Accessibility for the Contemporary City. In Sanchez J.S, Barco, M.A (Eds.), *De la Polis a la Urbe a Través de Miradas Interdisciplinares* (pp. 309-324). Madrid: Mc Graw Hill.

Pallasmaa, J. (2012). *The eyes of the skin: Architecture and the senses.* New York: Wiley-Academy.

Persson, H., Ahman, H., Yngling, A. A., & Gulliksen, J. (2015). Universal design, inclusive design, accessible design, design for all: Different concepts—one goal? On the concept of accessibility—historical, methodological and philosophical aspects. *Universal Access in the Information Society*, 14(4), 505–526.

Sdegno, A., Riavis, V. (2020). Toccare la profondità: restituzione prospettica e percezione aptica inclusiva. In *Disegnare Idee Immagini*, XXXI (60), 72-83.

Secchi, L. (2018). Toccare con gli occhi e vedere con le mani. Funzioni cognitive e conoscitive dell'educazione estetica. In Caliri, G., Donatiello, P., Miele, S. (Eds.). *Ocula. Percorsi di gioco. Ricerca e discorso ludico per la comunità*, 19(19), 15-31.

Shore, S. (2009). *Lezione di fotografia. La natura delle fotografie.* London: Phaidon.

DOI: https://doi.org/10.20365/disegnarecon.32.2024.19