

Effects of Spatial Modelling on the Perception of time. Definition of Places Through Temporal Typologies

Stefano Sartorio¹, Francesco Airoidi¹¹ Politecnico di Milano

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The complex relationship between time and architectural design manifests itself in many ways, some of which are emblematic of how temporalities are part of the very concept of architecture. When we talk about time, we frequently think about its consequences on buildings (i.e. generating forms of decay), or how architecture reacts to its cyclical or linear flow - days and seasons, years and centuries - or how architects refer their work to history. Moreover, in the sphere of design, further typologies of temporalities come into play; after all, projecting something into the future is a significant feature of design itself.

In the field of perception and consciousness, some elements allow us to link the notions of space and time. 20th century philosophical literature is full of reflections on this relationship, starting from the phenomenological approach to reality and subsequent authors like Henri Bergson, Martin Heidegger and Dino Formaggio, who demonstrated how the individual perception of time was influenced by the pure form of space: topics such as duration, simultaneity, instantaneity, endurance and other kinds of temporalities can be read as consequences of the spatial action on individuals.

If space and time are related, then the manipulation of space - the matter of architectural design - necessarily affects the perception of time. Light and shadow, transparency and opacity, sound and silence, solid and hollow (etc.), are the proper tools of architects' practice to determine different temporalities within spatial design, identifying architecture as the territory where this relationship materialises. In this research paper, references of this concept are investigated through effective examples, which best represents the architectural design capability to determine dilations, contractions or suspension in time perception.

Trying to observe these topics from the research in peri-urban and inner European territories - one of the frontiers of architectural study in Western countries - and acknowledging that architectural design is a modification of time and not just of space, suggests architects to apply time-based design strategies which are tailored to the needs that the 21st century dynamic and unstable context requires.

1. The relationship between space and time

It is a matter of fact: time and space are connected. Studies from the science, philosophy and literature world well defined that. The most famous of these, which generated a wide-ranging critical debate in the early 20th century, involving authors from different cultures and backgrounds, was the one elaborated by Physicist Albert Einstein in 1905 and later expanded, which took the name Theory of Relativity. There were enormous repercussions of Einstein's work on the *Zeitgeist* "the spirit of the age", starting with that first paper entitled *Zur Elektrodynamik bewegter Körper* (Einstein, 1905). For the first time in history, time ceased to be an autonomous and uniquely measurable entity and became a descriptive variable deeply linked to the three spatial ones. To summarise the thinking of the Nobel Laureate in Physics, it is useful to borrow the words of Brian Greene,

according to whom «Einstein supports the strange theory that two observers in relative motion with respect to each other have different perceptions of time and distances. As we shall see, this means that two identical clocks, worn by two similar observers, do not mark the hours synchronously and therefore do not agree on the intervals of time elapsed between two fixed events. Restricted relativity shows that this statement has nothing to do with the precision of clocks, but rather that it is a true characteristic of the phenomenon of time» (Greene, 2005, pp. 24–25).

Since the publication of Einstein's works, time has ceased to be just a physical matter and has immediately affected the spheres of philosophy and literature, demonstrating the extent of this "revolution". In fact, 20th century philosophical literature is full of reflections on this relationship between space and time: after all, they are objectively measurable and subjectively experienced, which is

why an inquiry involving the humanistic disciplines lends an aura of greater completeness to the research. Specifically, in the field of perception and consciousness, some elements allow us to link «what Kant had defined *a priori* data of sensitivity, that is, space and time» (Panza, 2014, p. 39). Edmund Husserl, in 1913, started drawing a phenomenological approach to reality from which some authors like Henri Bergson, Martin Heidegger and Dino Formaggio moved to demonstrate how the individual perception of time was influenced by the pure form of space. Topics such as duration, simultaneity, instantaneity, endurance and other kind of temporalities can be read as consequences of the spatial action on individuals, «once we have interiorized our own duration as motion in space» and «we naturally form the idea of instant, [...] as soon as we acquire the habit of converting time into space» (Bergson, 1965, pp. 52–52). According to Henri Bergson, space is an *a priori* datum filled with perceivable objects, while time is not pure form: pure duration «is given by the succession of our data of consciousness» (Bergson, 1889, p. 58) that we place side by side, arranging them spatially (Panza, 2014, p. 39).

Starting from these premises, it can be stated that spatialized time is the fourth dimension of space; this way, we encounter the territory of architecture, intended as a discipline concerned with the measurement and manipulation of space through design. Therefore, architecture is certainly focused on space, though the project of architecture works is bound to the temporal dimension, meeting various shades of construction phases, perceptive atmospheres, and subjective perception of time by the users. But the relationship between time and architecture today is affected by a crisis of definition «due to the acceleration of processes, the immateriality of the phenomena, and the simultaneous spread of information. The technical and technological acceleration that affects our living and contemporary interest, directed at the past interpreted as a heritage, decidedly emphasises the space-time ambiguity of events» (Faroldi, 2020, p. 20).

Since the research is interested in temporality in architecture and in the cause/effect dynamics of time and speed mutations in certain spaces, it is necessary to renounce the objective and external vision, promoted to conceive the questions that exist between this peculiar and interesting binomy of space and time and, necessarily, to come across the subjective dimension intrinsic to this issue. We will therefore proceed with the tracing of these effects, attributable to spatial forms of the architectural field or tangents to it.

2. Time and temporalities in architecture

The complex relationship between time and architectural design manifests itself in many ways, some of which are emblematic of how temporalities are part of the very concept of architecture. Moreover, in the sphere of design, further typologies of temporalities come into play; after all, projecting something into the future is a significant feature of design itself (Gregotti, 2020): «the central notion is that of design, therefore the action and transformation towards the future» (Ugo, 2007, p. 14). «The fundamental phenome-

non of time is the future» (Heidegger, 1976, p. 40), and «the past does not exist. Everything is simultaneous in our life and culture. Only the present exists. In it we recreate the past and imagine the future» (Ponti, 1960, p. 79). In associating the notion of time with the discipline of architecture, we often resort to a schematism whereby the former pre-exists the latter, configuring itself as a kind of universal container within which facts, objects and buildings “happen”. In fact, when we talk about time, we frequently think about its consequences on buildings (i.e. generating forms of decay), or how architecture reacts to its cyclical or linear flow - days and seasons, years and centuries - or how architects refer their work to the past. The history of architecture itself often shows some issues related to the schematism explained above, which sometimes move it away from a pure critical view (Ugo, 2007, pp. 16–18). But including the concepts of memory and tradition in the study of this subject, it becomes evident how - through the definition of some temporalities - history of architecture is not definable into a static system but resolves itself into a set of mutations which transforms a present into another one, allowing humans to assert their temporal presence by the natural settlement in space (Rogers & Molinari, 1958/1997, pp. 253–254).

In architecture, thinking about temporalities means also embracing a much broader sense of the concept of time, linked to the notions of space and figure. While space is often thought of as homogenous and external to us, «various qualities that make it perceptible to us are phenomena derived from the presence of a conscious body, such as directionality, envelopment, and orientation» (Judson, 2011, p. 38): as also Steven Holl wrote in his *Parallax*, the apparent horizon, formed by the superimposition of perspectives due to body movement, determines the interpretation of space (Holl, 2000, p. 26). The philosopher Dino Formaggio, in a series of talks given in a seminar at the Faculty of Architecture in Milan between 1985 and 1986 and collected in a 1990 publication entitled *Aesthetics, Time and Design*, demonstrates how architecture operates in perennial confrontation with the material body and time from three pragmatic figural experiences: the figure-image that destroys reified object boundaries, the figure-form that is transformative power, and the figure-matrix that marks the reference to the realm of symbolic archetypes and constitutes a kind of “matrix” for architecture (Panza, 2014, p. 41). To explain that time is not an entity innate to architectural works but, in some ways, undergoes an influence from them, it is necessary to reflect on the meaning of the concept of “place”. «Architecture is constituted as a measuring element, capable of confronting itself with the landscape to the point of defining attributions of meaning; the “figure” [...] becomes an element of interpretation of the place» (Spagnolo et al., 2016, p. 177). It is therefore a dialectical game of construction of meanings: a place is born from the spatial interpretation of an anthropogeographic landscape (Gregotti, 1966/2014, p. 61) in which the human mind projects its own emotional and temporal dimension. Consequently, it appears clear how the concept of identity is

linked to the binomial space/temporalities, which is deeply rooted in the definition of places and territories.

Also, technology, as well as architectural composition, plays a key role in constituting the relationship between architecture and temporalities: consider, for example, the role of elevators in skyscrapers, which made architecture out of the simple multiplication of space in height, giving rise to what Rem Koolhaas calls «congestion culture» (Koolhaas, 2001/2004, p. 115). In this way «day and night are radically shortened, time accelerated, experience intensified, life - potentially - doubled, tripled...»: simultaneity is one of the main topics of this building typology, where different functional programs can coexist, giving birth to a kind of architecture which has, in addition to a spatial connotation, strong temporal features (Koolhaas, 2001/2004, pp. 183–200).

The architect's activity is mainly focused on the modification of space in function of living the places; however, as demonstrated above, a spatial design necessarily involves variations in temporality (and *vice versa*). Moving away from the scientific definition of time and space, the investigation continues with a reflection on their specific consequence: the perception of time *in* space.

3. Tools of architectural design in inner peripheries to operate on time by space

If space and time are correlated, then the manipulation of space - the subject of architectural design - necessarily affects the perception of time that determines places through the definition of identity, as previously written. But today, there are contexts that are experiencing a profound “identity crisis” due to processes related to depopulation phenomena: the inner peripheries, significantly distant from the centres of availability of essential services (Tognon & Bovati, 2022, p. 90). They are configured as an archipelago of small isolated centres with a predominantly mountainous or hilly landscape, an important historical-cultural heritage and relevant natural and environmental components. They present strong topics of criticality related to socio-economic opportunities, low levels of income and productivity, environmental and seismic risks, demographic ageing, depopulation and poor maintenance of buildings and landscape: aspects that determine a large number of discomforts and consequently lead individuals to accept a series of compromises to be inhabitants. The role of architectural research applied to design within the identity redefinition of places turns out to be fundamental, as it is the only discipline capable of manipulating space by fostering the projection of human emotions and perceptions that determine new temporalities. It is thus possible to identify architecture as the territory in which this relationship materialises.

After these premises, it becomes clear how necessary it is to reason about what can, in the architectural design field, simultaneously affect spatial conformation and temporal perception, thus conferring a precise identity to places. Light and shadow, transparency and opacity, sound and silence, solid and hollow (etc.) are the proper tools of architects' practice to determine different temporalities within

spatial design, «space and time are [...] objective quantities. In the heart of this relationship, the architect acquires an extraordinary awareness of the profound energy and opportunity to create time. Without being subject to it; rather, organising it, ordering it [...]. The architecture of time becomes an indicator to define, implement, and design a space, since it is an element that possesses time connected to physiological rhythms of use.» (Faroldi, 2020, p. 14). By accepting this assumption, it is useful to investigate where and how those design tools are applied, through some renowned references placed in Italian inner peripheries, which can represent the capability of architecture to determine dilations, contractions or suspension in time perception.

Monumentality/dynamism

Starting from the history of graphic arts, spatial research began to assume the fourth dimension with the Cubist experience. The dynamism and immediacy promoted by the Modern Movement and certain avant-gardes (e.g. Cubism, Futurism, Russian Constructivism), subsequently led to the birth of an architectural language focused on geometrical interpenetration, through the use of diagonals, visual connections, and anisotropic compositions, capable of manipulating the user's perception. Moreover, history shows how political entities have used the monumentality of the classical lexicon to assert and establish an appearance of stability.

The power of dimensional features is evident in the design of stately buildings of the past, such as the Ducal Palace in Urbino, a Renaissance factory commissioned by Duke Federico da Montefeltro, who, with the design of his own residence and the urban redesign of public spaces and streets, wanted to make the entire environment “prince-sized.” Today, observing the village from the valley, one perceives the representative role entrusted to architecture through its capability to define the figure of the city, an element common to some later experiences - from the American neo-Palladianism of the 18th century to the totalitarian architectural propaganda of the 20th century - with a shown communication in which the greatness of the buildings and monuments still suggests a sense of suspension in time and a sense of bewilderment in space, where people could feel overwhelmed in front of such majestic isotropic spaces (Gideon, 2004, pp. 420–439).

Light/dark

Some architectures were conceived and are generated by light. Gothic architecture, for instance, well experienced the use of candles and stained-glass windows to moderate and vary the perception of volumes of the built environment, in relation to the flowing of time. In this sense, the perceiver is fooled by the light coming through the colourful windows, constantly changing during the day.

The UNESCO World Heritage site Basilica of Saint Francis in Assisi is the church mother of the Order of Friars Minor Conventual, built in a village in central Italy. The XIII century basilica can be considered a landmark for the nar-



Figure 1. A sense of suspension in time. Laurana L., Ducal Palace, Urbino, 15th century a.D. - photo donated to the authors by Riccardo Abagnale

ration of the previously described hypothesis; indeed, it is a combination of two churches (known as the Upper Church and the Lower Church, plus a further crypt), where antithetical binomials of design tools converge. The case study, while externally showing a gabled facade, the interior of the upper Basilica is an important early example of the Italian Gothic style. This bright and spacious part of the basilica consists of a single nave with cross-vaulted ceiling, in which the transept and a polygonal apse displays a series of frescoes by Giotto. This place of collectivity, used to disseminate the contents of the Bible, the place where people could meet in their community, vibrant and dynamic, is characterised by a diffused clear light. On the contrary, entering the lower Basilica, a visitor immediately sees and perceives a different flowing of time. The Lower Church was built almost entirely in the Romanesque style: it has almost no elevation, vaults are widely decorated with dark/intense colours, and the use of light is significantly divergent from the upper level. It was designed as an enormous crypt with

ribbed vaults, giving the experience of living in a sepulchre. Entering the lower basilica, one sees and perceives the function of a sepulchral church, in a more intimate atmosphere dedicated to personal meditation. Few openings, similar to embrasures, allow the visitor to perceive the space. Though this little presence of outdoor light could unveil the passing of time, the composition of the place in elevation together with the refraction of light on the vaults, alienate the presence of time from the visitor's perception, frozen in a continuous present, where time flows in a dilated dimension.

Rhythm/continuity

Rhythm is a concept that architectural and music composition have in common. In both cases, through a spatial arrangement of elements (whether musical notes or, for example, pillars) a perceptible temporal dimension is constituted: time compressions and dilations are possible by



Figure 2. A sense of dilatation of time. Basilica of Saint Francis in Assisi, 13th century a.D. - photo by Francesco Airoidi

increasing or decreasing the rhythm of the elements that constitute and characterise the space.

An example of the above can be sought in the Parish Church of Santa Maria Assunta in Riola, a project of Alvar Aalto located in the Apennines of Emilia, Italy. Due to the dynamism characteristic of the Modern Movement, the architect designed a system that communicates through the juxtaposition of elements, their rhythm, fragmentation, and verticality. From the outside, one perceives an orientation of the volumes given by the shape of the sails in the roof and the figure of the bell tower, which induce the observer to move in space and orient the gaze in a precise direction. Inside the hall, on the other hand, space is manipulated by bringing about time compression in two different ways: through the rhythm of the portal structures transverse to the nave and through the inclination of the walls, drawing an optical cone in the direction of the altar and increasing visual depth, imparting an acceleration to the perception of the space-time system.

4. An example of output: some possibilities in fragile contexts

While it is true that the gap between urbanised and marginal territories continues to persist, it is equally clear that the latter are no longer considered only as a problem but also as an opportunity for the future: a new and different perception that stems from phenomena such as the crisis of

cities and the development model they embody, the importance of issues related to territorial security, and a profound cultural change resulting from a substantial «inversion of the critical gaze» that needs to be leveraged by applying a clear methodology to architectural-design research (De Rossi, 2018, p. 5). It is possible to construct a narrative that emphasises and enhances the fragmented and plural nature of the Italian territory, associating the concept of “social marginality” with that of “territorial marginality” and thus giving a strong spatial and temporal connotation to the themes of internal areas (Llop Torné, 2022, p. 18). In a context in which depopulation and abandonment are the most consistent socio-demographic phenomena, it is evident how the issue of living should enjoy privileged attention, and how co-living in coexistence with nature is a determining aspect there. If we conceive architecture as a possible answer to the problem of inhabiting space (in time) - an assumption that constitutes one of the important definitions of this discipline (Gregotti, 1966/2014, p. 45) - the strong relationship that exists between architectural design and the social, economic and cultural dynamics that it can trigger becomes evident. Dynamics which are crucial to re-establish a co-evolutionary and co-existential connection between peoples and territories, bringing the inhabitants back to be an integral and characterising part of it: that is, to reconstitute communities capable of projecting their own habits, customs and ideas into space, making it a place (Galán Fernández et al., 2022, p. 59).



Figure 3. A sense of compression of time. Aalto A., Parish Church of St. Mary of the Assumption in Riola, 1966-1978 - photo by Francesco Airoidi

Acknowledging that architectural design is a modification of time, and not just of space, suggests architects to apply time-based design strategies tailored to the needs that the 21st century dynamic and unstable context requires. All the more so, in a significantly sensitive field such as the fragile territories of inner areas, great attention must be paid to spatial, temporal and perceptual issues, juxtaposing architectural design themes with two particular visions that contribute to redefining places through the attribution of new identity connotations: one linked to the perception of present time and one to the ideas of past and future which territories embody.

First, it is clear how in sites far from the hustle and bustle of metropolises and the dynamism associated with certain architecture and urban conformations, there is often a perception of a present time that flows slowly, defining different social and cultural dynamics. One of the most obvious forms in which spatial variations influence the passage of time is in fact the morphology of the territory: it estab-

lishes additional levels of complexity at a larger scale and expands the theme of the research by introducing temporal distances alongside spatial ones. Adopting an effective design methodology in relation to morphological temporalities means acting on altitudes and infrastructures by communicating - through the project - with the ground line and with the concepts of flows and accessibility.

Second, regarding the concepts of past and future, it is crucial to remember that in a built environment the concentration of significant elements from different eras produces a heterogeneous landscape that the human mind considers rich, representative of the villages and towns of Italy's inner peripheries. The importance of this combination is evident both in cases of conservation and reuse projects of existing buildings in established fabrics and in reconstruction situations in areas affected by natural disasters such as earthquakes and landslides (one of the recurring themes in the study of inner territories). Environmental transformations often show people's efforts to preserve,

create or destroy the past, to make sense out of a rapid transition, or to build a secure sense of the future (Lynch, 1976, p. 3). It happens that the quality of the personal image of past and future time influences individual well-being and also our success in dealing with environmental changes, and «the external physical environment plays a role in constructing and sustaining that image of time» (Lynch, 1976, p. 1). However, our strongest emotions relate to personal knowledge, confirming that immediate continuity and individual memory are emotionally more important than remote time. In fact, our minds cannot retain everything: memories are the result of a process of selection and organisation in which we retain what is considered significant and discard what is not.

Dilations, contractions or suspensions in the perception of time, as discussed in the previous paragraphs, thus become effective design actions in the constitution of the identity of places by means of architecture. There is therefore the possibility of a shift in the meaning of territories in places through the projection in them of individual emotions that arise from the temporal perception of well-designed spaces. This awareness represents a fundamental step towards the goal of re-inhabiting internal areas, as it demonstrates the possibility of influencing the idea and image that they project in our minds.

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