

The Gestalt Principles for Cultural Heritage Understanding.

The Ermete Novelli Theater Case Study: an a-Posteriori Methodological Application

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Abstract

Gestalt psychology, originally developed to explain perceptual organization, is already employed in numerous application domains, including Medicine (for instance, in diagnostic images reading and interpretation), Neuroscience, Psychology, Computer Vision and Design. However, no studies in literature appear to apply these principles in their entirety to the field of building renovation for historical structures - especially when approached in a multidisciplinary manner, as presented here.

This paper proposes to adopt Gestalt principles as a guide method for the extraction and recognition of visual patterns aimed at the understanding of cultural heritage in terms of Engineering Approach, in cooperation with mathematical models and illustrative algorithms. Particularly Authors were involved in scientific analysis and multi-level improvement design of the “Ermete Novelli” Theater in Grottazzolina, Italy. The improvement design is both Seismic and Functional Improvement. The first is due to Post-Earthquake (Central Italy 2016 event), the second is due “Recovery and Functional Adaptation of the Historic Ermete Novelli Theater Sound, Light, Heat” Project funding. The global approach included three-dimensional surveys from laser scanning, infrared thermography, crack pattern analysis, in-situ dynamic measurements, and historical and archival evidence analysis, as well as to the overall project. The design was carried out by Authors in different moments and activity.

The purpose of this paper is “a posteriori” methodological application considering Gestalt principles, that aims to demonstrate the intrinsic presence of these principles within a correct design process and proposing them as a method to guide the preliminary stages of design.

The operational translation of the principles of proximity, similarity, good continuation, closure, good form (prägnanz), symmetry, common fate, and figure-ground makes it possible to highlight recurring patterns, complete partial traces, and identify and distinguish elements by selecting interpretative hypotheses that are most parsimonious and consistent with the evidence. The application example illustrates how this approach can contribute to clarifying relationships among elements and to structuring the reading of data in a reproducible and traceable manner. It is suggested that this methodological framework could be extended to other case studies in cultural heritage, supporting diagnosis, intervention prioritization, and post-intervention verification. The goal of this paper is not to rewrite or expand the project performed, but rather to demonstrate how these principles could have systematically guided organization, integration, and interpretation of Case Study heterogeneous data.

Keywords

Gestalt principles, Structural Improvement, Post-Earthquake Survey, Cultural Heritage Understanding, Functional Improvement, Pattern extraction, Multi-objective Optimization. ¹

1. Introduction

Extraction and recognition of visual patterns for understanding of Cultural Heritage generally aims to render legible what time has made fragile the investigated element: interrupted pictorial stratigraphies, eroded surfaces, misaligned fragments, incomplete 3D surveys.

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The task is not merely to “see” but to structure: to segment, connect, assign, and compare across time. Within this framework, the aim is to pinpoint that the eight principles of Gestalt can provide a perceptual lexicon that can be translated into stable computational criteria, capable of guiding models when data are incomplete or noisy.

Proximity and similarity support the grouping phase: elements that are spatially close and that share chromatic or textural characteristics tend to form coherent portions, which is useful for distinguishing backgrounds, motifs, and restorations. Good continuation and closure govern the reconstruction of contours and textures: lines and curves are prolonged according to the most regular solution, while nearly closed loops are favored in their “completion”. Common fate coordinates temporal analyses or orientation fields, which is useful in historical series; symmetry stabilizes planimetric and morphological hypotheses in sculpture and architecture; figure–ground separates the meaningful sign from background noise; *Prägnanz* imposes parsimony, limiting explanatory complexity to the essential structure [1]. These principles, formulated as constraints or perceptual priors, do not overwrite the data but regularize them.

Operationally, it is assumed that an objective function (that will be presented numerically in future works) balances fidelity to the data and perceptual coherence: adherence terms (photo consistency, registration errors, geometric measures) are complemented by penalties corresponding to Gestalt principles, each with a calibrated weight.

The Authors of this paper carried out the global restoration project of the “Ermete Novelli” Theater in Grottazzolina. The project, arising from the seismic damage (the Theater was classified to have overpassed the Life Safety Limit State) after 2016 Central Italy Earthquake, was already carried out considering both Structural and Functional (architectural, acoustic and lighting design) perspectives.

In this paper the Authors aim to propose a guideline capable of offering a new interpretative perspective based on former technical schemes and hypotheses: a method that systematically organizes and coherently integrates the heterogeneous data derived from multiple sources.

In this way, the complex and stratified informational framework is a-posteriori reinterpreted [2] through an organization that reflects the natural perceptual mechanisms of the human mind, ensuring greater clarity in the relationships among elements and a more immediate readability [3]. It permits us to show as these principles can assume a basic role in a design process.

Integrating Gestalt principles into actual framework produces more robust models and, above all, interpretable results: maps, segmentations and reconstructions that engage with conservation practices and with the history of the works, transforming visual analysis from a mere sum of algorithms into a method [4].

2. Case study: the Ermete Novelli Theater

The discussed case study project falls within the “Urban Cultural Hub” measure of the POR FESR 2014–2020 (Regione Marche, Axis 6, Action 16.1), whose objective was to transform the ‘Ermete Novelli’ Theater into a multimedia terminal of Grottazzolina’s cultural system, networking existing places and functions and introducing dynamic uses: a transformable stalls area, a stage also accessible as public space, a gallery equipped as a small soundboard and a foyer dedicated to conviviality and the promotion of local excellence [5].

For the urban and social context of Grottazzolina, the ‘Ermete Novelli’ Theater constitutes a primary cultural node, and the project is very ambitious according to structural situation. In fact, the Theater, an early twentieth-century Liberty-style masonry building with significant reinforced concrete elements, exhibited unexpected vulnerabilities after the 2016 Central Italy Earthquake.

It was declared out-of-service. An integrated diagnosis (historical–critical analysis, 3D laser scanning, infrared thermography, geophysical and micro-seismic testing) identified a foundational problem criticality linked to functional interventions carried out in 1984, disregarding seismic code. This fragility was confirmed by archival evidence and surveys [6].

The global project envisaged both structural works and conservative and reversible architectural restoration considering a scenario-based lighting system with circadian control and variable acoustics for multiple uses. The overall goal of the Authors of this paper is to frame a set of observations and reflections on the project through an interpretive lens based on Gestalt principles, in order to maximize legibility [7], perceptual coherence, and experiential quality [8]. Gestalt principles have historically been used to explain perceptual phenomena such as grouping, completion, and the selection of the “simplest” model. In applied contexts, the same principles here are proposed as tools to guide segmentation, contour reconstruction [9], classification by homogeneity, and, above all, the verification of global coherence [10] of the carried out interventions.

In Cultural Heritage, where three-dimensional surveys, thermal investigations, damage descriptions, dynamic measurements, architectural, acoustic and lighting designs, and historical archives coexist, such a unifying framework is intended to increase clarity, traceability, and parsimony of hypotheses [11]. Applying Gestalt to the design and diagnostics of a historic theater means transforming perceptual principles into technical criteria that make the space clearer to read, safer to use, and more consistent with its identity. In the case of the Ermete Novelli Theater (early twentieth-century masonry building, Liberty-style matrix, multiple functional uses), this translation helps orchestrate structural improvements according to Seismic Code, architectural choices, lighting direction, and hall acoustics into a unified and governable system.

3. Proposed approach

This holistic approach aims to emphasize the intrinsic presence of the eight classical principles of Gestalt: figure–ground, proximity, similarity, good continuation, closure, symmetry, common fate, and Prägnanz (good form) [12].

Each Gestalt principle is applicable to design bases; following these principles can support design choices, preventing planning errors and unnecessary repetition of phases caused by misperception or incorrect interpretation of project data, thereby reducing the overall realization time. In Figure 1 diagrams of Gestalt principles and their interaction with global design process are shown.

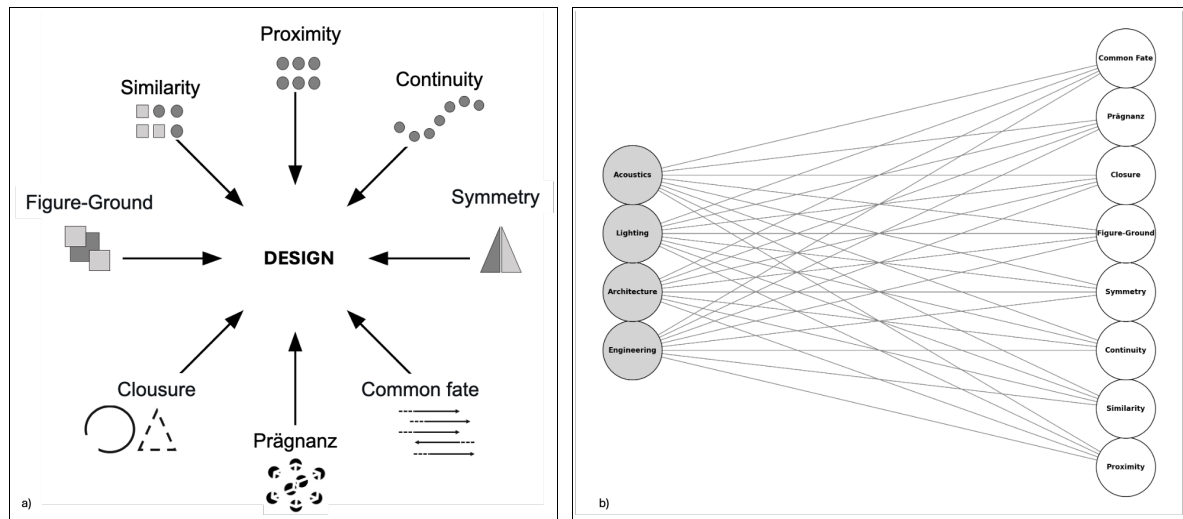


Figure 1: a) Diagram of the eight main Gestalt principles and design; b) Diagram of the interaction between Gestalt principles and engineering, architecture, lighting, and acoustics.

In Figure 2 the interaction of Gestalt principles with the classical structural improvement process for an existing structure is shown: this approach is theoretically similar to those for architecture, acoustics and lighting approaches. In every case the final check for project goal satisfaction could be a real, final experimental, check and not only a theoretical one.

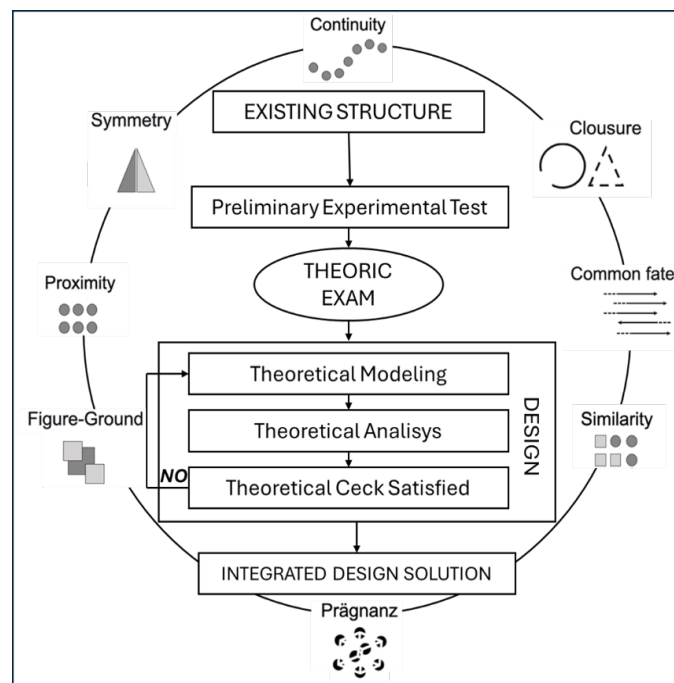


Figure 2: Specific diagram of the interaction between Gestalt principles and structural improvement process for an existing structure.

The Authors have chosen to verify these principles applicability in “a posteriori” approach to an already developed project, both to identify the unconscious presence of such principles throughout

the theoretical design phases and to highlight how certain applied techniques are based on algorithms that can be unquestionably traced back to Gestalt principles [1].

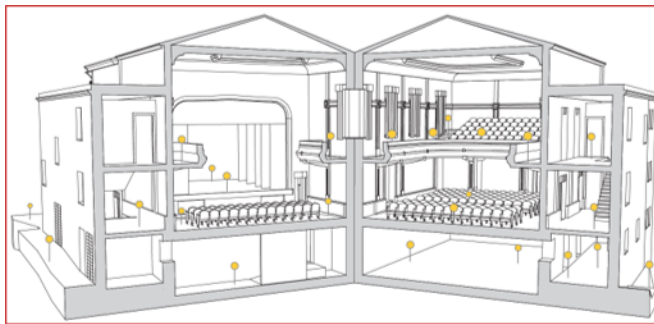
The Gestalt principles describe how the human brain organizes sensory signals into stable and interpretable sets– just as artificial neural networks and the algorithms based on them do.

In the “a posteriori” analysis of the Ermete Novelli Theatre project evolution, these principles are translated into operational rules: defining the figure and reducing the background; grouping what is close or similar; ensuring continuity where perceptual traces tend to break [13]; filling informational gaps [7]; enhancing symmetry when constructive, otherwise seeking balance; synchronizing elements that must change together; and, ultimately, pursuing “good form” as a condition of readability and parsimony [7]. The desired outcome was a Theatre that “explains itself,” while remaining scientifically measurable through standard domain indicators [2] (structural, visual, acoustic), and that – when examined in detail through reconstructive techniques – can truly be “understood”, adhering as rigorously as possible to the requirements of historical preservation [14].

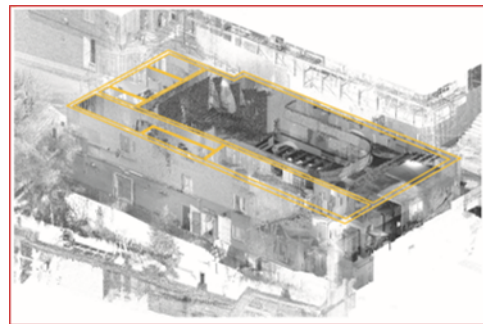
4. Structures: making the resistant form legible

The unexpected seismic behavior of the ‘Novelli,’ which emerged after the 2016 Central Italy Earthquake [15], [16], [17], also due to a foundational discontinuity introduced in the 1980s, demonstrated how essential a coherent perceptual reading of the structural figure is in relation to the background (claddings, systems, fittings) [18]. The interventions must restore continuity to the load paths and clearly distinguish what carries from what merely accompanies [19].

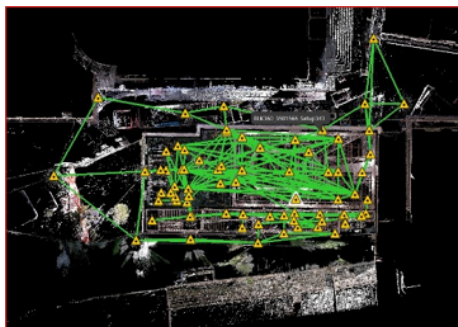
In order to restore this continuity of load path and to have a comprehensive understanding of structural and non-structural parts hierarchy a complete survey as to be carried out as shown in Figure 3 in which the laser scanner setup is presented in order to obtain the more realistic 3D model, 3D model that is the real base for any structural analysis, above all in the case of a masonry structure.



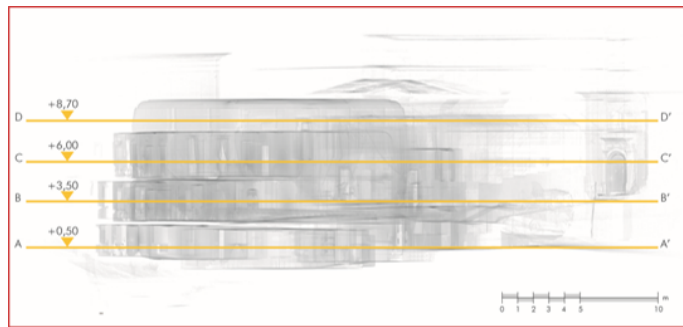
(a)



(b)



(c)



(d)

Figure 3: a) Laser scanner setup in the theater: a total of 76 acquisitions; b) Network of scanner setups; c) Capture of horizontal scans for the development of the 3D model; d) Section levels for the 3D model



Figure 4: Structural constructive sequence: in yellow original design, in red final, actual, configuration

In particular for an existing structure is necessary to know the structural constructive sequence as shown in Figure 4, it is to note that the Ermete Novelli Theater is a Cultural Heritage Building, so fortunately a lot of archive notice and information were at structural designer.

It permitted as shown in Figure 5 to evaluate the structural connection efficiency between different structural parts and to elaborate a first structural design, using quite invasive methodology (like TFE in foundation and CAM system) in order to improve structural response at basement level: this level was the more fragile level due to previous excavation at the base continuous foundation level.

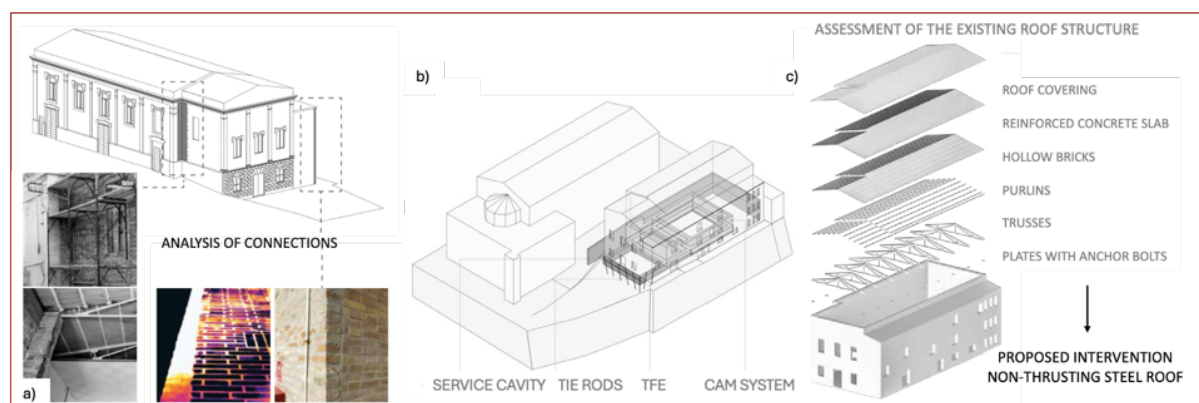


Figure 5: Structural connection efficiency evaluation, a), structural improvement hypothesis, b) & c): this hypothesis was assumed to be too invasive for a conservative point of view

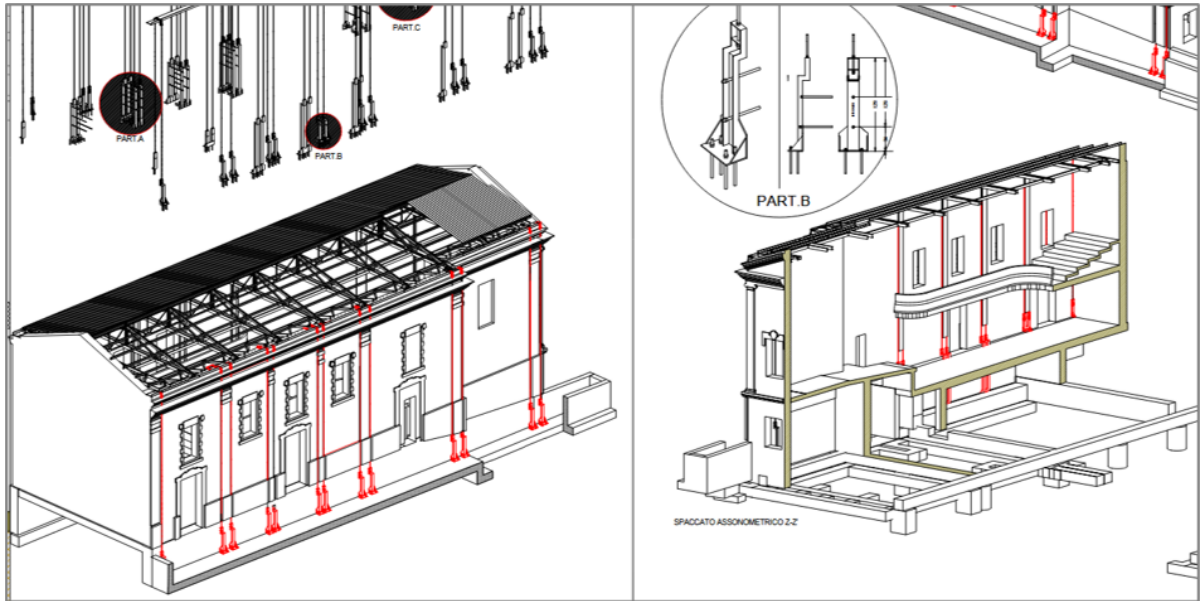


Figure 6: Structural connection efficiency evaluation and final structural improvement hypothesis: this hypothesis is assumed coherent with Cultural Heritage conservation goal

Unfortunately this previous approach didn't overpass the Cultural Heritage Authority evaluation, and a more conservative structural approach was carried out as shown in Figure 6: in this case an innovative system of steel pre-stressing ties was defined in order to permit to avoid the out-of-plane mechanism.

In this manner both structural improvements and Cultural Heritage conservation goals are reached, and final project was approved by both the Cultural Heritage Authority and Government Reconstruction Commissary.

This administrative path is really coherent with Gestalt approach: each Gestalt principle, together with its corresponding supporting algorithm that has to be selected, can be identified within the design phases.

The Authors proposal was carried out as discussed below:

1. *Figure-ground*: The figure coincides with shear walls, diaphragms, and effective connections; the background comprises infills and finishes. The key operation is to render the figure visible already 'in design' (details, joints, connections), and not only retrospectively during verifications.
2. *Proximity*: Cracks occurring close in space and time compose 'fields' of damage; on the ground floor of the 'Novelli,' this proximity guided the foundation stitching and the re-establishment of continuity in the horizontal diaphragms.
3. *Similarity*: Cracks with similar width and orientation point to common causes: targeted design (local reinforcements, distributed dowels, compatible reinforced plasters) addresses families of vulnerabilities rather than isolated episodes.
4. *Good continuation*: The force path, interrupted by joints or changes of material, must be re-established through collaborative connections and diaphragms; it is continuity that reduces local kinematic mechanisms and torsional drifts.

5. *Closure*: The informational gap concerning the foundations is “closed” by integrating historical surveys, thermography, and 3D modeling, thereby completing the image of the structure without conjecture.
6. *Symmetry*: Where the theater’s geometry allows, the balance of stiffness is restored to limit torsional effects; elsewhere, a functional, non-forced symmetry is sought, aligning structural responses.
7. *Common fate*: Shear walls and slabs that ‘move’ together under excitation must be treated as a system: through steel ties (pre-tensioned or not), r.c. beams, and steel injected connectors acting jointly.
8. *Prägnanz*: The desired structural outcome is a simple and stable form: clear load paths, legible construction detail, reversible interventions coherent with the historic organism.

4.1. Algorithms and methods

Different algorithms and methods can be used in order make the structural system legible, above all in the case of a masonry structure:

3D survey and alignment. Point clouds acquired with laser scanning are registered using Iterative Closest Point (ICP) and cleaned with statistical filters to obtain reliable geometries; the HBIM mesh becomes the unified support for verifications and traceability.

Damage recognition and clustering. On ortho-images and IR maps, automatic crack extraction is performed through edge operators and oriented filters; line/arc fitting with RANSAC or Hough transform; spatio-temporal clustering with DBSCAN to identify coherent damage fields (proximity/common fate). For the case study deliverables, the software Faro Scene was used.

Dynamic identification. Under operational conditions, Stochastic Subspace Identification (SSI) and Operational Modal Analysis (OMA) extract frequencies and mode shapes; variations $\Delta f/f$ and modal correlations signal changes of state (symmetry/closure of information gaps).

Model updating. FEM calibration on experimental data through constrained optimization; search for the best compromise between local stiffness and global response.

Monitoring and forecasting. Kalman filters and change-point detection techniques applied to cracks, interstory drift, and environmental signals; threshold-based dashboards triggering targeted inspections.

Many of these methods have been used in the original design process and they could be considered coherent with a Gestalt approach.

5. Architecture: Functional Morphology and Spatial Legibility

Starting from original configuration, the “Urban Cultural Hub” perspective was that the structure lends itself to multiple configurations (standing, club with tables, traditional, exhibition, mirror-like): the architecture must render immediately intelligible the state in which the hall is set, without the need for instructions as presented in Figure 7, according to an actual, new, spatial distribution set-up improving. These new distributions, that could be summarized in five different configurations, are show in Figure 8.

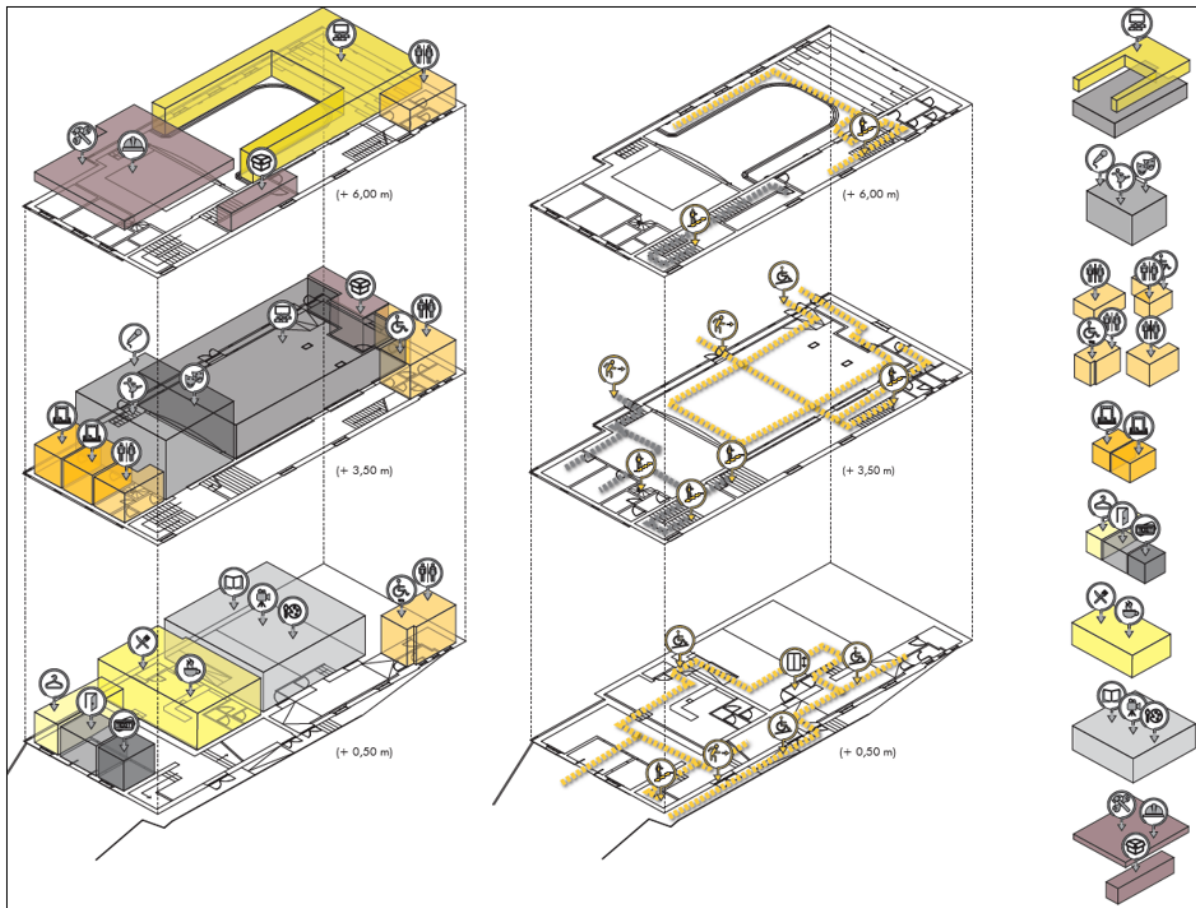


Figure 7: Architectural survey and actual, new, spatial distribution set-up in order to design Ermete Novelli Theater reuse.

Here, Gestalt can govern this innovative hierarchy of parts, functional organization, and recognizability as:

1. *Figure-ground*: In a rehearsal or performance, the stage constitutes the figure and the enclosure the ground; in an exhibition layout, the object becomes the figure and the container recedes. The design avoids visual competition.
2. *Proximity*: Ticket office, information, and access points are arranged as closely grouped clusters, easily understood; services and emergency exits are placed where proximity reduces decision-making time.
3. *Similarity*: Homogeneous materials, color schemes, and signage define functional families; what 'resembles' communicates belonging and role.
4. *Good continuation*: Fluid pathways, clear thresholds, and horizontal markers guide both gaze and movement: continuity reduces disorientation and micro-congestion.
5. *Closure*: Lightweight wings, reversible paneling, and curtains define volumes without saturating them: they suggest rather than impose, leaving the visitor with the instinctive reconstruction of form.
6. *Symmetry*: Where the Liberty matrix is symmetrical, it must be respected; where it is not, perceptual balance is sought through well-distributed visual weights.

7. *Common fate*: Mobile fittings, seating, and draperies shift together across the five configurations as in Figure 7: a single gesture makes it immediately apparent to the eye that the state has changed.
8. *Prägnanz*: A limited number of use states, distinct and repeatable, confer a stable identity to the hall; the user recognizes within seconds how to behave within the space.

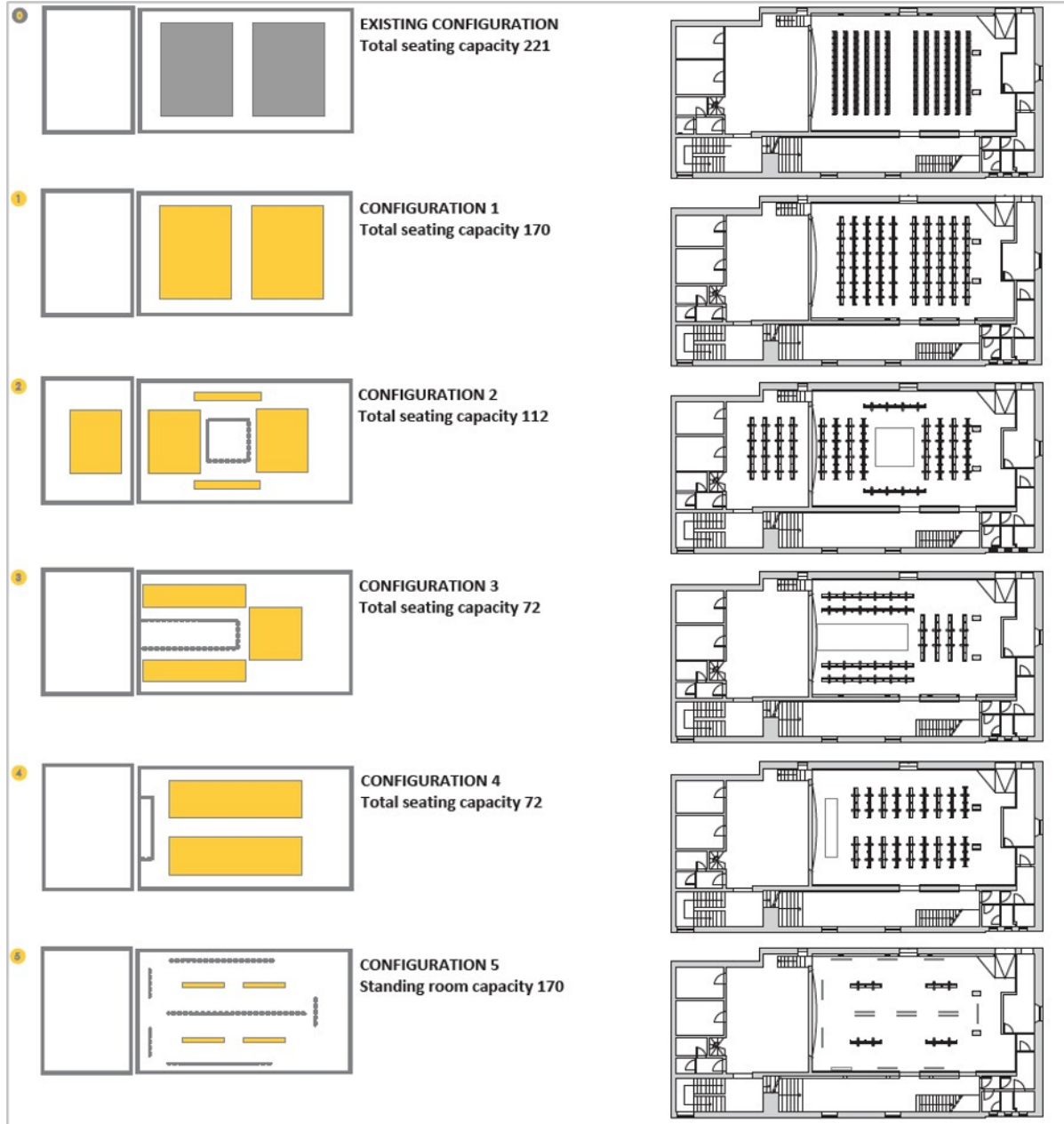


Figure 8: Architectural design and spatial redefinition, five admissible configurations, in order to transform the Classical Historical Ermete Novelli Theater in an "Urban Cultural Hub".

5.1. Algorithms and methods

Space Syntax and Visibility Graph Analysis (VGA). Computation of integration and visual control for locating ticket office, information desk, and access points at nodes of high intelligibility; isovist maps for calibrating openings and wings.

Agent-based simulations. Pedestrian flow models (e.g., Social Force Model or ORCA) are employed to verify capacity, evacuation times, and points of conflict in each configuration; scenario testing includes both “event” and “exhibition” settings.

Computational wayfinding. Weighted graphs and sequential decision models estimate choice probabilities at junctions.

Multi-objective optimization. Trade-offs are explored between capacity, evacuation time, exhibition floor area, and conservation requirements, while maintaining perceptual coherence as a constraint.

6. Lighting Engineering: Luminance Hierarchies and Visual Comfort

Light, more than any other medium, organizes perception. In a Theatre, or in a “Urban Cultural Hub”, the work has to be carried out primarily on three levels: reading the stage, providing comfort to the audience, and preserving the value of the enclosure.

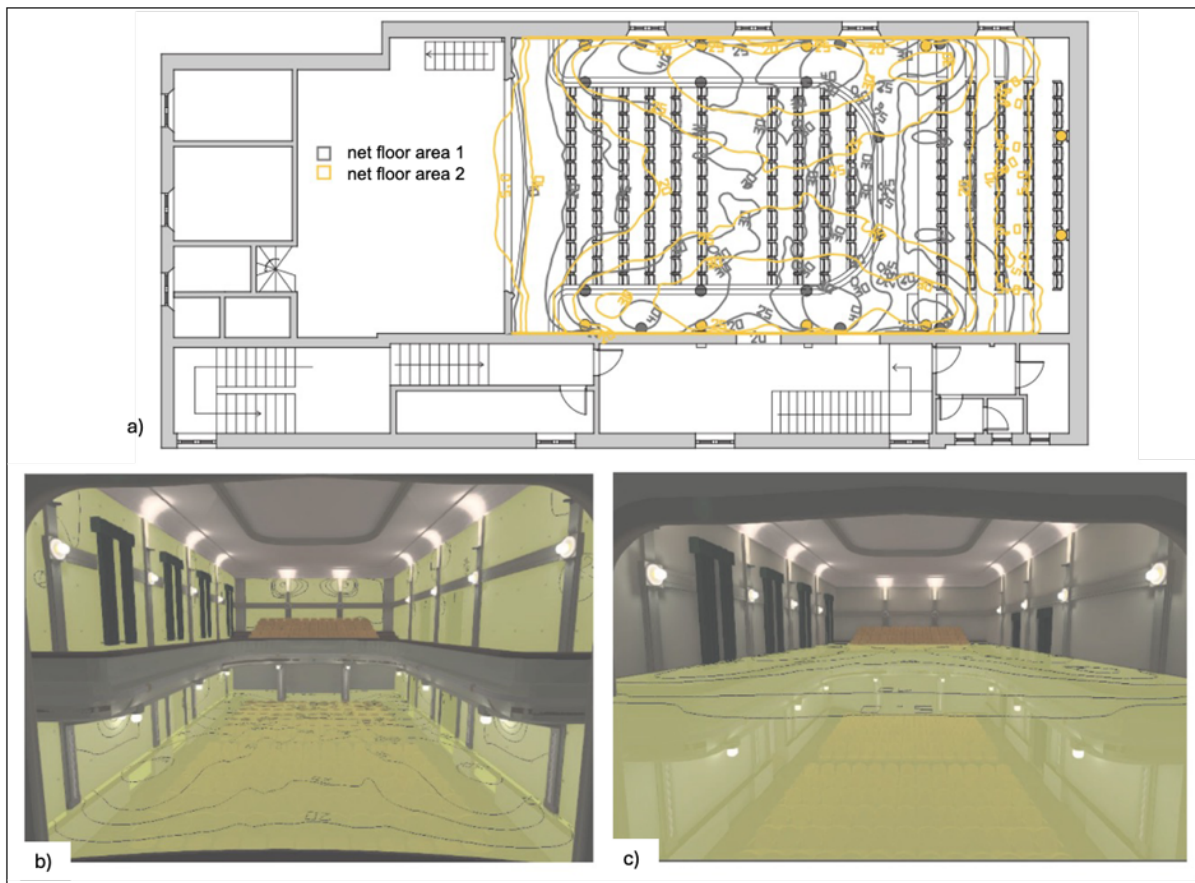


Figure 9: a) Lighting surfaces; b) e c) Images related to the calculation results produced with Dialux EVO software referring to the analysis performed on the usable surface at the level of the audience area. The trend of the isolines at the specified elevation is highlighted.

The eight principles are translated into choices of luminance, contrast, color, and transition that could be summarized as shown in Figure 9 regarding initial lighting situation that is according to traditional Theatre set-up.

In this case, Gestalt governs the perceptive approach as stated below and they have to be approached by considering the five new design configurations that have to reform the Figure 9 approach:

1. *Figure-ground*: The figure is that which must emerge (actor, speaker, artwork); the background maintains contained, uniform, and non-competitive luminance levels.
2. *Proximity*: Functionally adjacent zones share luminance levels and color temperatures; the audience area is perceived as a coherent field, distinct from the foyer and the stage.
3. *Similarity*: Light sources with compatible spectra and color rendering properties prevent perceptual ‘collages’; the stage preserves recognizable luminous grammar.
4. *Good continuation*: Smooth gradients between foyer, audience, and stage prevent abrupt transitions and glare; the luminous trajectory accompanies the physical one.
5. *Closure*: Grazing beams and wall-washers delineate perimeters and bases, helping to “complete” volumes with minimal strokes.
6. *Symmetry*. Accurate lateral balancing in the audience reduces visual fatigue; minor asymmetries on stage remain intentional and controlled.
7. *Common fate*. Dimming and chromatic variations move synchronously during transitions (pre-show, performance, interlude): light alone conveys the change of state.
8. *Prägnanz*. A limited set of presets, each with predictable luminance ratios and Unified Glare Rating (UGR), enables rapid operation and repeatable quality, with allowances for the non-visual component (circadian tone) when required by the intended use.

6.1. Algorithms and methods

Photometric simulation. Physically based rendering with ray tracing and daylight analysis is employed to evaluate luminance, uniformity, and contrast on surfaces and faces; verification of figure-ground ratios. Software used: DIALux, applying the radiosity method.

Glare assessment. Computation of HDR (High Dynamic Range) luminance maps and metrics such as UGR (Unified Glare Rating) and, when required, DGP (Discomfort Glare Probability) for dynamic conditions; rapid iterations on optics and shading devices.

Contrast perception. Retinex-type models are applied to estimate perceived contrast and to design gradients that guide the gaze without inducing fatigue.

Non-visual component. Calculation of α -opic quantities (CIE S 026) for setting circadian profiles in daytime trials and long-duration occupancy, coordinated with the actual use of spaces.

Operational control. Model Predictive Control (MPC) over DALI/DMX integrates presence and luminance sensors; optional reinforcement learning refines scenario selection based on audience feedback and energy consumption

7. Acoustics: clarity and warmth as perceptual outcomes

The Theater Hall is apprehended, first and foremost, by the ear: the distinction between what must be listened to and what must provide support is Gestalt in its purest form.

The acoustic design of the Novelli Theater renovation enhances both speech and music through a variable and measurable configuration [20] according to both Figure 7 and Figure 8 innovative configurations. Above all in the case, as of this case study, that provides a complete redefinition of

Theater functions and usages; a “Urban Cultural Hub” is quite different from the so called Classical Historical Ermete Novelli Theater [21]: usage, sound level, sound quality and sources are very different. Local analogical or remote digital sounding have to be managed with correct quality and efficiency.

In this case, Gestalt generally governs the acoustic configuration as stated:

1. *Figure-ground*: The acoustic figure is constituted by the direct sound and the first useful reflections; the ground is the controlled reverberant field that provides body without masking.
2. *Proximity*: Reflections occurring too close to the direct sound create confusion; the regulation of early reflections prevents “blurring” in speech intelligibility.
3. *Similarity*: Surfaces with coherent timbral behavior prevent spurious colorations perceived as extraneous ‘sound objects.’
4. *Good continuation*: Sound trajectories maintain energy without gaps or excessive concentration; flutter echoes and focalizations are mitigated through targeted diffusion.
5. *Closure*: Isolated late reflections, perceived as echoes, must be suppressed in order to restore the unity of the sonic event.
6. *Symmetry*: A balanced residual noise response stabilizes the stereo image (or natural imaging in passive acoustics); systematic differences must be corrected with discrete passive elements.
7. *Common fate*: Direct sound and early reflections move “together” in phase and amplitude, reinforcing the perception of a single source.
8. *Prägnanz*: A limited set of clear objectives (speech intelligibility, musical clarity, and control of mechanical noise) leads to a stable calibration, reproducible under different occupancy scenarios.

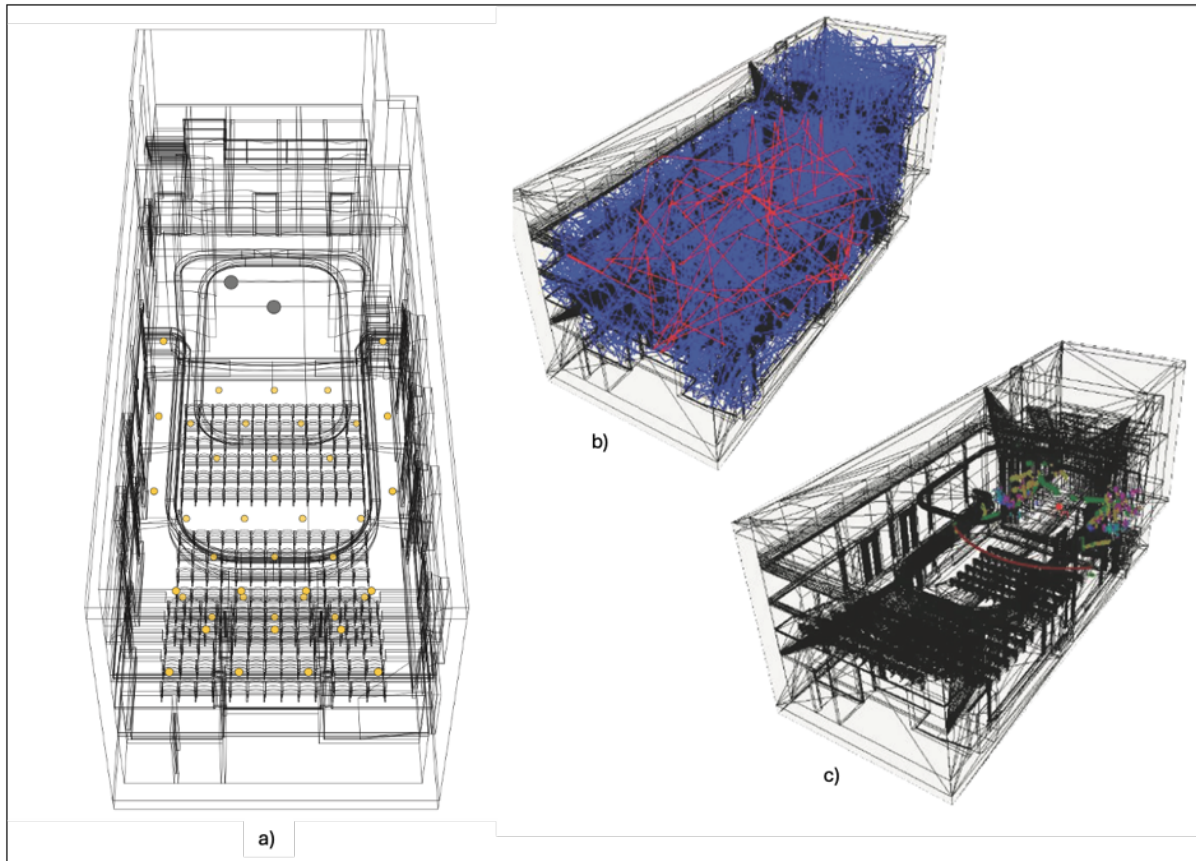


Figure 10: a) Placement of acoustic *sources* and *receivers*; b) e c) 3D acoustic modulation with ODEON software (v.15)

Figure 10 shows the original configuration acoustic evaluation: also in this case the five new design configurations have to be coherent with renovation goals.

7.1. Algorithms and methods

Room modeling. Hybrid approaches combining the Image Source Method and advanced ray-tracing algorithms for mid- and high-frequency reflections, supported by wave-based or FDTD methods for low frequencies in critical volumes. Genetic algorithms and fitness functions are employed. Software: ODEON software (v.15).

Measurement and auralisation. Impulse responses acquired through exponential sine sweep and deconvolution; computation of RT/EDT, C80, D50, STI, and RASTI, with auralization to validate perception in the control room.

Optimization of variable parameters. Determination of set-points (curtain openings, panel configurations, shell geometry) through Bayesian optimization or robust heuristics, maximizing intelligibility or clarity within conservation constraints. Genetic exchange crossover techniques are applied.

Sound diffusion and public address. Coverage and beamforming design under spill and uniformity constraints; control of mechanical noise on Noise Criterion/Noise Rating curves, and vibro-tactile filtering applied to seating where required.

8. Cross-domain direction: synchronizing domains and states of use

Perceived quality arises from coherence among domains. When light renders the scene as figure, acoustics must sustain it, and architecture must guide without interfering; the structure remains a reliable background. Contiguous signals of proximity and similarity (materials, chromatic schemes, timbres) reduce cognitive load; transitions follow the good narrative continuation of the event; documentation and the digital twin ‘close’ the informational cycle; subtle adjustments among domains ensure global symmetry even when geometry is not; light, sound, and furnishings move in common fate; a limited number of operational states constitute the *Prägnanz* of the system.

8.1. Platform and orchestration algorithms

Digital twin (HBIM). A single database for geometries, systems, scenarios, and quality parameters.

Data fusion and orchestration. Structural, lighting, and acoustic sensors feed into a sensor-fusion layer; Dynamic Time Warping (DTW) and event triggers synchronize light, sound, and configuration.

Multi-objective. Pareto fronts among comfort, conservation, energy consumption, and operability; each state of use represents an efficient solution rather than a random compromise.

Governance. Operational manual with cross-domain Key Performance Indicators (KPIs) that transcend individual technical silos and measure the overall outcome of the system; complemented by periodic verification procedures..

9. The Relevance of Gestalt Principles for Applications in Cultural Heritage

Author assumptions are that Gestalt Principles can contribute to obtaining these relevant goals if a complex modification in Cultural Heritage contest. The relevant goals can be considered the sequent ones.

Reduction of arbitrariness: proximity and similarity constrain segmentation; good continuation and closure prevent pointwise interpretations; figure-ground reduces false positives caused by non-structural elements. To avoid ‘by-eye’ readings, segmentation is guided by explicit rules: grouping what is spatially close (proximity) and what is truly similar in physical or geometric properties (similarity). In this way, critical areas emerge autonomously, without forcing. When data are fragmentary, good continuation and closure assist in reconstructing complete traces and structural loops, avoiding interpretations based on isolated points. In parallel, figure-ground distinction serves to eliminate contextual elements (systems, finishes, furnishings) and retain only the structure, thereby reducing false positives.

Global criteria: symmetry and common fate test coherence at the scale of the organism, not only at the local level. It is not enough to understand what happens at a single point; one must ask whether the building, as a whole, ‘fits together.’ For this reason, symmetry is checked (the extent to which behavior is balanced between left and right, front and back) and common fate (which parts move together). If these two tests are held, the local reading is more credible; if they fail, there is a broader underlying cause to be identified.

Explicit parsimony: model selection respects the principle of minimum description length, avoiding over-parameterized interpretive constructions. Among multiple possible explanations,

the one that best accounts for the data with the fewest additional assumptions is chosen. In practice, lean models are favored, and unnecessarily complicated ones are penalized. This provides a transparent way to avoid overinterpretations and unnecessary additions introduced merely to make the results fit.

Compatibility with established practices: the method builds upon measurement chains and tools already standard in cultural heritage. It relies on 3D surveys, thermography, dynamic measurements, and archival/documentary checks that are already in common use within heritage contexts. What changes is the direction: how the data are integrated and how decisions are made, with clear and reproducible criteria.

10. Conclusions

This paper retrospectively analyzes and highlights the intrinsic presence of Gestalt principles throughout the various and multidisciplinary phases of a multidisciplinary restoration project of a historical Theatre. The a-posteriori recognition of perceptual analysis underlying the previous designer's actions is emphasized not only using programs and algorithms derived directly from the mathematics of perception, but also by proposing additional algorithms of the same origin.

Although in the field of artificial intelligence there is constant discussion about the use and training of neural networks to emulate human behavior, it is often “forgotten” that all of this objectively stems from the psychology of perception. Through perception, analysis is carried out with the goal of finding solutions to a problem – in this case, perceiving a structure in order to understand, interpret, and identify the most appropriate solutions for a conservative and improvement-oriented restoration.

The theory of perception associated with mathematical algorithms applied to the understanding and preservation of historical heritage remains scarcely represented in scientific literature. However, the sources cited in this work highlight the importance of identifying and processing “points” in images for the study and interpretation of artworks, architectural elements, and even entire buildings.

Authors intend, in future research, to analytically demonstrate the clear correlation between algorithmic processes and Gestalt laws. It is believed that a solid and indisputable perception is possible, since when translated and grounded in mathematical laws, it can evolve from a subjective opinion to a universally shareable form of evidence. Mathematically translating what the eye first sees and what the brain subsequently perceives becomes not only a model for understanding the human mechanism of contextual comprehension but also the foundation upon which to educate the anthropophilic mechanisms of artificial intelligence.

The recognition of Gestalt principles made evident within the four modules and activities of the Ermete Novelli Theatre restoration project demonstrates that perceptual principles can serve as both an interpretative tool and a methodological foundation for a reliable technical framework aimed at understanding and making informed decisions regarding interventions on complex historical assets.

The Gestalt Method approach can shift renovation from a sum of specialist interventions to a coherent and governable system. The Ermete Novelli Theater becomes a tuned instrument: respectful of its historical identity, adaptable to contemporary uses, and monitorable and maintainable through objective criteria. This is the true usefulness of the method: transforming perceptual quality into verifiable technical quality, making a design practice replicable in time and space that unites science, conservation and user experience.

So the restoration project goal, a real “Urban Cultural Hub”, have been obtained.

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Declaration on Generative AI

The authors have not employed any Generative AI tools.

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