Subjectivity in Machine.
The Future of Generative Art.

Rediscovering the Author in Generative Artificial Intelligence and saving the Logical Interpretative Memory of Digital Culture for Future Generations

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Premise

The history of computer use starts from a first approach in which problem solving was the initial aim. With the use of personal computers, at the end of the 70s, however, a whole series of experiments were also developed based on the possibility of supporting one's subjective point of view in dealing with issues related to creativity and "telling" one's own logical and interpretive vision of what surrounds us.

To make an experimental software based on one's own vision was, in those first moments of experimentation of Digital Art, like writing a book, but with an evident additional element: one's own vision was executable, therefore communicable also through direct experimentation.

Everything changed abruptly anyway. Later, with technological fast development and the widespread production of closed commercial programs, i.e. without the availability of source codes, this subjective and visionary approach weakened. Instead, the approach that we might call overestimating the technological aspects has been consolidated.

The software of creative experimentation based on the subjective identity of the artist has given way, in most cases, to commercial software that has progressively covered many of the possibilities traced by the first experimenters, making them, at least apparently, objective and detaching them from the creative identity of those who had designed them.

This has developed, indeed consolidated through actual practical realization, the philosophical concept triggered by Roland Barthes, "the death of the author" where the recognizability and identity of the subject was overshadowed if not deliberately hidden to the advantage of a presumed collective identity linked to technological progress. This approach consolidated the primacy of technology over subjective logical thought. Art and architecture, for example, have also been strongly conditioned by the latest available technology rather than pursuing the vision and identity of the author, as was already happening with the advanced tools of technical drawing.

Even when a possible identity was created, as in the case of "robots that create art", there was no reference to the identity of the programmer, the true author, but an attempt was made to pass on the concept of the autonomous creation of the machine..

In fact, two philosophies clashed.

The first had as its primary concept the definition of objective categories in which to catalogue events, the objective identification of problems and optimization, carried out even at the cost of simplifications, which was based on the choice to develop projects only as a group.

The second identified in the diversity and uniqueness of the subject the possibility of increasing the complexity of the design work and its recognizability as belonging to the author.

The philosophy based on optimization has monopolized the culture of the end of the last century, both in the scientific and creative sectors.

Recently, however, something is changing and even Artificial Intelligence has rediscovered the poetics and the need to overcome the concept of optimization and reduction of events only to objective categories.

It involved the need of accepting the importance of small differences and the need to manage them with reference to different possible parallel interpretations.

This happens mainly because it was found that the limit of the objective approach to "problem solving" was the impossibility to fully face the complexity of the systems..

Even if always remaining in the field of problem solving and optimization, this approach has found the need of the "singularity", that is to develop, in every AI system, a unique subjective peculiarity based on the "learning machines" to face the problems in the specific environmental structure in which the system has fallen.

The next step is in progress.

Rediscovering what thirty/forty years ago were experiments carried out individually, a new type of artificial intelligence is configured, which we could call generative artificial intelligence. It does not propose to optimize the solutions sought but to develop them according to subjective logic in order to restore the pleasure of variations and the discovery of unique and peculiar visions, such as the interpretations of the past, of nature and of what surrounds us.

This new artificial creative intelligence could be further developed by artists when rediscovering and improving their own identity as authors, when telling the interpretative logic adopted to create works of art, architecture, objects, music and poems that are finally recognizable as the work of an author and his subjective vision.

All this comes from Generative Art, that cannot be identified as technique, when it is not limited to experimenting with the latest technology and entering the anonymous world of technological recognition, but is based on the desire to communicate one's own subjective interpretative logic, one's own dynamic vision of the world.

It must therefore be clarified, even historically, a profound difference that already existed between the precursors of digital art.

On the one hand, we found those who experimented with the last technologies available at that time, such as the oscilloscope, where they found, I would say successfully, the possibility of generating complex and pleasant forms based on the synaesthesia between forms and physical events.

The interpretation was fundamentally based on technology since the control of these representations was not for the purpose of communicating a creative idea but for the purpose of finding aesthetically fascinating representations of possible physical events.

On the contrary, other precursors started from their creative vision and, even if they obviously used the appropriate technologies, they did not follow in the wake of the latest technological tools but pursued, with the help of advanced tools,

the development of their own ideas and visions.

There was no categorical difference between the two approaches, also because often the same "precursors" of digital art oscillated between these two possible ways of experimentation.

The recognisability of the artist enhanced by variations.

Between these two approaches, the recognizability of the artist has always made the difference.

While for some experiments the emerging element was the recognizability of the technology used, and the results were not directly recognizable as belonging to a specific author, for others the use of technological tools provided the opportunity to manage the complexity of the results with the opportunity to expand and even consolidate the recognizability of the vision of the artist.

The possibility of acting creatively with digital instruments was based on the operative capacity of the machines to be able to repeat the same logical processes indefinitely, starting from even limited variations. This possibility defined the way of having multiple variations linked to one's own logic and therefore of having control of one's own ideas, of one's own creative action, evaluating, at the same time, the multiplicity of possible outcomes and the recurrent characters common to all variations.

In practice, it was possible to propose and manage the structure of the variations similar to those of natural events belonging to the same species.

The random and the unpredictable contest

The use of random parameters was the easiest way to proceed. Random was configured as a tool capable of unpredictable possible outcomes but also

with the risk of eliminating the recognizable characters of the author.

My opinion is that the random factor can be used in the same way that the nature uses the unpredictable environmental context. An olive tree, the more it is beaten and strongly conditioned by the wind, the more it assumes the character of an olive tree.

If instead the random factor interferes directly on the form of the event without being conditioned by its organizational structure, we have the so-called emerging form. In this way the recognizable character of the author's idea moves away. This approach is something similar to the compulsive shopping of forms.

Time, uniqueness and unrepeatable

In my generative software Argenia, but also in my generative parallel software Musicablu, I have identified over time the variables that manage the differences and uniqueness of the events generated within the recognizable identity of the species.

The flowing time parameter is used to orient choices between alternatives and not to act directly on formal outcomes.

At the start, the generative program reads the year, month, day and hour, minutes and seconds. These data, which are updated in real time, provide the codes through which is indexed, for each spatial event, the list of possible alternatives, identified by the structure and characters of the connections indicated by the topological paradigm.

The choice, of course, affects the structure in progress of the generation of the event and is reported, often expanded, in the next development. But this does not change the direct relationship between the author and his own vision.

The use of time means that the scenarios generated in rapid succession are always unique and unrepeatable (time goes on inexorably second by second) but are more similar to each other than those

generated with more extended time frames. This is due to the fact of involving only the seconds or at most the minutes and not the days, months, seasons and years.

Very often, even for the current speed of the machines, I thin out the generations in time to have a range of scenarios that cover more possibilities.

The use of time, in my opinion, favors a control of the individual diversity of the generated scenarios, similar to that of an environmental context that varies but that does not affect the recognition of the species that remains the goal of the generative project.

The topological paradigm is the same, even if it is formalized in different ways, and the results, in multiple variations, maintain the basic characters that identify the recognizability of the idea and, obviously, of the author.

In other words, this approach to Digital Art has provided the possibility of creating not only individual events, but especially events able to focus the subjective logic that could generate this multiplicity of variations, linked tp the recognizability and uniqueness of author's creative "style". The forms can change but the idea remains the same.

This is where Generative Art was born, a direct expression of human Creativity in the Digital Civilization.

Generative Art cannot therefore be only considered a digital technique, a representation based on the synesthesia of physical events or considered as art generated by machines without human control.

Creativity and Digital Art. Interpreting Nature and the Past.

Creativity, in fact, comes from the logic adopted and not only from the forms used. As Poincarè stated, creativity is born from the subjective interpretation of the relations between events and of the topological configuration of the possible relations.

The evaluation of the validity of the hypothesized relations is certainly subjective, basing itself, as Poincaré affirms, on "beauty" and not on presumed optimizations. Objective evaluation cannot take place because each creative approach tends towards a different purpose, identifiable in a subjective vision.

The idea of a structure of possible connections that follow a subjective vision and characterize it springs as an abstract idea.

The abstract idea could be configured as a Topological Paradigm in which events do not yet have a defined form but of which a network of relations and reciprocal characterizations is assumed. The creative idea configures an idea of organicity that corresponds to one's own vision and cultural references.

The idea can be abducted from the past or from nature. Every subjective vision is based on the interpretation of the existing matter that, in this way, becomes a way to develop a possible future.

The basis of a cultural identity is related to the interpretation of Nature, in its various and surprising harmonic structures, the interpretation of the past, the unique characteristics of some cities, as well as masterpieces of architecture, music, poetry, art, but also the scientific discoveries, with the various and parallel theories that focus from different points of view the harmony of the universe, noi missing the mathematical and geometric insights.

In particular, the drawings of synthesis between various dimensions, such as perspective theories, are indicators of a harmonic structure whose beauty excites us and that we can use as a reference for the construction of a structure of connections that makes our idea explicit.

Reading Nature and the Past by interpreting the organic aspects that respond to our subjective sensitivity, to the characters that we would like to

consider as pertinent to our peculiar vision of the possible, means building the future by creating new systems of relationships. The act of shaping topological systems capable of increasing and accelerating a system towards a given objective, defining the structure of relationships present in the events in which we are, this is identifying a subjective Idea.

This is creativity.

Identity and subjectivity

Each of us, individually, develops a concept of identity in different ways for events that are common to all.

The very concept of an ideal city is undoubtedly a concept shared at least by those who live in a certain city with a strong power of fascination, such as Venice, Rome or New York. But the same concept of the ideal city is expressed in different ways in each person and the collective result is to work to increase the characteristics of this identity in progress through works, architectures, texts, artworks, music that, in their diversity and multilaterality, contain a possible character able to increase the complexity of the shared idea.

Different interpretations of a common fascination create the possibility of increasing this identity in progress. Each different interpretation of the same ideal city are variations capable of amplifying its identity. Together with the ability of this complex system, as each city is, to communicate and respond to the diversity of subjective requests of its inhabitants, often unpredictable requests.

No one can think of increasing the identity of a city by repeating existing forms, even if this may seem possible. The urban identity, as well as that of each individual, exists only if understood as a way of growing. Otherwise, there is a risk of museification and the death of the identity itself.

The forms are therefore not the basic elements of an identity but only possible outcomes of a process of dynamic interpretation of the existing.

This happens not only for the cities.

Even at the scale of events such as artworks, and specifically in relation to the digital approach to creativity, the interpretation of Nature and the Past opens us to the world of progressive transformations, of algorithms as identification of a possible evolutionary process, of a way of operating in the progressive search for logics that correspond to our identity as artists. Nothing is static but everything is transforming following logics of which we can subjectively evaluate harmony and beauty.

Forms as dynamic entities interpreted as algorithms.

Each form is and must be considered and interpreted as fluid, within a generative logic.

Considering forms from this point of view, that is from the point of view of "vital dynamics", our interpretation of formal events cannot stop at the insertion of a form in a predefined category but must access the possible progressive logic that could generate it.

To trace our interpretation of a specific form as generative dynamics means to opt for a fundamental creative choice, to choose a generative dynamic among the infinite possibilities that could correspond to the identified form.

We can make this interpretation explicit through a dynamic logic, an algorithm that defines its progressive structure and that opens the door to the experimentation of further potentialities inherent in this interpretative passage from static to dynamic.

It's impossible to fix one of this dynamic logic in generating a form as the optimized procedure. The interest is that they are

infinite and, only all together can cover the complexity of possible and, some of them, together, a subjective identity of a vision.

These possibilities have been the basis of the experimentation of the precursors of Generative Art that are not limited to Digital Art but that exalt some possible aspects related to the conceptual and creative passage from forms to algorithms.

Each set of progressive processes of transformation, from unique results to the "species" of results, create identifiable sequences of variations able to identify in a more pertinent way each idea.

Note:

Even the simplest forms can be considered as a point of passage for a spatial geometric progression. A cube could be interpreted dynamically in many different ways, for example as:

1. Moment of passage from a square-based prism with infinitesimal height to a parallelepiped with height tending to infinity. Passage points can be discretized with the height equal to the base, with the height in relation to the gold section with the base, or following the Fibonacci series, and so on.

2. Moment of passage of a square that, rotating around an axis, defines the following edges. The cube occurs when the rotations are 90 degrees but these rotations can be discretized in different ways until you achieve, when they are infinitesimal, a cylinder.

3. Moment of passage from a square-based pyramid, when the upper square is reduced to a point, to an inverted truncated pyramid when the upper square is greater than the base square and can tend to infinity.

4. Moment of passage of a transformation of a rhombic-based parallelepiped where one of the corners of the base goes from 0 to infinity.

5. And so on, but you can go further

6. Using the subjective interpretation of the past, for example Baroque, we could define the cube as the moment of passage between the shortening of the diagonals and their lengthening, keeping the distance from the center of the cube to the center of each face fixed, and transforming the faces into a double-curved surface, convex or concave.

7. Going ahead, it is also possible to use, to define algorithms for the dynamic transformation of forms, the possible parallel structures of perspective representation. We can move from the historical ones, medieval subjective perspective, Piero della Francesca's perspective, anamorphic perspectives, Florenskji's inverted perspective, to the anamorphic, spherical and inverted perspectives developed by me with my first software of perspective by using the perspective restitution (I developed a software for managing these possibilities: Tracce, 1979) .

If, for example, we consider a perspective drawing, even if rather simple, like the one I proposed in many cases to my students, (see figure), it is possible to activate a whole series of interpretations that can then be translated into algorithms using both the procedures of a perspective system.
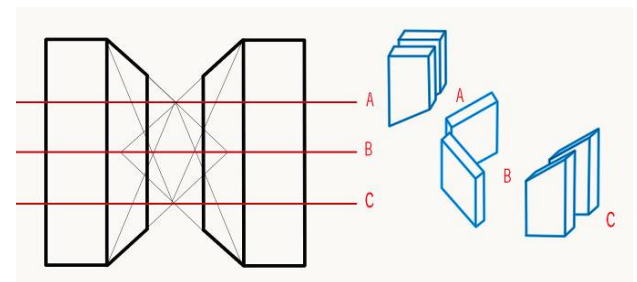
We can define different interpretation of the image by varying some parameters connected only to the subjective reading of the image and not to its structure, such as the position and distance of the point of view from the surface of the drawing. It reflects, mathematically, one of the parameters of the subjective interpretation, as well as the logical

procedures of passage from one perspective system to another.

In the example we explain 3 cases.

If we modify the position assumed by the observer to make a perspective restitution, that is to say to geometrically define the represented event, we can identify some positions that significantly alter the stereometry of the event we trace, to avoid ambiguity through an axonometry.

Case A, interpretative variation by modifying the observer's reading position:

A1.   In position A, the trace on the sheet of the point of observation coincides with the point of presumed perspective focus of the two ridge lines, understood as a plane, a terrace. In this case, the lines that trace the attack on the ground "generate" a plane inclined downwards. The buildings will be parallelepipeds, parallel to each other, rising on a downhill road.

A2.   In position B, which may be another point of progressive variation of the stereometry interpreted in the image, not in contrast with the previous but which focuses on the progression of transformation of the event, we can interpret the design as two parallelepipeds that have different vanishing points but it is the same horizon line. In this case, maintaining the stereometric structure of the parallelepiped, the two volumes will no longer be parallel to each other, they will lose the inclination of their bases but will diverge towards the observer forming a plane and triangular space between them.

A3.   In position C, we can interpret a variant of position 1. While the attack on the ground will be on a flat road, with the two volumes parallel to each other, the terrace will disappear transforming itself into an inclined roof, with the inclination towards the observer.

Case B, interpretative variation passing from one to another perspective structure.

B1.   If we interpret the image through the restitution from a "traditional"

perspective, we have the possibilities identified in the previous cases.
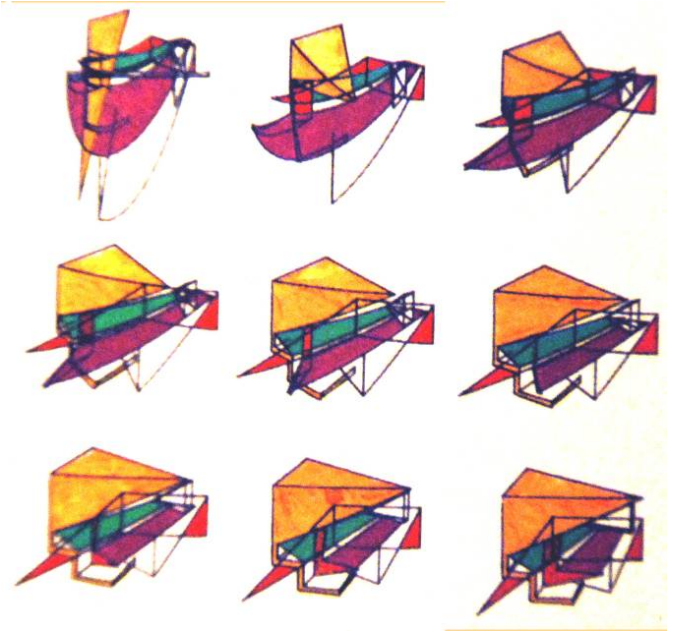
Transforming Futuristic Balla picture moving from Euclidean and non Euclidean perspective

B2.   If we interpret the image as restitution from a non-Euclidean anamorphic spherical perspective the geometry of the volumes assume an arrangement that we could define "Baroque", because it corresponds to a type of geometric transformation used, for example, by Borromini in S.Andrea delle Fratte.

The lines that represent the sides of the parallelepipeds in perspective, passing from the Euclidean to the non-Euclidean arrangement, move towards the inside of the volume itself.

We have thus found the possibility of constructing a baroque algorithm using the logic of geometric passage from a Euclidean reference to a non-Euclidean one. But this is only one of the many possibilities.

And so on: no limits to possible subjective interpretation of forms as dynamic transforming rules for designing generative algorithms.

ARGENIA

Since the 70s I have developed various generative software dedicated to experimenting how to implement my vision, my interpretations of the past.

With the first personal computers, I have developed, at the end of the '70s, my passion for perspective structures as tools for the passage of spatial events from a dimension to another.

I experimented my logical interpretation of the Middle Ages as a moment of rethinking of multidimensional representation, of the Renaissance as a moment of synthesis between Art and Science and of the Baroque as a moment of experimentation of generative dynamical geometry.

In parallel, I have developed subjective interpretations of scientific research, from chaos to attractors, which opened doors that were unthinkable before for those who did not tried to operate through computer tools.

In addition to the first specific works dedicated to particular themes, my generative work has been concentrated in the development of the software ARGENIA, dedicated to the generation of 3D models of Architecture, Design and Art and, more recently, starting from 15 years ago, also in the software MUSICABLU dedicated to the generation of musical scores and possible variations.

Logical memory

Unfortunately, in recent years the progressive development of technologies has also led to a real practical difficulty: how to preserve and pass on to future generations the work, but especially the logic used by those who have experienced the first steps of digital approach.

Much of the material produced in the world in the last 40 years, scientific articles, software and digital experiments, has been lost or can no longer be read because of the incessant upgrade of the technologies used to achieve it that have made obsolete, and therefore unobtainable, the tools used.

A constant of my work, and in particular of the generative software Argenia, has been to preserve the memory of the generative logics adopted. It was like writing a book that tells in progress my peculiar vision of the world. Every occasion of generative project led me to design new transformation algorithms focused on the realization of events closer to my spatial vision of the moment.

But own identity today is never the same as yesterday.

These algorithms are always a little, or even a lot, different from the previous ones and do not replace the previous ones but support them, increasing the logical memory of my spatial vision in the various facets due to the creative moment and to the progressive sensitivity belonging to the contingencies and passions for different moments of our cultural history.

The structure of this generative software, even if it has progressively used different hardware platforms, from Apple II to the current PCs, has remained essentially the same, especially because it does not use, by choice, the commercial software libraries that are always rapidly obsolescent.

The progressive transformation of the structure of Argenia started from a program strongly built on a path limited to a few variables to arrive at a system based on a very large logical labyrinth and with many possible alternatives that can be activated both in parallel and in sequence.

These alternatives, which are not alternatives to each other but multiple logical representations of the world of the possible, tell my vision, without simplifications, without attempts at optimization, without denying possible negative moments and dead ends with the

conviction that these moments are only a necessary path of transition to complexity.

Argenia is a personal software of AI that is configured as a digital alter ego of mine able to tell operatively my creative vision and, I hope, to communicate it also as a possibility to future generations.

Argenia, as Generative software must be, is not based on a problem solving approach, since every project opportunity presents a range of possible solutions, each one acceptable because it is chosen on the basis of what represents my vision in progress and not on the basis of objective optimizations.

Argenia is like a critical text, a story that documents an evolving point of view where every possibility, concretized in an algorithm of transformation, had its own emerging moment when it was created for a specific project, but still remained in the labyrinth of possibilities to be activated when specific characters are required by subsequent projects or by peculiar spatial arrangements. These spaces can also be generated in projects strongly different from the one for which the algorythms were written.

Each different generative algorythm is therefore a possibility among many others to work logically to transform the system based on the contingency defined by an abstract idea, by an initial topological paradigm that is identified as the backbone of a new generative project.

The progression of Argenia and the logic of transformation activated as an interpretation of the past.

My generative work is born through the interpretation of my great masters, telling their work through the creation of codes of transformation that can identify the potential, at least those that collide with aspects of my spatial, architectural and urban vision.

ARGENIA, step by step

Argenia's first preparatory works were born in the early 1980s from the logical interpretation of Piero della Francesca, whose chalice (which, in the 1980s, was still identified as Paolo Uccello's chalice but was later attributed to Piero) was the basis for the construction of the algorithmic system of perspective views.

This logical perspective system was not born from an attempt to emulate vision, but from the mathematical interpretation of the first geometric sequences identified by Piero della Francesca.

The logical interpretation in algorithms of an encoded system of geometrical procedures had an extra potential. The algorithms could be used by forcing the limits of natural vision and bringing the mathematical and geometric transformations towards the construction of scenarios outside the representations of what can normally be seen by the human eye.
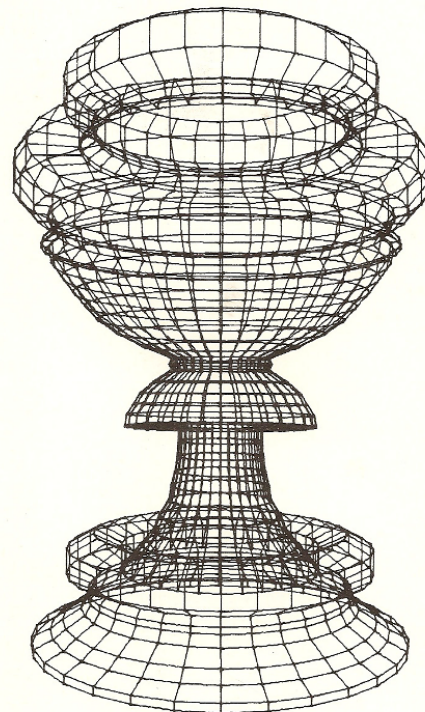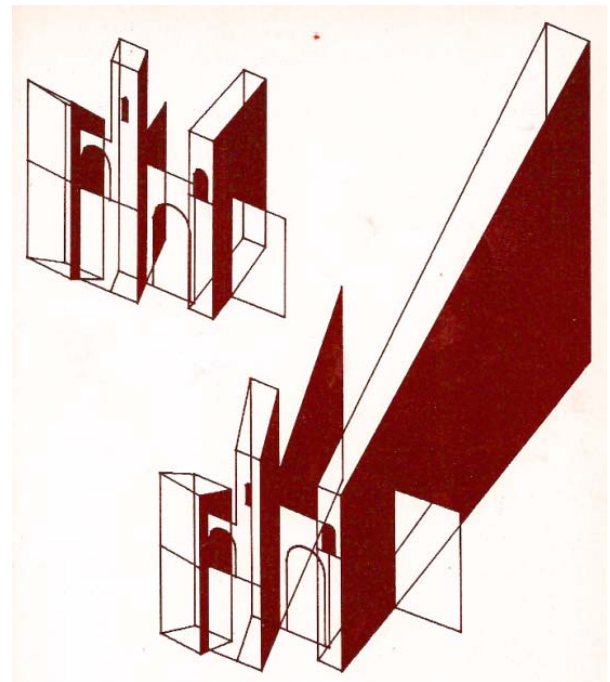

Algorithmic reconstruction of the perspective system used for the chalice of Paolo Uccello – Piero della Francesca.

Based on these perspective logics, the interpretative readings of Giotto and Simone Martini with their representations of medieval cities, had a great potential, that of not being, intentionally, structures prospectively "correct".

Working on multiple virtual points of view and making transformations between the image of the painting and a possible measurable axonometric representation, I realized that these works could be interpreted as dynamically built on progressive deformations that follow and amplify a space-time path within the city they represent.

In Simone Martini's representation of the miracle of the "child hit by the wolf" (1328) for example, the virtual path took place from the outside of the city towards the inside and involved, dynamically, the perspective arrangement of each individual building, reformulating the same spatial arrangement.

Dynamic reconstruction of the Medieval Town painted by Simone Martini. 1985

It was the first time that perspective logic, based on algorithms written by interpreting the "chalice", focused on the "subjectivity" of the algorithms themselves, becoming capable of dynamically interpreting and telling the progressive transformations of the point of view within a single image understood as a three-dimensional space-temporal representation of a complex dynamic event.

The same interpretative basis had a further possibility of being structured as a transformation code. The occasion was to interpret one of Vincent Van Gogh's paintings: the interior of his house, painted several times by the artist. The perspective structure appears, at first glance, correct. But then, when the perspective system is checked, a profound divergence appears, which is then the possible hidden charm of this work.

Van Gogh, the bed room
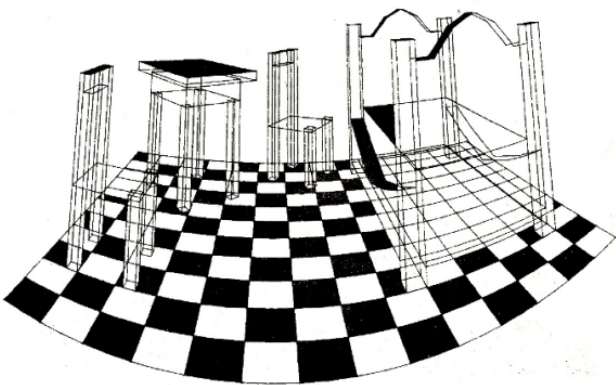

Curved perspective looking to upside

The perspective of the interior of his bedroom appears as curved perspective seen from above, and the entire upper part of the room is excluded from the painting following this assumption of vision from above, but the perspective structure is that of a view from below as can be seen from the inclination of the vertical lines.

I interpreted this dystonia as the desire to represent space while, looking upwards, only the one he saw downwards with the tail of his eye was represented.

In practice, the view used by Van Gogh appeared on one side, like that of a person lying down looking upwards but, at the same time, the highest part of the room and the ceiling were not drawn, limiting the painting to the "invisible" part except with the tail of the eye. The image appears as a perspective representation

in which the exception tells the logic of Van Gogh's communication.

This interpretation of mine was expressed in an algorithm of transformation where the perspective structure acts not only as a narrative of space but as an accentuation of the character sought in the same structure of the spatial order. (These two examples, and others, are in the book C.Soddu, L'immagine non euclidea, Gangemi Ed. Roma 1986, whose second digital edition can be downloaded free of charge from the website https://artscience-ebookshop.com, as are all my books cited).
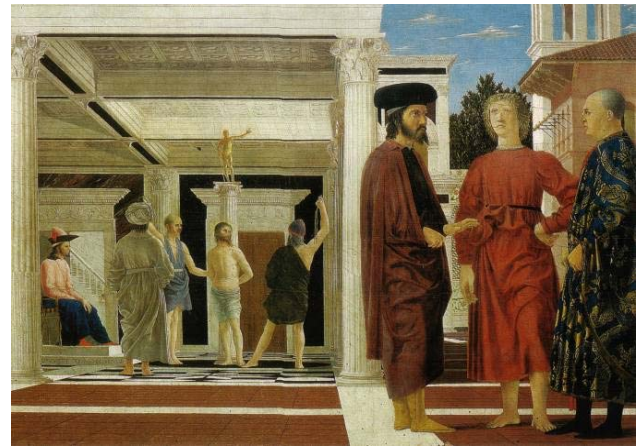
Piero della Francesca, "La Flagellazione"

This painting by Van Gogh proposes a perspective structure capable of structuring relations, the connection between the seen and the unseen. We can find the same structure of relations in the "Flagellazione" of Piero della Francesca who instead used an upward expansion, "beyond the limits", of the perspective vision, while maintaining the correctness of the perspective geometric construction.

The point of view, in fact, is very low but the three people and the urban background on the right are still correctly represented even if, in a "natural vision" could not have been seen.

The topological tear of the relations between the parts, also in this case, is the basis of the fascination of the painting and

this spatial-temporal distortion can be interpreted with a generative algorithm that responds to this process of disorientation and focusing capable of communicating a dynamic vision in a static image.

In all these cases, from Simone Martini to Piero della Francesca to Van Gogh, these are geometric logics capable of representing at least four dimensions within a two-dimensional image. The passage from one dimension to another and the stratification of multiple dimensions in a first two-dimensional or three-dimensional event was one of the main ways I used to build generative algorithms for designing my own personal generative logic in progress, based on the subjective interpretation of the past.

These first works of mine between perspective representation and transformation algorithms continued in the following years, also tracing the logical structures of Pavel Florenskij's inverse perspective that allowed me to write and use, in a generative way, the algorithms of a whole series of possible perspective rules.
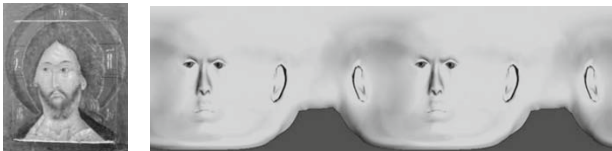
Icon with Pavel Florenskij's inverse perspective and the anamorphic 360 degree perspective from inside the face. The view from inside identifies the character of the icons perspective creating a new possible transforming structure for generating events.

Perspective is not in fact an axiomatic method of representation but a possibility of focusing on the plurality of possible relationships.

We can refer, depending on the moments of interpretation, both to the perspective of Piero della Francesca (an eye and a target), to the spherical and cylindrical anamorphic one (an eye and infinite objectives) and to that of Florenskij

(infinite eyes and a single objective). (C.Soddu, "Perspective, a Visionary Process: The Main Generative Road for Crossing Dimensions" in Nexus Network Journal: Volume 12, Issue 1, Page 33-46, DOI 10.1007/s00004-010-0016-6, Springer Publisher, New York, 2010)

The construction of Argenia began after the first experiments in perspective geometry with the creation of the first experimental software of generative architecture that had as its first reference the work on Simone Martini and Giotto.

The idea was to generate 3D models of medieval cities, all different but having in common the characteristics of an Italian medieval city.

To be more explicit, the characters of medieval cities are not the results of objective analysis of the real medieval citis in Italy.

They could be identified through my interpretations of the works of Giotto and Simone Martini, getting, in this way, a more complex and useful support in identifying its peculiarity.
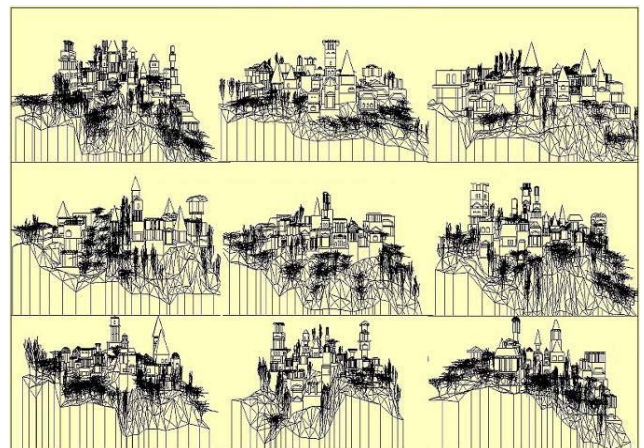
First generative 3D models of Italian Medieval cities, done referring to Giotto and Simone Martini. 1987

In my 1989 book (C. Soddu, Città Aleatorie, Masson Ed. Milano 1989) I made explicit this experience of generative experiments carried out on medieval cities and on some of their topological variations.
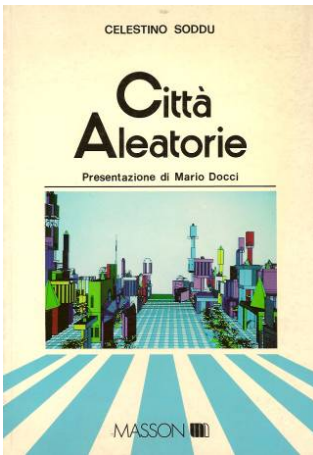
Following this generative work I decided to abandon the evocative power of forms to concentrate on the connections between events and the dynamics of transformation.

For example, it was no longer possible to identify the forms generated with the corresponding medieval forms in the works of reference.

The proliferation of the logic of transformation cancels the relationship between the forms of reference and the forms generated, but maintains, indeed amplifies, the importance of mutual connections, of the topological structure, as the carrier of the medieval identity of the scenarios generated.

In the subsequent book, written together with Enrica Colabella (C. Soddu, E. Colabella, "Il Progetto Ambientale di Morfogenesi. Genetic codes of the Artificial ware", Leonardo project 1992) we presented our educational experience directly related to generative experiments.

In fact, we have seen how the experiences of generative design, the progressive logic of transformations and

the use of the catalyst as an interpretative reference to the Past for the construction of the topological paradigm were directly traceable in teaching and design laboratories. Especially in the didactic structure connected to the teaching of creativity.

In this book I also presented how I had extended the experimentation on medieval cities to other cities, the contemporary one, the coastal one, etc., and the first experiments to generate design objects, like chairs, for the industrial production of unique and unrepeatable objects, like natural events.*.*
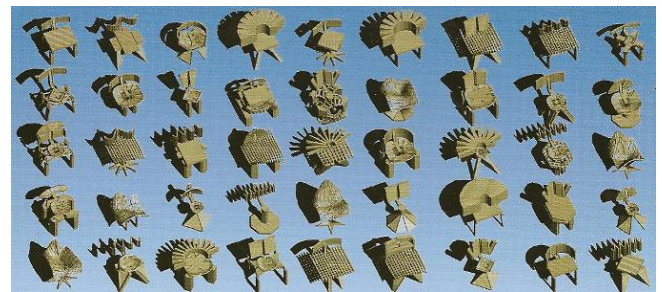

Generated chairs for unique and unrepeatable object to be produced by industrial devices working directly with the outputs of generative software

Focusing the architecture, I defined, for the first time, a topological architectural paradigm based on the number 27, as indicated, without explanation, by Francesco Borromini as the basic number of architecture.

The paradigm 27 for architecture was one of the fundamental steps to move from urban scenarios that alluded only to the urban image to urban scenarios formed by realistic architectural events, i.e. built according to the topological, structural and functional rules of architectural events.

This has led to an increase in the level of reliability and complexity of the 3D models generated and parallel to the possibility of managing the generation following the characters of my architectural vision.
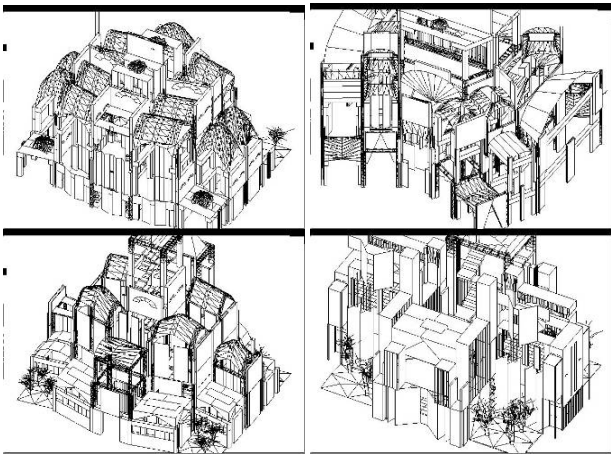
Generated architecture 3D models with paradigm 27.

Paradigm 27 defines a system of connections between 27 events that form a unique "architectural" event.

A floor, four corner stones, four basic beams, four columns, four walls, four capitals, four beams, a roof and, of course, an interior space. In all, 27 events that have a basic structure of mutual connections between them, connections that can, of course, assume different values and characters depending on the project and the "point of view". Identifying how to structure connections meant identifying the operational structure of my architectural creativity.

It is not, in fact, a matter of optimising relationships, but of an open organic design that makes it possible to subjectively express one's own vision of each individual topological relationship while maintaining the structuring peculiarity of the architectural event.
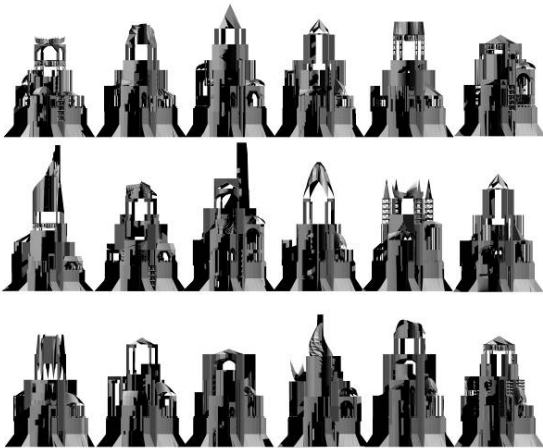
Generated Medieval Castles with paradigm 27

Later I built a variant of paradigm 27, paradigm 21, which defined the logical interpretation of the topological structure of the works of Francesco Borromini that I care most about, as Sant'Ivo alla Sapienza. This unique work is in fact based on the extremely complex and exciting use of the geometric matrix of the equilateral triangle and the spiral.
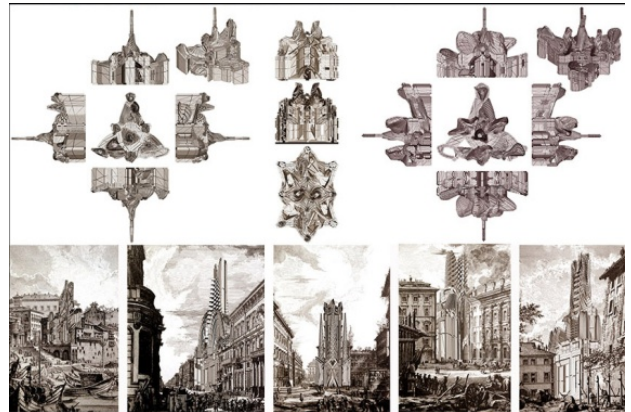

Use of paradigm 21 for generating baroque architectures based on triangular grid.

The use of paradigm 27 in didactics was fundamental, although it was difficult for some students not inclined to have an abstract vision before the formal one to use it.

We have experienced this not only in all the courses at the Politecnico di Milano University but also at the Faculty of Engineering of Cagliari where, beyond the paradigm 27, we have proposed to the students a paradigmatic interpretation of Palladio such as to disregard forms but such as to subjectively retrace the harmony and the logical and organic structure of Palladio's topological matrices.

With paradigm 27, in fact, a cube is not generated following the cubic form, as it might seem by simplifying the control system, but it could generate architectural events completely different from each other while maintaining the topology defined and built with 27 matrices.
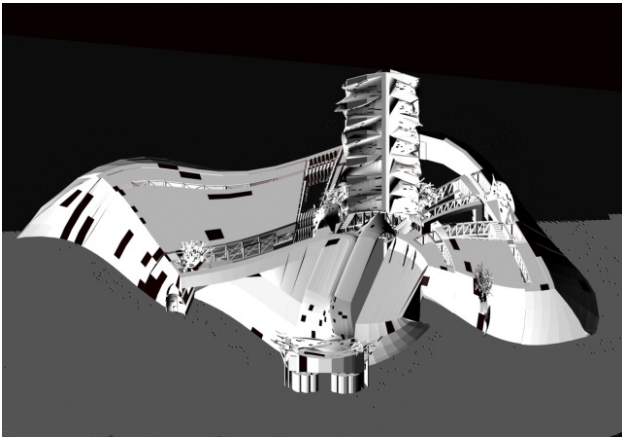
Generated Shopping centre near Rome, 2001. The use of pardigma 27 does not exclude the possibility of generating systems with complex geometries.

The use of an abstract topological paradigm has allowed me to experiment with possible evolutions in the generation of architectural scenarios related to the same organic structure.

Being a three-dimensional system of events linked by reciprocal connections and to the characters that these connections could define, increase or vary, I experimented with the use of three-dimensional Cellular Automata in such topological systems.

Cellular Automata insert in these three-dimensional relation systems an evolutionary dynamic, then a fourth dimension based on the evolution of the interconnection links between events. The logics of these possible evolutions can be written with original algorithms capable of telling an idea.

Evolution is always different and surprising precisely because of the possible interrelations and reciprocal contamination of these logics, once they are activated in an existing system also formed by a few basic events located in three-dimensional space.

The results, although they appear unpredictable, maintain the harmony due to the logic of the defined laws of transformation, and therefore generate progressive topological structures with the same characters.

What is fundamental in these generative experiments is, in fact, the absolute extraneousness of the formal references.

Geometries are interpreted as dynamics of progressive transformations and the very structure of the topological architectural paradigm does not affect the formal structure.

The events generated with these progressive paradigms maintain, in fact, the recognizability of the idea even in different patterns of relationships and with the use of different forms. This is due to the fact that the logic of transformation remains the same and defines the general character of the spatial vision adopted.
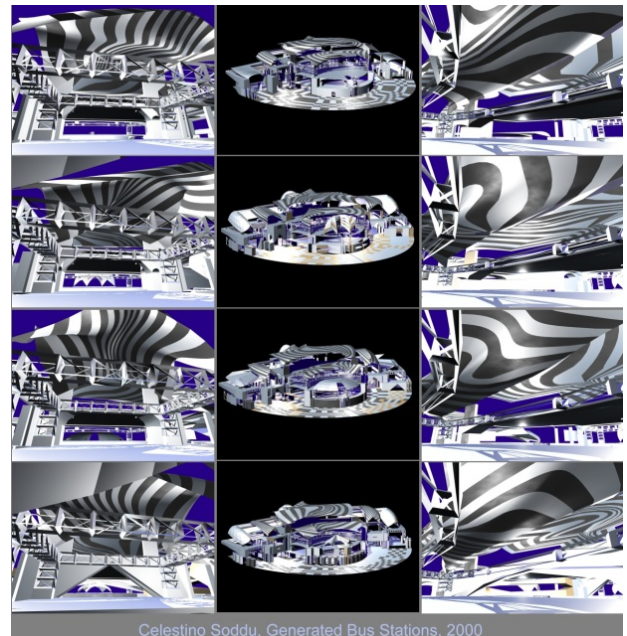
Celestino Soddu, Generated Bus Stations, 2000

Generated Bus Station in 4 variations.
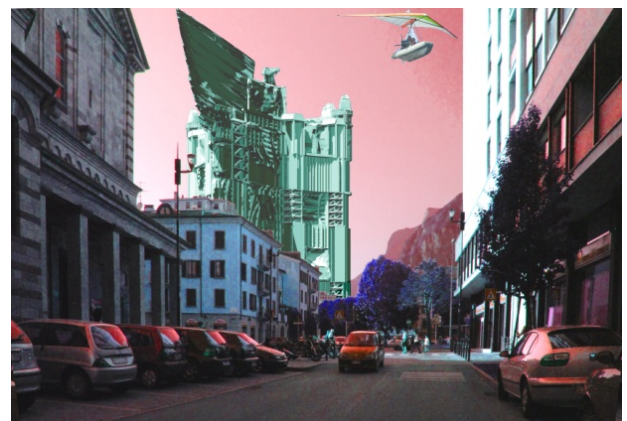
Generated Architecture in Lecco, Como lake, 2009

Beyond architecture

In all the experimentations until 2001 I used my software that had been built with the aim of architecture and cities. The X and Y coordinates were dedicated to horizontal events while the Z coordinates managed the structure of the heights, from the ground attack to the roofs.

XY and Z were therefore two types of dimensions constructively, functionally and aesthetically different, because they were based and differently controlled by gravitation. This is true even if, as exceptional events, oblique events could also be generated.

However, the variation in vertical alignment did not deny the topological relations between the parts that remained, in any case, marked by the relations between vertical and horizontal members.

Obviously the horizontal events, which could appear as orthogonal in the paradigmatic representation of the system, had instead a variable geometric arrangement, hexagonal, curved, parabolic, hyperbolic, ellipsoidal, sinusoidal, "baroque" open or closed, depending on the codes of transformation adopted and, of course, depending on all possible contamination between these codes.

The vertical ones, on the other hand, even if they were generated as oblique, maintained the characteristic of structural continuity, of the presence of an attack on the ground and of a structure of "how it ends".

When there was a lack of vertical continuity, this was replaced by the neighbouring events that supported this lack, as it happens in the bridges, in the arches, in the overhangs.

The first generations of objects such as chairs and lamps also continued to have this architectural matrix where the Z coordinates had different characteristics from those of X and Y.

In 2001 I faced these limits and I transformed my generative program

making possible, for each event identified in the paradigm, a different "direction of growth" and corresponding to the category of connections that would control the generation of the event.

This has opened infinite possibilities, first of all the generation of "hypercubes" or other multidimensional representations.
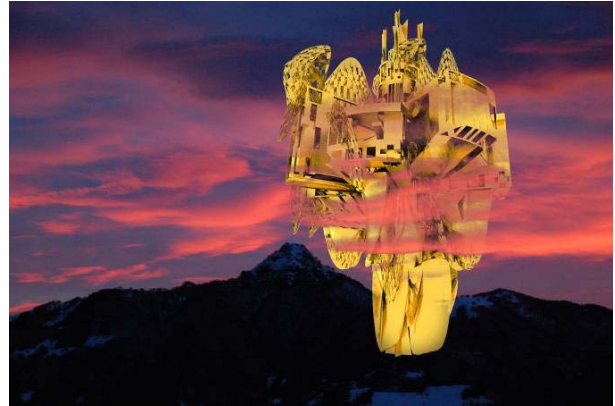

Generated Hypercube castle

All subsequent projects had the potential to free themselves, if necessary, from the pure architectural matrix to creatively control the generation of "design" objects, and not only that.

The generation of fantastic animals, the generation of portraits of interpretation by Francis Bacon and the generation of car bodies were only possible after this innovation.

The transformation matrices, the generative algorithms, however, remained the same and continued to grow in number populating a labyrinth of the possible ever larger.
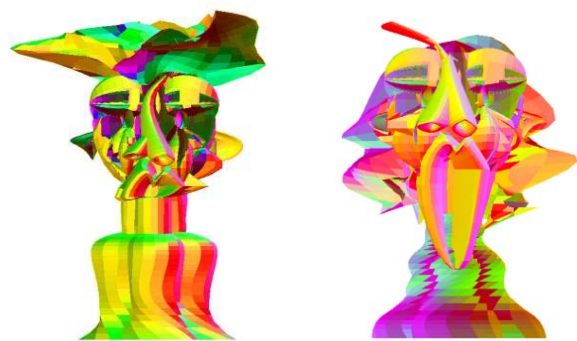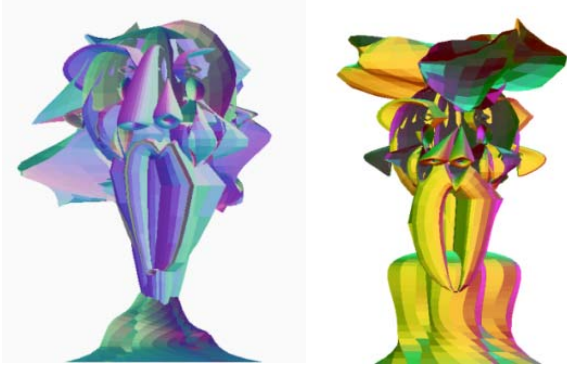
Generated portraits interpreting Francis Bacon

Homage to Francis Bacon of a fantastic animal to accompany him in his dance on the stairs.

Subsequent experiments, and the progressive increase in the logic of transformation, were based on the search for the generative characteristics of Ideal Cities, meaning as ideal cities those whose identity contains a concept of the future, of not yet reached but which is visibly perceptible and felt by those who live in these cities.

Identity is understood as the character of the transformations towards the future, as

a vision of the possible. Rome, Singapore, Hong Kong, Chicago, Washington D.C., New York, Venice, Delhi, Ravenna, Shanghai, Milan, Lima were some of the "ideal cities" that I interpreted with generative algorithms.

A generated car, a U.F.O. and a baroque architecture for Porlezza, near the country where Borromini was born.


Generated car bodies. 2016

I proposed them, through exhibitions in these cities, futuristic scenarios that tried

to represent these identities in progress. All this work has remained as a trace in the labyrinth of algorithms stored in Argenia.

Everything enters into memory, as in life experiences, not only as a memory of events but as a memory of how to act, transforming the world into a world closer to our vision, and often trying to express the potential of the various contexts, the various urban realities, the various identities.
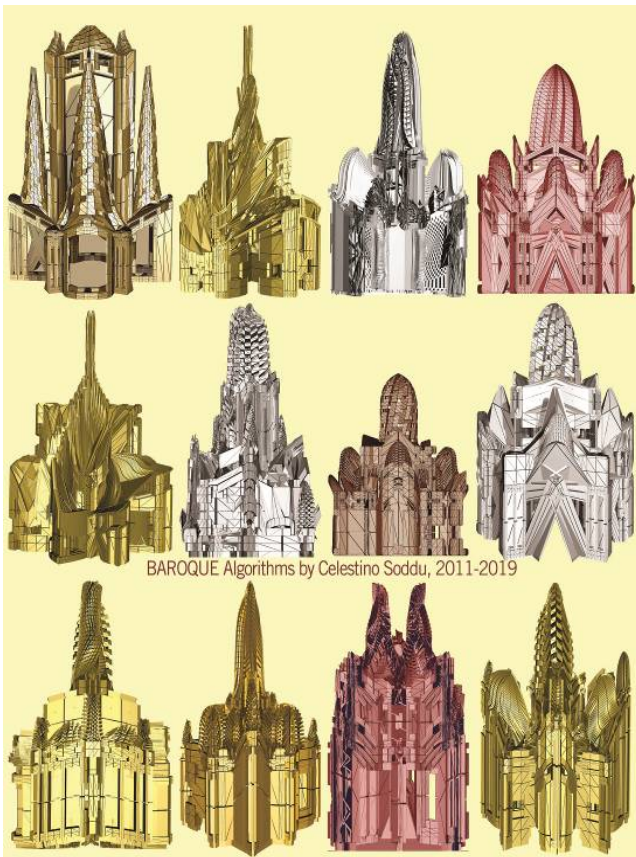
Baroque architectures for Rome, interpreting geometric transforming rules by Borromini.

I never started from an analysis of the cities but from how they had been seen by artists and architects. For example, I interpreted Rome by entering the world of Baroque geometric transformations imagined by Francesco Borromini, while Venice was interpreted generatively through the works of Canaletto.

Milan, on the other hand, I interpreted it through what has never been expressed in this city: the Futurist feeling.

Milan experienced Futurism intensely but Futurism was never allowed to actively enter the architectural image of this city.

3 generative variation for the Futuristic Museum in Milan, 2004

By generating "futurist" scenarios for Milan, I tried to interpret a feeling, a debt that Milan has in the construction in progress of its ideal identity. (C. Soddu, "Milan, Visionary Variations. Futuristic meta-codes for Milan identity", (Italian and English), Gangemi Ed. Roma 2005., which was also the catalogue of my solo exhibitions in Hong Kong and Milan. The second edition, digital, can be downloaded for free from artscience-ebokshop.com)

Each personal exhibition, in Europe, in the East and in America, was an opportunity to increase Argenia's "active" memory.
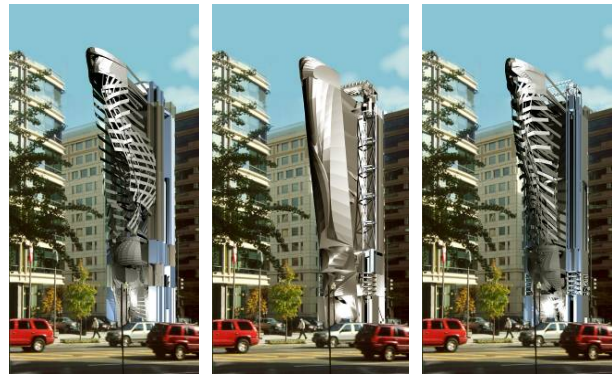
3 variation for the World Bank cultural centre in Washington D.C., 2002

In my exhibition at the World Bank's cultural center in Washington D.C. I tried to interpret the cultural matrix that led to the construction of this city, an abstract matrix that is not so easily identifiable in the urban form and I experienced the results as recognizable variations of an idea with the generative project of the World Bank's cultural center.

In Los Angeles, in my solo exhibition at the Pacific Design Centre, my future

scenarios were multiple, just as this city is multiple despite having an extremely strong identity. I asked visitors to tell me about the generated scenario where, according to them, Los Angeles is more Los Angeles than before.
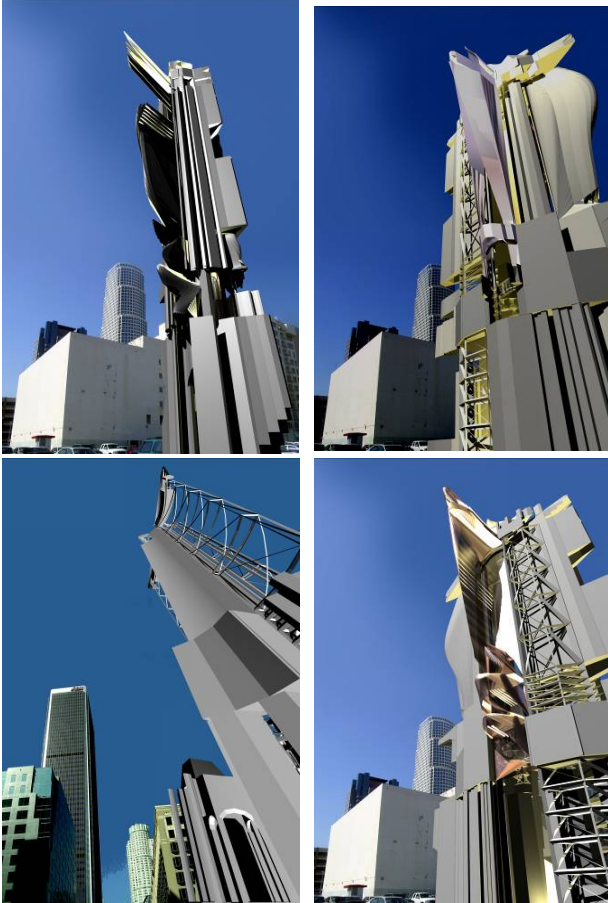
4 variation of generated broadcasting towers in L.A.

From the answers I identified which interpretations, and which transformation algorithms, were more in tune with their ideal City. This, as well as the parallel responses I had in other cities around the world, gave me incredible indications about the algorithms that were able to tell different identities.

The results were surprising: different identities could be told with small variations, even related to infinitesimal numerical variations, within the transformation algorithms used.

It was like drawing a logical-mathematical map of variations in urban identity and recognizability.

Potentiality between different identities can be explored through the progressive dynamics of small variations.

Delhi, interpreting Indian identity with small variation of already used algorithms.

Venice, in 2015, was an opportunity to generate Venetian scenarios by interpreting this city in the works of Canaletto.

The results were "Venetian" scenarios that had no formal element of the architecture, cathedrals and bridges of Venice, but only its character that had been grasped by interpreting Canaletto.

However, these were unmistakably Venetian urban scenarios. And also the characters who populated these urban scenarios, just as the paintings of Canaletto were populated, were "Venetians".

In fact, I inserted in these urban spaces a fashion show with models using clothes generated for the occasion with the same algorithms creted to "generate Venice".

*Generated Venice referring to Canaletto. Paintings, 2015*

The results were recognized as Venice also by the Venetians, even if immediately

after the first impact the Venetians began to tell me that, yes, the bridges were not those of Venice, Venice did not have the same fireplaces on the palaces, and so on, highlighting what interested me, the existence of a Venetian identity told by my algorithms whose Venetian character was recognizable but was not based on the repetition of forms.

Forms were, as in any generative event, only one of the possible variations to tell the same idea.

Generated town in Tuscany landscape
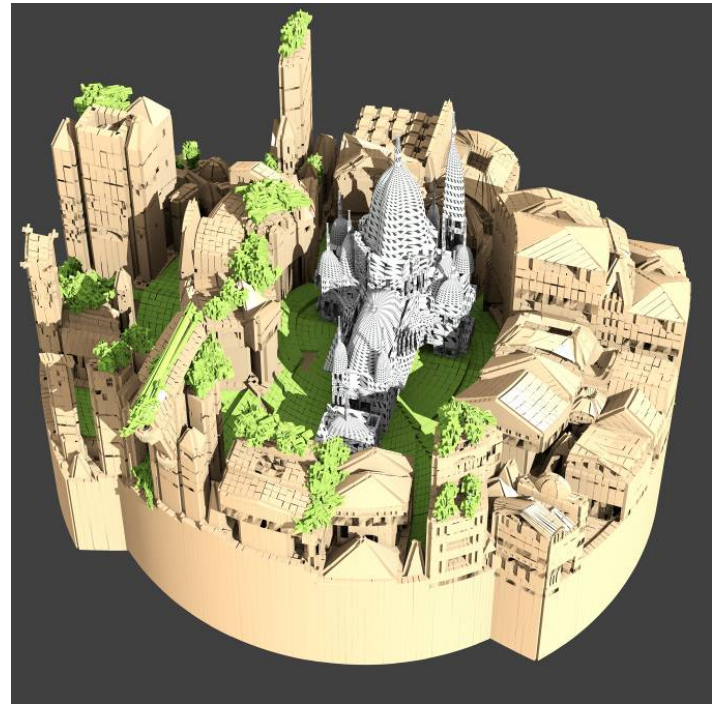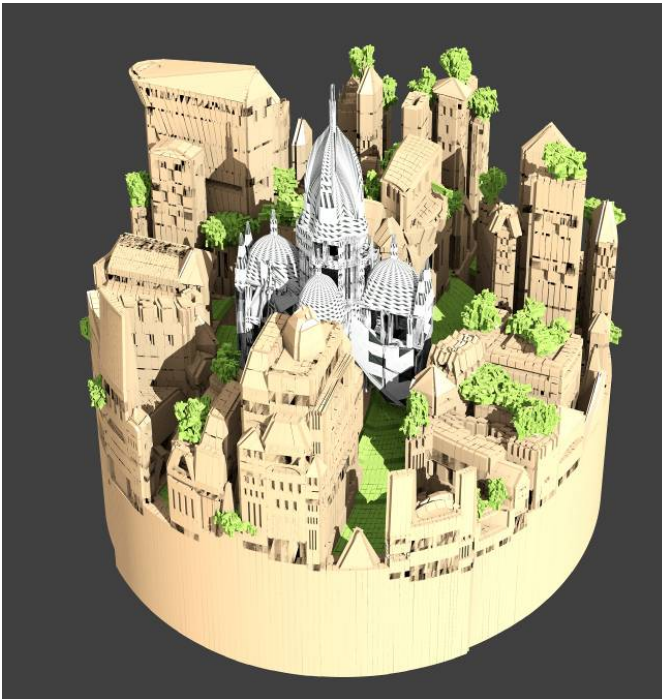
Generated Tuscanian medieval cities, 2016

Following the exhibition in Florence for the Generative Art conference in 2016, I tried to make a increasing complexity evolution of my first generative work, the Medieval cities. But with a particular attention to Tuscanian cities that have, like Florence, a core, sometimes different and a city structure fully Medieval. I called this mix of identities "duets". The generated cities have a strong identity representing the Tuscanian peculiarity.

Generated Mosaic Architecture for Ravenna, 2017. Two variations.

Ravenna, and its mosaics, have been the basis for codes of transformation that have tried to expand, sometimes overturn the relationship between spaces, volumes and details, relocating them in a structure of mutual connections built to enhance the future identity of this city.

The mosaic architectures I generated (exhibition at the Art Museum of Ravenna on the occasion of the Generative Art 2017 conference), while tracing a strong image of this city, struck the common imagination of its inhabitants because they proposed a world that was not utopian but visionary, therefore a futuristic world capable of representing the truly possible imagination of their cultural identity.

Verona, in 2018, through the generative interpretations that I developed for the exhibition of the GA conference at the Museum of Natural History, gave me the opportunity to make a further logical interpretation of the Renaissance matrices of this city, and not only of this city, expanding the cultural reference to the Renaissance that has been fundamental in all my previous work.

I made it together with the possibility of retracing the imaginary figures of some of its monuments, generating the fantastic animals that populated the architectural and urban scenarios generated for Verona.

In the exhibition at the British Cultural Centre in Lima I presented my interpretation of the Inca matrix grafted onto the subsequent development of this city and of Cuzco, the ancient Inca capital.

The interpretation and subsequent recognizability of this historical matrix was born from the consideration of both the architecture that traced the identity of Lima, such as the geometric stereometry of the buildings defined by the facades with special projecting balconies and the structure of the holes, but also and above all from the style of its ancient inhabitants and of what, even today, characterizes the original population.

Lima, generated architectures identifying Peruvian identity, 2018

Verona, generated architectures in BRA Square, 2018

Lima, generated architecture by interpreting the tradition. 2018

Not forms, but structures of connection between the whole and the part, between events in succession, both in traditional clothes, in work tools and in architecture.

Notre Dame de Paris. Generated proposal for the reconstruction of the spire. 2019.

The reading and interpretation of the past has been actively experimented with the works of the artists who have most urged me to find generative structures that involve the characters that I most appreciated.

From Giotto and Simone Martini to Piero della Francesca and Leonardo da Vinci. In the last century, from Van Gogh to Picasso to the Futurists and Francis Bacon.

A recent tribute to Francis Bacon was to generate pets suitable for his self-portraits. These pets are certainly different from self-portraits but, starting from the characters of the muzzle to the general characters, they are born from my interpretation of his paintings, which I had already dynamically interpreted with the previous series of post-portraits by Francis Bacon.

To this I have added, as primary, the reference to a series of new algorithms, realized for example on the occasion of the mosaic architectures for Ravenna that, in the animals for Francis Bacon have been used, with appropriate variations of the parameters, for the mantle of these animals.

This makes clear that each algorithm has its own dynamics, was born for an occasion but finds, in the evolution of ideas and opportunities, its own life and further possibilities to emerge, adapting and interpreting creatively the design context. In this progressive shift they tell the progression of the interpretative and generative logics that build the identity of an artist.

CELESTINO SODDU - GENERATIVE WOMAN 3D PORTRAITS

Generative Interpretation of Picasso woman portraits. 1996

MUSICABLU, The generative software parallel to Argenia with output of music scores.

Musicablu uses the same approach as Argenia: the algorithms are built logically interpreting the masters of music that are most in tune with my vision. From Bach to Mozart, from Coltrane to the Modern Jazz Quartet, from the harmonic structure proposed by the Beatles to the codes of mathematical sequences (sequences of prime numbers, Fibonacci, sequences of squares, hailstones, Alcuin, etc.).

In Musicablu I built a topological paradigm of relations and connections between 15 instruments that controls the evolutionary dynamics of the piece and its basic harmonic structure.

Each instrument uses a specific modus operandi in the construction of the melody (construction of the passages from one chord to another, riffs generated with the construction of the retrograde, inverse, etc.. as the fugues of Bach, interpretations of the structure of the sequences of various pieces that do not constitute a reconstructed repetition of the same but are used only when the reference event is no longer recognizable and only its logical structure shines through.

The harmonic structure is also generated based on basic topological structures, carrying on, among other things, the experiments of the Beatles in the 3D progression between tonalities, progressions based on some chords of passage that allow, not only on the plane of horizontal sequences but also vertical and oblique, the tonal movement. (see paper for GA 2013 and article on Gasathj).

In conclusion, Musicablu is not a generative software for music but a generative software able to generate my music. The algorithms fit my abstract idea of a piece of music, following my subjective experience as jazzman in 60s,

and cannot be used for any type of results.

Conclusion

In a modern reality that consumes and destroys everything, from the planet to recent history and culture, and leaves nothing to the next generation, a possible door opens.

Argenia's attempt and all the generative software created by those who are actively following the path of Generative Art, can start a parallel path to Artificial Intelligence by inserting subjectivity in machine.

Generative Artificial Intelligence, the personal intelligent systems are the version of AI that can only be born from artists and their subjective view of the world.

Like the books of the past generation, these subjective machines can be the tools through which future generations can read the recent cultural history and, perhaps, enrich the ability to interpret cultural diversity, to find possible paths to develop their own personal logic, to build their own identity in progress as creative people, as people able to identify themselves as bearers of their own cultural vision.

However, the need is to preserve this logical memory, creating generative software able to survive to the quick change of external technologies and libraries with rapid obsolescence.

In this way, we can find, or rather build our own approach on how to transfer from the past to the future, an idea of civilization that comes from multiple subjective interpretations of the past.

Like cathedrals first and printed books later, they can be an important instrument of memory of our transformation into digital civilization.

References

C.Soddu, P.A.Rossi, "*Il calice di Paolo Uccello uno e senza limite*", (the goblet of Paolo Uccello, one and without limit) with a referee of C.L.Ragghianti, in "Critica d'arte" magazine n.8 1986.

C.Soddu, "*L'immagine non euclidea*" (the not Euclidean image), Gangemi publisher, 1987. (book)

C.Soddu, "*Citta' Aleatorie*", (unpredicatable cities), Masson Publisher. 1989 (book in Italian)

C.Soddu, "*Simulation tools for the dynamic evolution of town shape*", in "Global change and local problems book", Oxford Polytechnic 1991.

C.Soddu, "La *simulazione della dinamica evolutiva della forma, dagli scenari metropolitani al design morfogenetico*", (The simulation of the evolutionary Dynamic shape. From urban scenarios to the morphogenetic industrial design), in the proceedings of "La citta' interattiva", Milano, June 1991

C.Soddu, "*Simulation tools for the learning approach to the dynamic evolution of town shape, architecture, and industrial design*", in the proceedings: "computer aided learning and instruction in science and engineering", published by Press Polytecniques et Universitaries Romandes. Lausanne 1991.

C.Soddu, E.Colabella, "*Il progetto ambientale di morfogenesi*", (the environmental design of morphogenesis), Progetto Leonardo Publisher 1992 (book)

C.Soddu, E.Colabella, "*The project of morphogenesis to design the DNA or architecture*", in "CIB'92, World Building Congress", Montreal 1992.

C.Soddu, "*Il progetto ambientale attraverso i codici morfogenetici del naturale artificiale*", (the environmental design using morphogenetic codes of natural/artificial systems), in the book "Poiesis, l'informatica nel progetto euristico", Citta' Studi Publisher, Milano 1993.

C.Soddu, lecture and art installation at the Gestaltung Museum of Zurich,

"*Morphogenetisches Design: Architekturen*" in "New Realities - Neue Wirklichkeiten II ArchitekturAnimationenInstallationen" 27 Jan/4 Apr 1993, Museum fur Gestaltung Zurich.

C.Soddu, E.Colabella, "*The morphogenetic design as an artificial intelligence system to support the management of design procedures through the total quality of the built environment*", in "The management of Information Technology for Construction. First International Conference" Singapore 1993.

C.Soddu, "*Human-machine interaction in design processes. New search software to generate the simulation of the increasing complexity of an idea about architecture, environment, and industrial design*". In "Computer Science, Communications and Society" Neuchatel, 1993.

C.Soddu, "*Il progetto di morfogenesi / Design of morphogenesis*", in the magazine Demetra, n.5 December 1993. (In Italian and English)

C.Soddu, E.Colabella, "*Artificial Intelligence in the teaching of architectural design*", in the proceedings of Hypermedia in Sheffield, Sheffield 1995

C.Soddu, E.Colabella, "*Recreating the city's identity with a morphogenetical urban design*", on Making the Cities Livable, Freiburg 1995.

C.Soddu, E.Colabella, "*Artificial Intelligence and Architectural design*", CAAD Futures '95, Singapore 1995.

C.Soddu, E.Colabella, "*Argenic design*", in "Contextual Design – Design in Contexts", The European Academy of Design, Stockholm 13-15.4.1997

C.Soddu, E.Colabella, "*A Natural Approach to Industrial Design: Argenic Design*", in New Simplicity?, Helsinki Aug 1997.

C.Soddu, installation "*La citta' naturale*" (the natural city) at the exhibition HighLife at Smau 1998, with the show, in real time, of cities and argenic architecture. The

exhibition has used the 360-degree anamorphic representation that is a patent by C.Soddu.

C.Soddu, "*Argenia, a natural generative design*", 1st Generative Art conference, Milan 1998

C.Soddu, "*Recognizability of the Idea: The evolution process of Argenia*", in the proceedings of AISB99 Edinburgh 6-9 April 1999.

C.Soddu, "*GENERATIVE ART*", proceedings of GA'98, 1st generative Art conference, Editrice Dedalo Publisher, Rome 1999

C.Soddu, "*Recognizability of designer imprinting in Generative artwork*". Proceedings of Generative Art Conference GA'99, Milan December 1999.

C. Soddu, "*New naturality: a Generative Approach to Art and Design*" in Artificial Life 7 workshop proceedings, Carlo C. Maley and Etlis Boudreau Editors, Portland, Ontario – Leonardo, MIT press, USA, 2000

C. Soddu, "*Argenia, Art's Idea as Generative Code*", in 2000 Genetic and Evolutionary Computation Conference proceedings, Annie S. Wu, University of Central Florida Editor, Las Vegas, Nevada, 2000

C. Soddu, "*Basilica, an Architectural Generative Virtual Office based on Italian Renaissance Code's interpretation*", in Mosaic 2000 proceedings, University of Washington Editor, Seattle, 2000

C. Soddu, "*From Forming to Transforming*", proceedings of Generative Art Conference, Milan, Alea Design Publisher, December 2000

C. Soddu, "*Argenia, naturality in Industrial Design*", in proceedings of 3rd International Conference on Computer-Aided Industrial Design and Conceptual Design, CAID&CD'2000, International Academic Publisher, World Publisher Corporation, December 2000

C.Soddu, "*Recognisability of the idea: the evolutionary process of Argenia*" in P.Bentley & D. Corne (edited by),

"Creative Evolutionary Systems", Morgan Kaufmann Publisher, San Francisco US, 2001

Duncan Graham-Rowe, *"Design Genes"*, Blueprint Magazine, August 2001

C. Soddu, "*Generative Natural Flux*", proceedings of Generative Art Conference, Milan, AleaDesign Publisher, December 2001

C.Soddu, "*Generative Art, Visionary Variations*", Catalog of the exhibition at Visual Art Centre, Hong Kong Museum, 2002

C.Soddu, "*New Naturality: a Generative approach to Art and Design*", Leonardo Magazine 35, MIT press, July 2002

C.Soddu, E.Colabella, "*Generative Art, Preludi natural mirrors*", ISEA2002, Nagoya, Japan, published by Inter Society for the Electronic Arts, Japan.

C.Soddu, "*Clarity, complexity harmony, and safety: Identity's Generative codes build liveable cities*", Cities Asia Summit, Singapore 2002, PSA Pub.

C.Soddu, "*La Citta' Ideale, generative codes design identity*", Proceedings of GA2002, GDL Pub., December 2002, Milano

C.Soddu, "*Generative Art, visionary variations of Washington DC*", catalog of the exhibition DigItalyArt, IDB Cultural Center, Washington DC, 2003.

C.Soddu, "*Visionary Aesthetics and Architecture Variations*", in Proceedings of GA2003, AleaDesign Pub., Milano.

C Soddu, E.Colabella "*Argenìa, a mother tongue in infinite variations*", Proceedings of the First International Conference on Design Computing and Cognition, Workshop 3 "Implementation Issues in Generative Design Systems", MIT Boston, July 2004

C.Soddu, "*Visionary Variations of Milano. Generative projects designing the Identity of Milano*", proceedings of De Identitate, GDLab Milano 2004

C.Soddu, "*Visionary Variations of Milano. Generative Projects Designing the Identity of Milano*", an exhibition at

IFC mall in Hong Kong, June 2004.

C. Soddu, "*Generative Design / Visionary Variations - Morphogenetic processes for Complex Future Identities*" in the book Organic Aesthetics and generative methods in Architectural design" edited by P. Van Looke & Y. Joye in Communication&Cognition, Vol 36, Number 3/4, Ghent, Belgium 2004

C. Soddu, "*Meta-Code, Identity's Borders*" in "Generative Art 2004", proceedings of the International Conference GA2004, Aleadesign Editor, 2004

C.Soddu (interview to), "*From gene to design: prof. Soddu and his Generative Design*", page. 6-13, Magazine "Designer" n. 1, 2004, Changsha, China. http://renwu.chda.net/show.aspx?id=106&cid=13

C. Soddu, "*Argenìa, Artificial DNA and Visionary variations*", in "O sentido e o universo digital", proceedings of SIGRADI, the VII congreso igeroamericano de grafica digital, Unisisod Nov. 2004

C. Soddu, "*变化多端的建筑生成设计法*" (Generative Design), article in the magazine "Architect", December 2004, China

C. Soddu, "*Milan, Visionary Variations*", Gangemi publisher, Rome 2005 (book)

C.Soddu, "Generative Art in Visionary Variations", in Art+Math=X proceedings, University of Colorado Boulder, 2005.

C.Soddu, "*Visionary Variations in Generative Architectural Design*", article in Chepos magazine n.003, TU/e, Eindhoven 2005.

C.Soddu, E.Colabella, "*A Univesal Mother Tongue*", Leonardo Electronic Almanac Volume 13, Number 8, August 2005

C. Soddu, "*Argenia, Artificial DNA and Visionary variations*", The Journal of designing in China, summer 2005, Hong Kong

C. Soddu, "*Argenia in timeless gen-codes*", proceedings of ARTMEDIA IX, dept. Philosophy, University of Salerno,

2005

C. Soddu, "*Gencities and Visionary Worlds*", proceedings of 8th Generative Art Conference, Politecnico di Milano University, Milan, 2005.

C. Soddu. "*Generative design, a swimmer in a natural sea frame*", proceedings of the 9th Generative Art conference, Milan, 2006.

C.Soddu, E.Colabella, "*Argenia*" PNCM conference proceedings, Daugavpils University, Latvia, 2007

C.Soddu, "*Endless interpretations, infinite in the mirror*" in the GA2007 proceedings, Milan, 2007.

C.Soddu, E.Colabella, "*Lumen in Splendore*", proceedings of ApliMat, University of Bratislava, 2008.

C.Soddu, "*Alive Codeness*", GA2008 proceedings, page 176-187, ISBN 978-88-96610-01-5, Domus Argenia Publ., Milano, 2008

C.Soddu, "*From Design to Meta   Design: Generating the artificial DNA of Lecco Futuristic Identity*" in PCNM conference proceedings, Daugavpils University publisher, Latvia 2009

C.Soddu, "*20 Years Argenia Evolution*", GA2009 proceedings, page. 86-104, ISBN 978-88-96610-00-8, Domus Argenia Publ., Milano, 2009

C.Soddu, "*Perspective, a Visionary Process: The Main Generative Road for Crossing Dimensions*" in Nexus Network Journal: Volume 12, Issue 1, Page 33-46, DOI 10.1007/s00004-010-0016-6, Springer Publisher, New York, 2010

C.Soddu, "*Curved spacetime perspective as generative engine. Intersubjectivity & Contrapunctus*", The GA2010 proceedings edited by C.Soddu, page 114-127, Domus Argenia publisher, 2010, ISBN 978-88-96610-06-0

C.Soddu, "*Immanent Codes of Cities Identity*", paper as invited speaker at the 1st International Conference "Art, Science and Technology: Interaction between Three Cultures", ORT Braude College,

Karmiel, Israel, 2011

C.Soddu, "*Baroc Generative Algorithms*", proceedings of XIV Generative Art Conference, GA2011, Domus Argenia Pub. 2011, ISBN 978-88-9610-145

C.Soddu, "*Generative Design*", article in GASATHJ, Generative Art Science and Technology hard Journal, issue #1, 2012

C.Soddu, "*Logics of Imagination. Generative Art performs the Artist Style as Executable Process*", proceedings of XV Generative Art Conference, GA2012, Domus Argenia Pub. 2012, ISBN 978-88-96610-18-3

C.Soddu, " *MUSICABLU; Generative Music Design software for increasing human creativity and generating unique and not repeatable musical scores*" proceedings of XVI Generative Art Conference, GA2013, Domus Argenia Pub. 2013.

C.Soddu, "*Generative Art Geometry. Logical interpretations for Generative Algorithms*" proceedings of XVII Generative Art Conference, GA2014,

Domus Argenia Pub. 2014.

C. Soddu, "*Generative Design: Art and Science. Dynamic Logics, Geometries, and Algorithms*", keynote speaker at ECAADE, Milan workshop 2015

C.Soddu, "*Generative Design: Futuring Past*", proceedings of XVIII Generative Art conference, GA2015, Domus Argenia Pub.

C.Soddu, "*The discovering of Persistent Deep Memory in Generative Design*" , proceedings of XIX Generative Art conference, GA2016, Domus Argenia Pub.

C.Soddu, "*Designing Generative Art. Mosaic concept, Creativity, and Idea in Generative Design*", proceedings of XX Generative Art conference, GA2017, Domus Argenia Pub.

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