

20 years ARGENIA evolution

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Abstract

Starting from 1986, I developed my generative approach by identifying, from Basilica generative software to the last Argenia "open" version, the challenges linked to my own creative Vision:

1. The cultural references to Italian Heritage, from Renaissance to Futurism, particularly Leonardo, Borromini, Palladio, Piranesi and Depero, and the reference to Gaudi' and Kandinskij, following my subjective approach to complexity.
2. Subjectivity as the main way to reach the complexity
3. Moving through multiple dimensions as the main engine for generating identifiable series of events,
4. Variations as the main expression of a Vision, following Bach approach.
5. Recognizability of each possible unpredictable result as confirmation of the quality of a generative process.
6. Identity, architectural, environmental identity, following own cultural and creative Identity as the main topic to manage with Generative approach.

Moving from subjectivity to multi-subjectivity, the new challenge is the possibility to extend Argenia to different users with the possibility to involve each user in constructing, in a while, the artificial DNA of his own creativity. This new software will be used, together I hope with other tools made by the friends of Generative Art, for starting new research and teaching activities also inside Domus Argenia, the international centre on Identities and Generative Art just now established in Sardinia.

1.Premise

When, in 1986, I designed Basilica, my first generative software in the field of Architecture, I had the experience of seven years of experimental software. Starting from 1979 I had designed software in the field of perspective representation of architecture, of reverse perspective for generating 3D models from 2D images, of the total 360 degree perspective and about the use of fractal geometry for generating natural environments. These first software were made together with experimental representations of complex not-linear systems with the aim to manage in a morphogenetical way multiple bifurcations and variations. My first reference, but also the friend for discussing these advanced approaches to Art and Science was C.L.Ragghianti, which published several times my researches in his magazine "Critica d'Arte".

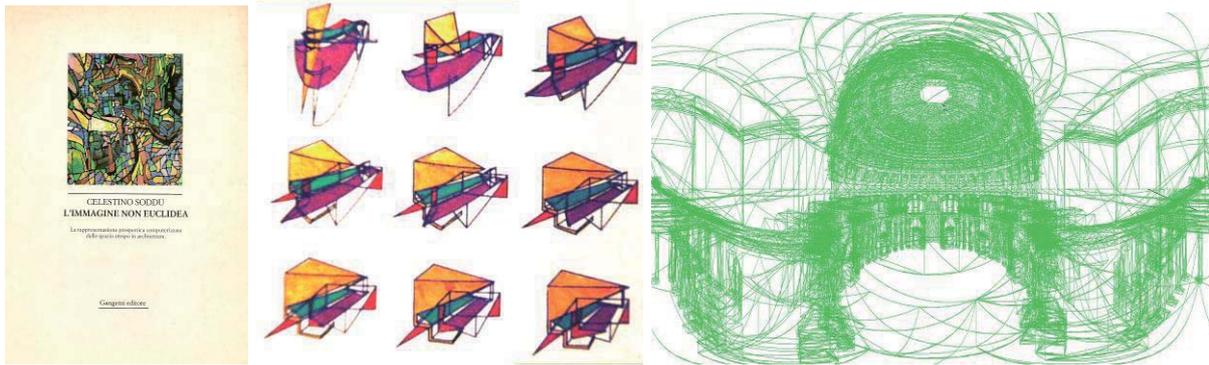


Fig. 1, Cover of “The not-Euclidean Image” C.Soddu, 1986

Fig. 2, From the article on “Critica d’Arte”, the magazine of C.L.Ragghianti, n. 18, 1988, about dynamic multi-dimensional and not-Euclidean interpretation of “futuristic” Balla.

Fig. 3. Use of Total Perspective for representing the Pantheon. Made with the “Total Perspective” software designed by C. Soddu in 1985. The software was explained in “Not-Euclidean image” book, 1986.

The aim of designing generative software was born from my passion for the architectural composition and design and from a consideration: in architectural design processes, each following step toward the final result forces us to choose among different possibilities/bifurcations. We need to choose what seems acceptable and what seems to fit our aims. But we are not able to evaluate, also *a posteriori*, if the choice has been happy. Certainly, the custom in designing and the acquired experience allows us to knowingly make such choices, as when we make a movement to chess and we pre-view the possible future scenarios. But always the doubt that the lost road would have been able of fitting unpredictable qualities remains. We know very well that alternatives that seem to be not practicable are only hypothesis not yet arrived to an acceptable maturation. But alternatives are innumerable and each one multiplies the possible incoming scenarios until infinite.

The matter is that we are aware that architectural idea/vision can be only represented with the endless possible choices that we valued as fine. All they are part of our Vision, not only those that we have made for finishing a project. Idea is a Poetic of a world of possible. Poetics cannot find its full expression through only one final result.

It’s possible to write this Idea as chaotic dynamic not-linear system? Were each bifurcation/alternative could be represented and variations can be generated by changing the starting point?

This consideration is at the base of my generative approach. Idea is not only the result but the logics able to develop the design processes. Idea as genetic code in imitation of Nature. Idea is the system of transformation-logics to move from a scribble (or other unpredictable starting point, not necessary fitting the idea) to an architectural project. And the idea belongs to subjective poetic. (C.Soddu, "Alive Codeness", GA2008 proceedings, DomusArgenia Publisher). This is the engine of Basilica, my generative software able to represent my Generative Vision in Architecture.

2. My first experimentations: generative engines from moving through different dimensions

Therefore, using my acquired experience in realizing software based on mathematical / geometrical approach, I decided to design generative software with the aim to write something like progressive Logics of Transformation from an existing environment into a possible one that had to be, more than only a tool, the expression of an Architectural Vision.

I have immediately realized that this approach would have sense only by stratifying a lot of possible "choices", therefore this approach would have asked a lot of time for reaching the necessary complexity. My idea was, and it remains, to stratify, to put into the interconnected system and recording them as operative logics, as algorithms, the "thoughts of design transformation" able to reflect particular design moments and different environmental situations. Design processes are not only dialectical games. They need creative vision and experience. Algorithms come accordingly

I had learned from my previous professional design activities that, very often, the only possibility to overcome a moment of stalemate in the development of a project, that is the moment in which we don't succeed in identifying possible alternatives and the design evolution seems linear, axiomatic and boring, is waiting for a change of humor or, if we are in a hurry, is artificially changing the point of view. We can do that, for instance, by turning upside-down the sketch that we are working to, or tracing a new perspective view from another point of observation. The new point of view is able to be a catalyst for seeing in different way the relationships among the existing structures so that it helps us to identify, immediately, a set of alternatives among which to choose.

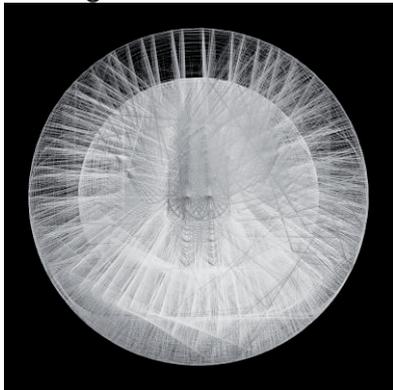
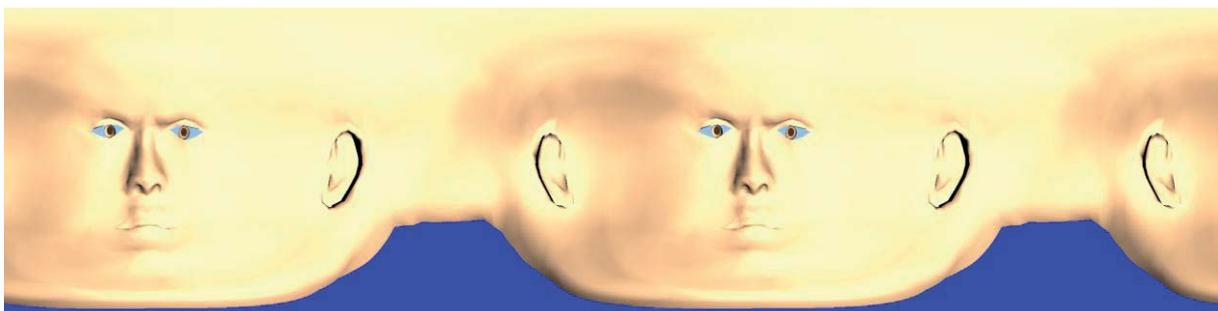


Fig. 4 Studies on multiple dimensions: a 9 dimension sphere. C.Soddu 2004

Fig. 5 Using reverse perspective of Florenskji in the 360 degree view of a face seen by inside the same face. (C.Soddu, "Perspective, a visionary process, the main generative road for crossing dimensions", NNJ journal, incoming publishing.



Therefore, the progressive creation of "logics of transformation" was immediately based on the manifold passages through different points of view, in practice on the

passage from two to three dimensions, and vice versa using perspective representations and reconstructions 2D-3D and on different passages from a dimension to another not limited to 3 dimensions. (C.Soddu, "Endless interpretations, infinite in the mirror" GA2007).

Also my studies on the representations of medieval cities by Giotto and Simone Martini, developed in my book "Not Euclidean Image" (C.Soddu, L'immagine non-euclidea, Gangemi Publ. 1986) identified, in the medieval images of cities and architectures, the dynamic progression of the "perspective" point as able to define a multiplicity of "reasonable" spatial orders that, all together, can better represent the idea of "medieval city". This particular "ideal city" is in the mind of these medieval artists and architects but, as happens also today, they cannot succeed in representing their Vision with only a static image but with dynamic images based on sliding points of view. These medieval city images seems to be not in "correct" perspective but they are only constructed stratifying different views with different points of view.

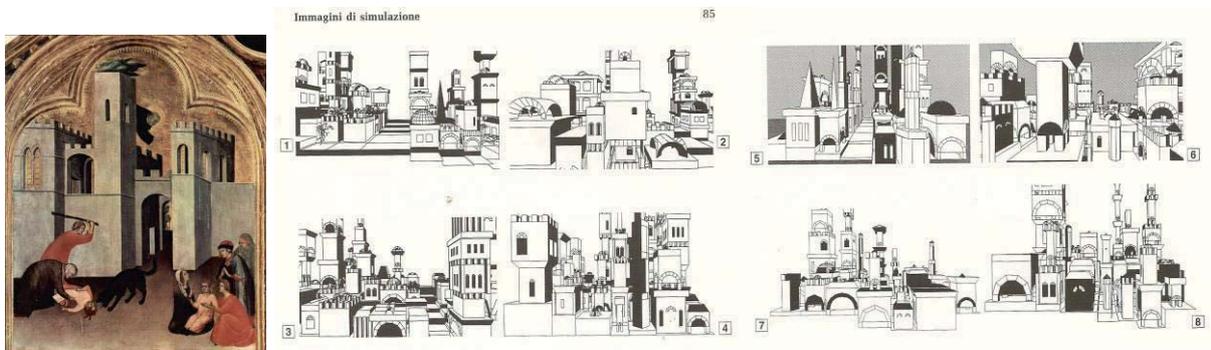


Fig. 6, 7 Starting from the studies on Simone Martini dynamic representation of medieval cities ("Not-Euclidean Image" book 1986) to the medieval town generated 3d models (from "Aleatory Cities" book by C.Soddu, 1989)

I have begun my generative experimentations by writing the first version of Basilica on Apple II with pen plotter. All was focused to generate events belonging to an urban "medieval" environment, or better an urban environment whose characters were my interpretation of Giotto and Simone Martini. The dynamic sliding of the point of view into only one image, peculiar character of the historical representations of medieval cities, but also used later by Piranesi (C.Soddu GA2008), became, in my generative program, the engine of possible transformations and multiple variations, operating "subjective" transformations among two and three dimensions. The main difficulty of these first experimentations of the middle of Eighties was the time due to verify the system. Because the screens with green or yellow phosphoruses were at low resolution, the only possibility was to directly trace a representation through the pen plotter. I launched in the evenings the program and the subsequent mornings I got up for seeing the result. Updated the program I had to wait a lot for verifying it again.

Soon, however, an aspect became more and more clear: Approaching the project through repeated progressions of transformations had two important results: the complexity and the strong identity; every result, although unpredictable, gained the possibility of being recognizable as belonging to a Medieval Vision.

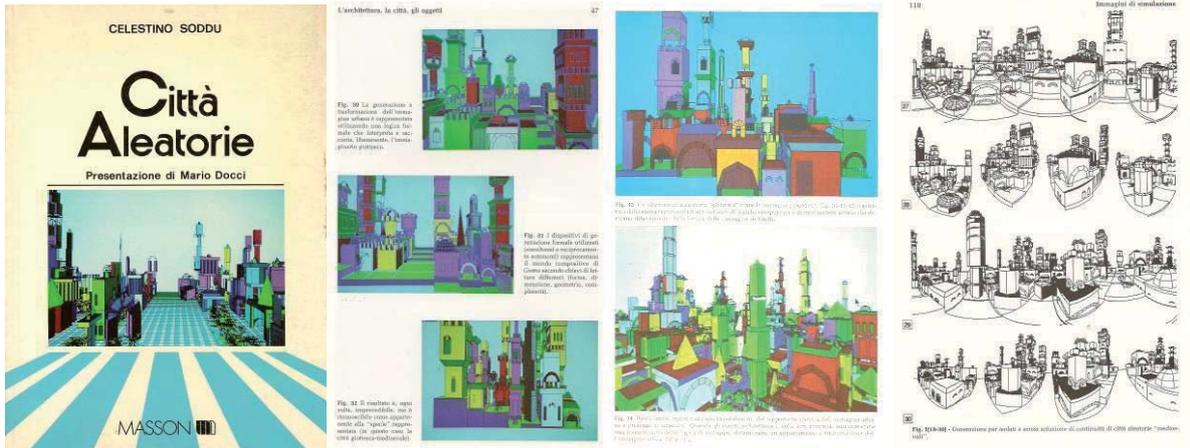


Fig. 8 Cover and 3 pages of “Aleatory Cities”, Masson Publ. 1989. The first book of Celestino Soddu explaining his Generative approach to Architecture and urban design and his software Basilica. In the images the generation of “Medieval Cities” as interpretation of Giotto and Simone Martini artworks.

First Basilica, toward the complexity.

The primitive structure of my generative software Basilica was therefore very simple:

1) Identifying organizational paradigms of architecture able to define events, relationships and interferences, 2) Tracing initial events that define, in first approximation, the dimensions and the orientation. 3) Managing ranges of geometric transformations, each one able to increase one of the functional / aesthetical / symbolic aspects and to push the events toward my architectural Vision. Each aspect answers to one of the functional, static and constructive architectural requests and, parallelly, to one of the characters identifying my Vision of architecture. I.E. “how I can apply a character of my Vision for transforming my beam in a way that it can reach the static needs?”.

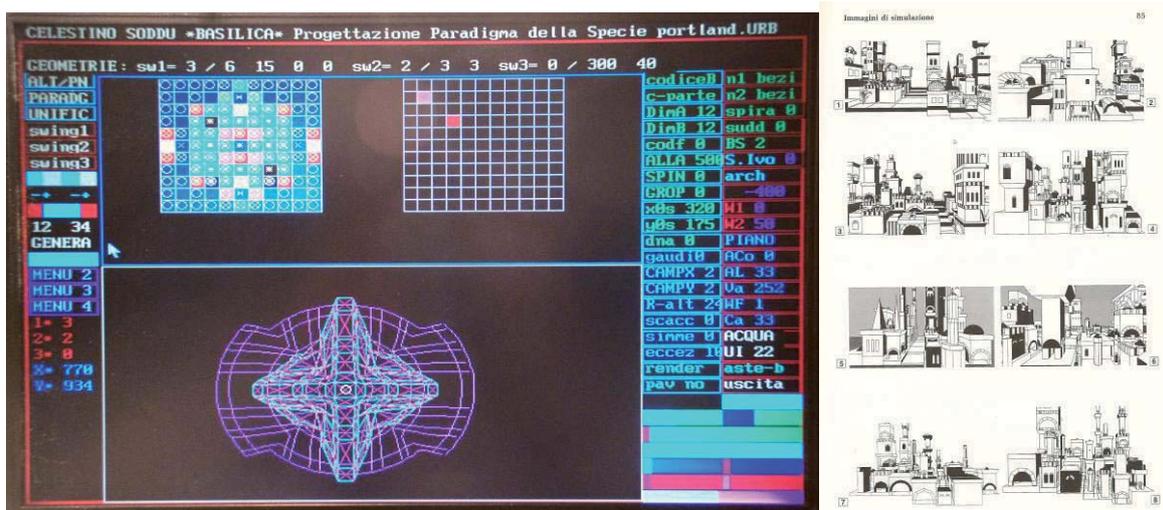


Fig.9, 10 Basilica Generative software (1987, it works only on Dos, also the last version 2009), Screendump of the paradigm and global geometrical transformations design interface. On the right a page from the book “Aleatory Cities” (1989) with 8 screen dumps of medieval town generation using Basilica.

The transformations run in parallel and also in series, belonging to single events and to the whole system; therefore transformations are repeated several times by using manifold "logics of transformation. If a series of transformations refers to the same logic in a way that we could define "fractal", the related functional / aesthetics / symbolic character is strengthened.

I designed these logics of transformation, these algorithms, in different moments and in different situations. Actually they reached a critical mass whose potentiality is to represent, even if still partially, my architectural idea in its evolutions and mutations. Reaching a critical mass of algorithms is fundamental for overcoming the simplification and for working on complexity. Today my generative software Basilica, in its last version, generates complex architectural scenarios because, stratifying from more than twenty years, I used every occasion for increasing the number of possible points of view and possible logics of transformation. It is evident that my generative approach founds on Poetic, therefore on the subjectivity, the possibility to reach the complexity and the production of variations. But does exist an "objective" way for reaching generative complexity?

In Basilica the choice of *when* and *how* these logics of transformation are activated, of what algorithm the program have to choose in each particular situation, is done by managing the progressive evolution of the system. All possible "transformations" that are able to fit the Vision could happen; but some were more probable than the others because they reflected a specific way to compare the transforming event to the already existing events. Like a Cellular Automata program mixed with something like Fuzzy Logic. This "management of the tones" also answered to the peculiarity of architectural characters able of reflecting the peculiarity of each single design occasion, the environment and urban identity in which the incoming architecture will live, in other words, the live-complexity of cities.

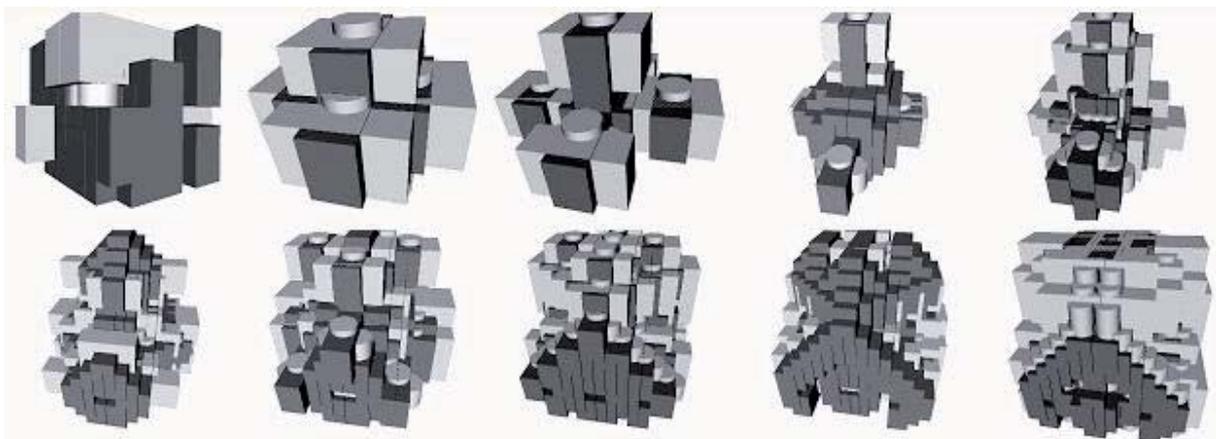


Fig. 11, 3d Cellular Automata software designed by C.Soddu for Generating 3D topologic paradigms, and now integrated in Argenia software.

The different starting point and the numerical not-precision of parameters used in these logics of transformation guaranteed the unpredictability and uniqueness of each results together with the recognizability of outputs as belonging to the same idea. (Marie-Pascale Corcuff , Chance and Generativity, in GA2008 proceedings)

The characteristic of the generative approach is generating unpredictable results belonging to the same idea, as happens in all not-linear complex systems. In my approach each result is also recognizable as "figure" (Enrica Colabella, figura, aura uniqueness, in GA2006 proceedings). This is the realization of a feasible architecture and not only the realization of an abstract three-dimensional image. In other terms my approach can be called "figurative", as for instance the approach of H.Cohen and of H.Dehlinger (GA1998 and subsequents) in the generative visual art, the experiments of P. van Looke in Mathematics that have the aim to reach the figuration (Philip Van Looke, Symbolic organic design, GA2006 proceedings), and the generative architectures of Renato Saleri Lunazzi ("GRUE: Génération régulée pour un urbanisme environmental", GA2008 proceedings). Figure is defined as dynamic event in which abstract is hidden inside. Similar to figurative is the representation of Nature

The "figurative" approach needs the use of a "control paradigm". It addresses the generative progression toward the "figuration", a functionally and constructively correct architecture, a recognizable event as possible variation of a known species, a human figure, a tree, a house, a city.

Another question is the difference among subjective and objective approaches. The aim of constructing a tool for everybody, an aid for generative design that, as the experiences of John Frazer J.Frazer, *An evolutionary Architecture*, Architectural Association Publications, 1995), Aant van der Zee and Bauke de Vries (Aant van der Zee, Bauke de Vries, *Design by computation*, GA2008 proceedings) try to refer mainly to "objective" functional aspects is different from my "subjective" approach that tries to increase and communicate an Idea by tracing a software as artificial Dna able to generate events belonging to a subjective Vision.

Results based on "objectivity" are very interesting. They identify a set of alternatives but they don't easily succeed in reaching complexity; and when it happens it is by introducing "subjective" choices as "objective" choices. For instance each house is different; each bridge is different even if it was built following the same scientifically correct choices based on the objectivity of statics. These "subjective" differences are really important in architecture and design. The difference among objective and subjective approaches could be identified, for instance, as the difference among axonometric and perspective views. The axonometric view, objective, cannot reach the representation of Infinite despite its strong communication and measurability. The perspective view, instead, can reach the representation of Infinite because it was born from the subjectivity of a point of view.

Based on subjectivity, for the reason that poetics is subjective and can be, obviously, not shared by everyone but only sometimes appreciable as subjective representation of the complexity of our life, this approach is more difficult to use as conceptual and operational reference in front of the "objective" approaches that can reflect in each results the direct relationship between algorithm and formal / functional needs. Knowing and exchanging "basic" algorithms is useful for basic needs, creating own algorithms is essential in performing creative results. Quoting Focillon, each visionary people must create his own tools.

The question that many people often asked me: "which algorithm do you use for Basilica?" hides the question: which category do you belong to? This question is misleading because my approach is based on the multiplicity and on the progressive

increasing of algorithms able to fit my own Vision. This increasing number of logics is the attempt to produce "variations" as progressive increase of recognizability of the idea. (C.Soddu, "Recognizability of the idea: the evolutionary process of Argenia", in "Creative Evolutionary Systems" edited by P.Bentley & D. Corne, Morgan Kaufmann Publisher, San Francisco US, 2001)

In Basilica I used specific geometric parametric algorithms, algorithms managing the transformation of event's figure by moving from a dimension to another, Cellular Automata and parallel progressions of transformations of single events that dynamically interact with others, as flocking of birds, and structures of repetition of the same algorithm applied to the same event, as fractal approach. But none of these methods is primary. The peculiarity of my approach is "how" I use them all together. It is the expression of how it's possible to effort single, unexpected and unpredictable requests with the aim to fit my Vision of Architecture. The main question is not only the tools but the right aim. I teach that to my students too, bringing them to consider their Vision overcoming the tools. (See the interactive website www.generativism.com with the teaching experience on Generative Art and Generative Architectural Design by Enrica Colabella and me)

Putting aside the difference based on categories of tools, we can identify two topics that make the difference among generative approaches and that can be reported to all involved fields, from Music to Visual art, from Architecture to Mathematics: **Figurative** versus **Abstract** and **Subjective** versus **Objective**.

3. Progressive paradigmatic development

I had to wait until 1988, this time with a PC 086, to find the time for subsequently developing the idea of generative software Basilica. And the possibility to use screen dumps for recording the sequence of results and to publish them together with the description of my software in the book C.Soddu, Città Aleatorie, "Aleatory City", Masson Publ. 1989.

Setting up a more rich paradigmatic structure of architecture was the following step. It allowed me to better direct and characterize single events and to generate more believable architectures. Moving from the previous simplified paradigm, now the architectural events were controlled by a paradigm constructed around a void space surrounded by 26 events: In total 27 events, number also identified by Borromini as the main reference for architectural systems. Figuratively: an empty space, four pillars, four vertical frames, two horizontal frames, eight knots / interfaces / capitals, eight beams. Obviously every space had in common with the nearby space, or with external space, 9 events that could be generated following this double influence in the progressive process of transformation. Possible evolutions could be managed, based on such relationships, through 3D Cellular Automata.

At superficial approach this paradigmatic structure could be valuated as too much axiomatic because it is easily representable as a cube. Instead the paradigm was shaped in a way that the geometric transformations could easily modify the architecture varying from a triangular based prism to pentagonal or octagonal based prism or to cylinder.



Fig. 12 screen dumps of Basilica using the new paradigm. 1990

Transformations can also involve the verticality of the architectural order, moving from inverted to truncated pyramid and managing, with an explicit reference to Borromini, the possible helical torsion of architectural structures. These transforming codes were in Basilica starting from 1992, soon after the publishing of the book “the environment design of morphogenesis”.

In any case Basilica keeps, as main aim, the feasibility of the architectural system because beams and pillars varied, melting, or dividing themselves, becoming more thick or more thin, folding up themselves or fragmenting themselves but always doing that in relationship to the static and constructive congruences requested by the feasibility. The “new” concept of material could be a false problem. I.e. every architect has his proper way for transforming a “beam”: He do that by following the variation of the length. From a wood beam of few meters, moving toward a steel beam until a long suspended bridge, each possible transformation follows both the constructive needs and architectural character. Every designer has his own subjective way to manage these transformations also if each different result maintains, in the progression of transformations, its static, constructive and functional credibility and clarity.

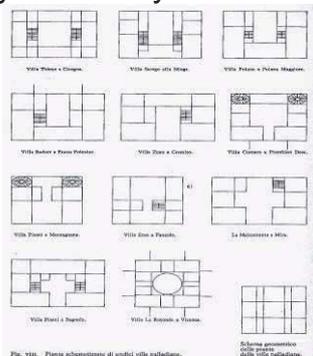
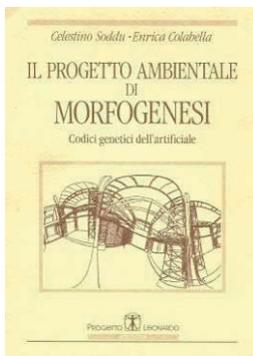


Fig. 13. the book by C.Soddu and E.Colabella “The environmental design of Morphogenesis”, Progetto Leonardo Publ., 1992

Fig. 14. All Palladio villas have different geometrical organization but all belong to the same paradigm, as Wittkower shown in this drawing in “Architectural Principles in the Age of Humanism”. (The paradigm is down on the right).

The reached results made by using this “architectural paradigm” drawn by Borromini were immediately enthusiastic: this further complexity of the paradigm produced fields of further recognizability of the idea.

In the meantime I have identified in the history of architecture, the organizational paradigm used by Palladio and drawn by Wittkover. This is able, through specific logics of geometric transformation, to splendidly suit manifold organizational possibilities strongly maintaining the architectural harmony in "innovative" geometrical orders. Approaching the transformig logics for creating "innovative" architectural systems, my first reference was Borromini: he made his wonderful architectural orders by using geometrical transformations on classical paradigms.

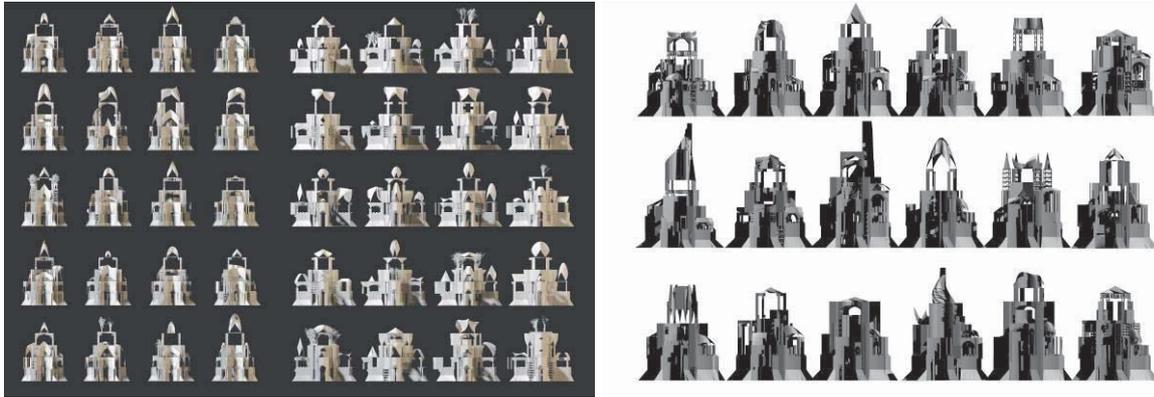


Fig. 15. Castles using the paradigm belonging to "La Rotonda" by Palladio. These two different variations of Castles were made In two different moments (with different codes). 1995, 2004

4. Variations, Design and Generative Art

Following Italian experience of Gio Ponti: not only architecture. At the beginning of Nineties, I was wondering if this generative approach could also be used in other fields like Design, Art and Music. In the book "The environmental project of morphogenesis, Dna of the artificial ware" (C.Soddu, E.Colabella, Il progetto ambientale di morfogenesi. Codici genetici dell'artificiale, Progetto Leonardo Publisher, 1992) I shown the first results made by approaching what has been for a long time the theme at the center of the design discussions: the chair. I used a paradigm really simple: the support to earth, the support-seat interface, the seat, the back, the interface seat-back. Looking at the results I identified a very interesting possibility in Design, industrial production and market: the industrial production of unique and not-repeatable objects. And we, Enrica Colabella and me, named this approach and the related software with the neologism Argenia. In the subsequent years, following this possibility, I designed Argenia for Jewels, Coffee pots, Lamps and other objects.



Fig. 16. Generation of coffee pots, 1995

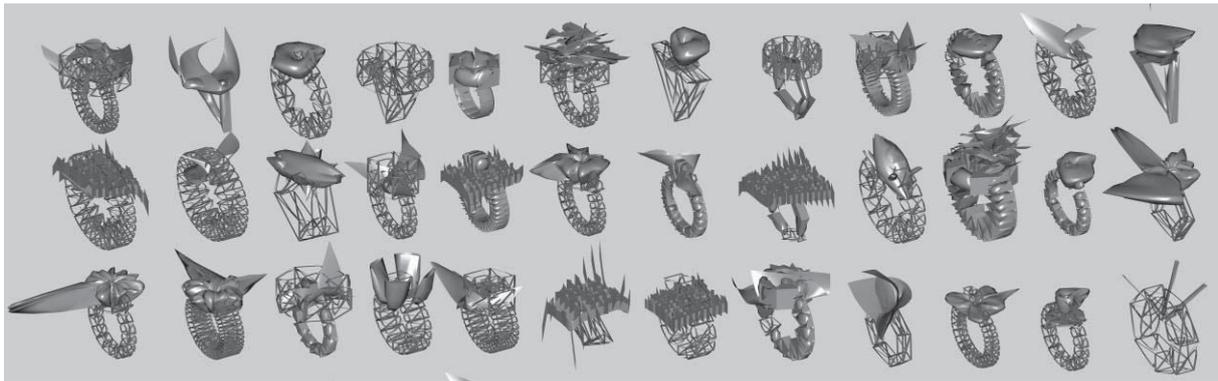


Fig. 17. Generation of “warrior’s” rings, 2002

From these experiments a new generative field of interest was born too: to work on Visual Art by following the Renaissance tradition to look at the Past for tracing the innovation. As Picasso re-painted Velasquez and the African art, naturally by stratifying over the identity of the references his own identity of artist, his own poetic, so I tried to re-paint Picasso by designing a dedicated generative software. A generative artwork was born: “d’apres Picasso”, an Argenia program able to generate a multiplicity of 3D models of women that, all together, can represent my interpretation of the women of Picasso, and printing them (in 2D but also, starting from 2001 with 3D printers) in real time, one after the other, until infinite.



Fig.18, 19. “D’apres Picasso”, endless generation of woman’s portrait (1997) and the physical rapid prototyping results directly constructed by “d’apres Picasso Argenia software”, 2002

With Enrica Colabella we have, in 1995, founded the Generative Design Lab of Politecnico di Milano University and the relative website. We have named this creative field Generative Art. The first personal exhibition of this kind of new "figurative/abstract" generative art was "d'apres Picasso" in a gallery in Milan in 1996. This personal exhibition has been the occasion to meet J.Frazer that, in 1998, participated to the first Generative Art Conference and invited me to the HKPolyU for make experiment related to my research. The first international conference GA'98, organized by my Generative Design Lab, has been the true first great experience of exchanging advanced approaches to creativeness and design. The presence of J.Frazer for architecture and design, of Hans Dehlinger for visual art, of Mauro Annunziato for artificial life, of Philip van Looke for generative mathematics and of other enthusiastic researchers, has been the occasion to define Generative Art as a multi-disciplinary field where the more advanced experiences in dynamically managing creative fields could usefully be discussed, exchanged and developed. Enrica Colabella and I named "Generative Art" this conference because we didn't intend to propose a limited conference to specific categories (cellular automata, swarm, artificial life, shape grammar etc.) or to single disciplines (Architecture, Music, Design, Visual Art, etc.) but to look at a wide context linked to Science / Art. I have to say that this denomination, Generative Art, has been successful. Already from the following year, with the presence at GA'99 of P.S.Coates, J. J. Romero Cardalda, Adrian Ward and Gabriel Maldonado this multi-disciplinary approach was definitely established. (GA1998, 1st Generative Art conference proceedings, 2nd e-book edition in English and Italian, Domus Argenia Publ. 2009, in the attached DVD)

During my staying at Hong Kong Polytechnic University in 2001, I developed and experimented the feasibility of a direct interaction between my generative software Argenia and rapid prototyping devices, and therefore with industrial devices at numerical control. I successfully managed the possibility to directly produce unique objects by using these devices. Argenia opens this possibility by generating in real time unique STL files usable for producing a sequence of unique objects. The possibility of industrial production of unique objects belonging to a recognizable species, as in Nature, through generative software Argenia and existing industrial devices was confirmed.

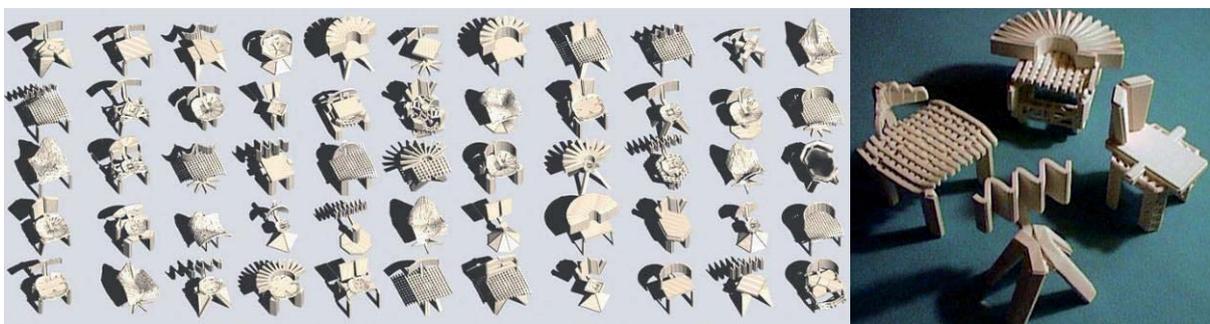


Fig. 20. Chairs generated by Argenia, starting from 1990. On the right chairs generated by using Argenia and directly produced with rapid prototyping device

Unfortunately the unique object didn't fit the market of those years, completely dominated by the repetition of all equal "fashion" objects. The market didn't accept the concept that idea comes before object. Idea as Product was, and is, our flag. The subjective Vision able to generate, as in Nature, multiple different unique objects that

people can choose because the Idea is recognizable was, and still now is, not accepted by the market.

5. Artificial Dna. Recognizable City Identity.

Beginning from 2001 I have developed a research field on Generative Architecture and Town Design fitting an essential need of contemporary environment: how managing in progress the urban and environmental identities and their clarity and recognizability.

I have discovered that, with minimal variations inside single algorithms managing the "logics of transformation" and their hierarchy, it was possible to reach aesthetical and symbolic tuning with the environmental characters of different urban identities.



Fig. 21, 22, 23. Ideal Cities, from the Cultural Heritage (Renaissance, Piero della Francesca 1480) to incoming City Identities.

I worked on generative projects focused on specific urban identities. The first experience has been Hong Kong, with the occasion of my personal exhibition at the HK Visual Art Museum in 2002. The aim has been to exhibit visionary scenarios of HK generated with Basilica and Argenia, unpredictable scenarios but where an increasing HK identity could be found. And I tried to ask to the visitors: "in which scenario do you see HK-City more HK then before? Clearly referring to a HK-Ideal-City that is in the mind of each inhabitant. Answers gave me the possibility to select the "logics of transformation" used for generating the "approved" scenarios and to

reconstruct an artificial Dna of HK, its genetic code able to represent the HK-Ideal-City.



Fig. 24. Hong Kong City Identity in progress. Generative projects shown in the personal exhibition of C.Soddu at Visual Art Museum, 2002

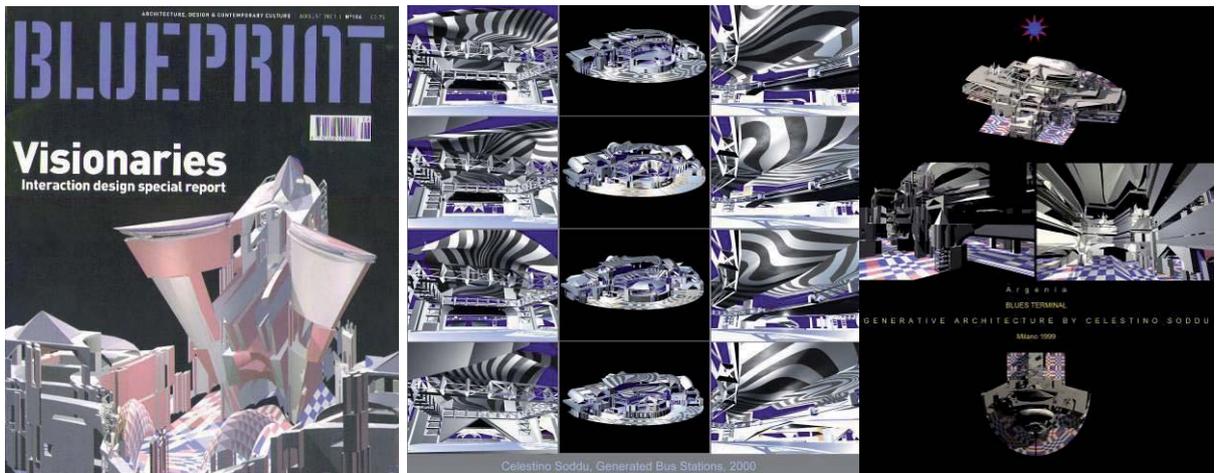


Fig. 25, 26, 27. Generative Visionary Architecture, The cover of Blueprint magazine 2001 with generative visionary architectures by C.Soddu, and other projects of C.Soddu published in the same magazine.

The following years, with my personal exhibitions in Los Angeles (Pacific Design Centre, 2002), in Washington D.C. (IDB Cultural Center, 2003), another in HK (International Financial Center, 2004) and in Milan (Palace of Giureconsulti, 2005) I have developed the creation of artificial DNA of these urban Identities and of others as NYCity, Chicago, Shanghai, Beijing, Macau, Dehli.



Fig. 28. Los Angeles: a office building, the broadcasting tower and IRTAL, shown at the personal exhibition of C.Soddu at Pacific Design Centre, L.A., and a new tower in "old" Chicago, 2002



Fig. 29. Variations of the new Cultural centre of World Bank in Washington D.C. presented in the personal exhibition at IDB Center, Washington D.C. 2003.

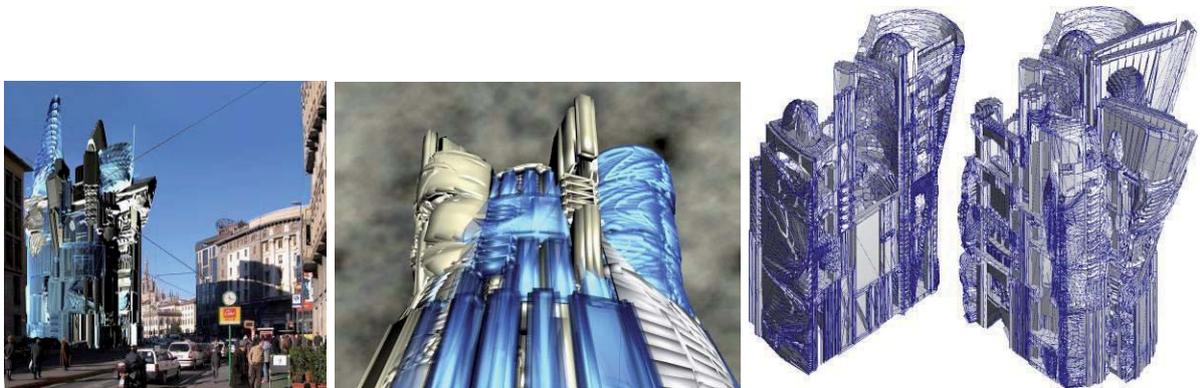


Fig. 30. C.Soddu Personal Exhibition in HK International Financial Center, Futurism Museum in Milan, 2004

In the same years, developing in my GenLab a research/exchange Asia-link program founded by European Commission, program of which I was coordinator, I succeed in establishing a Generative Design Labs network involving T.U.Eindhoven with Bauke de Vries and Aant van der Zee, Kassel University with Hans Dehlinger, China with Tongji University in Shanghai and Tianjin University, and enlarging the network to other Universities. This program, implemented with meetings, workshops, seminars and exhibitions was great and very useful for disseminating the Generative approach in several countries.



Fig. 31. Shanghai Generative projects, a generated town environment belonging to the reconstruction of New York City artificial DNA and 3 tower “homage to Gaudi”, using Basilica 2003

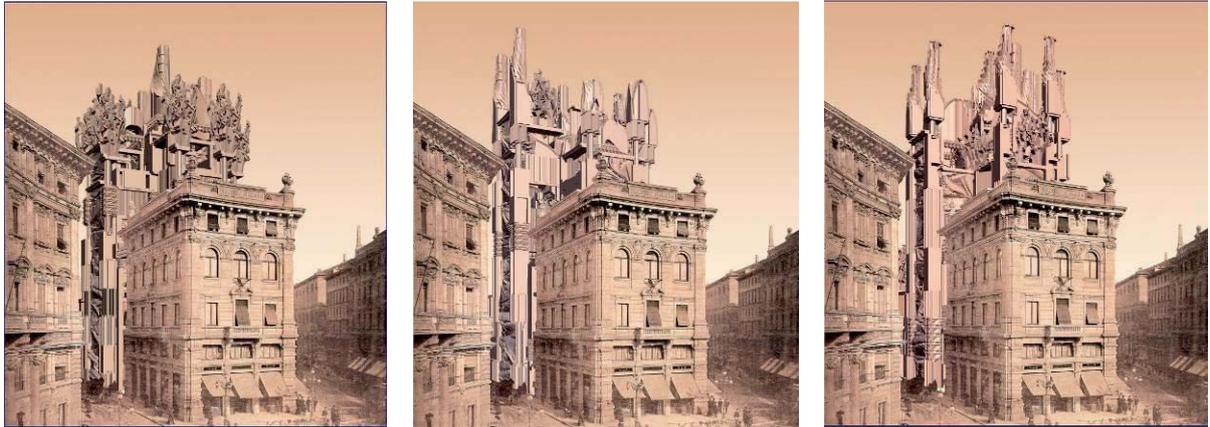


Fig. 32. Milano, Variations of Futuristic imprinting on Piazza Cordusio, The starting point of Milan Identity in 1915. (2005)

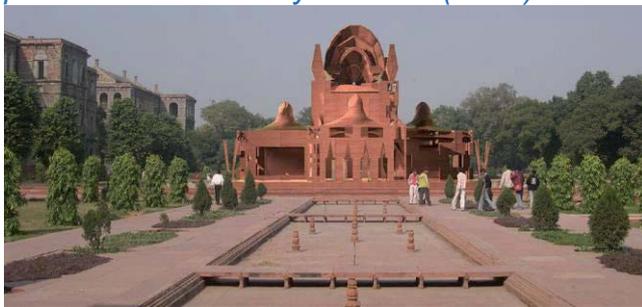


Fig.33. Dehli, finding city identity, 2006

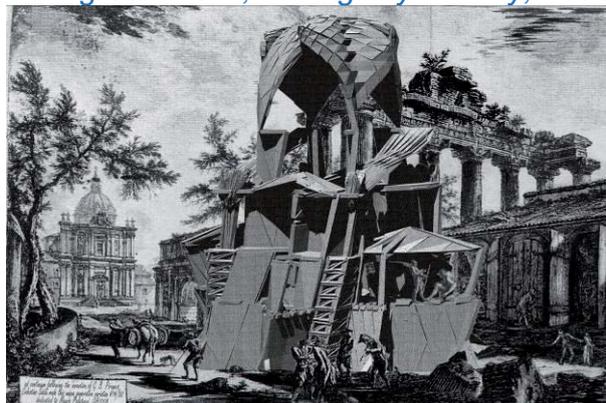
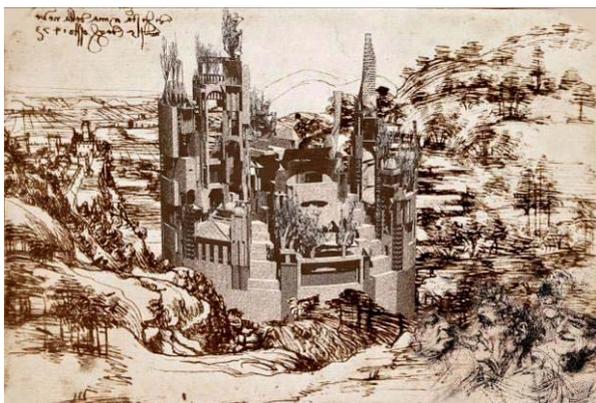


Fig. 34, 35. Generating over the drawings of my main masters, Leonardo and Piranesi, and learning from them (2008,2009)



Fig. 36. Generative scenarios of Lecco presented during the Futuristic Visionary Evening, 21 June 2009, at Lecco. Architectures generated using Basilica.



Fig. 37. Generated (with Basilica) scenarios at Serramanna, Barumini and Poetto for the last personal exhibition at the gallery of Domus Argenia Center regarding ancient Sardinian Identity following Nature (Sardinia 2009)

6. How to gain multi-subjectivity from singular subjectivity?

How to overcome the problem of disseminating a subjective generative approach that works very well in creative design, as I verified with my student of Politecnico di Milano? How to design generative software usable by different people for increasing and managing their own design Identity?

I decided, until now, not to sell Argenia because it was not usable by other people: it directly reflects too much my subjective Vision. This new hypothesis for which I have worked is a generative software able "to learn" from the architects, artists and designers. The aim is that the software becomes, after the first experiences, a rich and vivacious expression of each own creative and professional identity. In practice generative software that builds, step-by-step, the creative subjective artificial "Dna" of whom uses it.

Argenia, in the last beta-version, performs a "Dna" that can be managed for representing different subjective creative identities through integrations and stratifications that each artist / designer can operate. This happens because Argenia is open to change by following new logics of transformation and new paradigms. It has the possibility to work defining paradigms, transforming logics, codes, cellular Automata rules and fractal repetitions. In the core of Argenia there are:

1. a series of logics based on geometric transformations. Each geometric transformation is structured by using modifiable parameters able to manage the character and "how" the algorithm will run.
2. The functional character defining the incoming event in relation with the nearby events is defined by the user choosing among different logics of transformation belonging to "how the event will end", "how is folded", "how is divided", and so on.
3. Each one of these characters is defined with an increasable set of "logics of transformation" that operate this "How". The user can make new hierarchies among

these logics, can modify, can upgrade, can develop new ones and can select which will run in the generation process..

4. The organizational system of three-dimensional events doesn't work only in one "structural direction", as Basilica that was constructed with the distinction among vertical and horizontal structures in base to the architectural feasibility, but work through "directions" that the user can point out as character of every incoming event.

5. The user can build the organizational paradigm of each 3D event by modifying or generating a new one. It's possible to use 3D Cellular Automata and choosing the association of each character and each transforming rule to the structure of Cellular Automata. Cellular Automata logics are, in Argenia, different and selectable by the user.

7. The generation of events can be performed also by choosing or mixing diversified tools of construction of surfaces (Bezier, T-Spline, and so on.) able to reach different character of 3D results.

8. The progressive increase of complexity can also be reached by using parallel fractal transformations and by managing the relative parameters.

Besides, there are optional outputs for generated 3Dmodels directly usable with rapid prototyping devices, render and common commercial 3D tools.

Argenia is now opened to all artists, architects and designers because Argenia will be used in the activities of the new center "Domus Argenia", just now established in Sardinia. The opening was made with an exhibition about the Sardinian DNA done by interpreting the megalithic cultural references of this wonderful country. Domus Argenia has the aim to develop exchange among different creativeness and different disciplines in a cultural approach focusing on Identities, the subjective creativeness and different cultural heritages. And will be open also to not-lucky young people of the entire world for increasing their own possibility to creatively work with their own cultural reference.

This is my generative challenge of next years. .

References

Celestino Soddu, "L'immagine non Euclidea" (not-euclidean image), Gangemi Publ. 1986

Celestino Soddu, "Città Aleatorie" (Aleatory Cities), Masson Publ. 1989

Celestino Soddu, Enrica Colabella, "Il progetto ambientale di morfogenesi. Codici genetici dell'artificiale" (Environmental design of morphogenesis, Genetic codes of artificial ware), Progetto Leonardo Publ. 1992

Celestino Soddu, "Milan, Visionary Variations", Gangemi Publ. 2005

C.Soddu, "Recognizability 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

Rudolf Wittkower, *Architectural Principles in the Age of Humanism*, Academy Editions, London 1962

Enrica Colabella, *Catagorema*, GA2007 proceedings

Enrica Colabella, *Generative Art*, GA2008 proceedings

Marie-Pascale Corcuff, *Chance and Generativity*, GA2008 proceedings

Celestino Soddu, "Endless interpretations, infinite in the mirror", GA2007 proceedings

J.Frazer, *An evolutionary Architecture*, Architectural Association Publications, 1995

Aant van der Zee - Bauke de Vries, "Design by computation, Chance and Generativity", GA2008 proceedings.

Renato Saleri Lunazzi - Marian Janda, "GRUE: Génération régulée pour un urbanisme environmental", GA2008 proceedings.

Celestino Soddu, *Alive Codeness*, GA2008 proceedings, Domus Argenia publ.

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

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

Philip Van Loocke, *Symbolic organic design*, GA2006 proceedings

C.Soddu, *GENCITIES AND VISIONARY WORLDS*, GA2005 proceedings

Robert J. Krawczyk, *Architectural Interpretation of Cellular Automata*, GA2002

Gabriel Maldonado, *Sound and Graphics in CsoundAV*, GA2001 proceedings

www.generativism.com The interactive website with the teaching experience on Generative Design by Enrica Colabella and Celestino Soddu.

www.domus.argenia.it The site of just established "Domus Argenia Center on Identities and Generative Art".