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Paper: **Curved spacetime perspective as generative engine. Intersubjectivity & Contrapunctus.**

Topic:
Generative software

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Generative approach extends software from objectivity of a tool to subjectivity of a poetic. The foremost objective is to arrive at a common place where two or more perspectives meet, where two or more different interpretations of the world find a common space for interpretation.
In the generative approaches, this common intersubjective vision is not the result of progressive reductions of characters but it is an harmonious blend of multiple and different viewpoints.
The existence and awareness of multiple lines that come together in creative work are an essential part of our European cultural heritage and continue to be the logical framework of each harmonic system. In music, this creative approach has a name: counterpoint.
With this approach I designed Argenia with two subsequential paths:
1.Stimulate multiple subjective views through perspective visions, not only as representation tool but as a code alluding to possible multiple interpretations that directly work through three-dimensional space-time transformations of events made during their generation.
2.parallel to the previous but it is different for the used instruments. The use of different viewpoints is extended to multiple moving acts from a dimension to another (i.e. cube-hypercube and viceversa) and to multiple possible subjective interpretation linked to peculiar transforming logics.
I designed the structure of a possible intersubjective target following Renaissance masters. It could be identified, intersubjectively, as "Harmony" because the "common" concept of Harmony is clear but everyone (or the same artist at different moments) pursues it in different ways.
For defining the rules able to built the plot of Harmony we can identify a paradigm as "common intersubjective concept", as "cantus firmus" from what generate contrapuntus variations made with transforming rules. Like natural DNA.
Next step is directly opening the generative software to intersubjectivity by stratifying subjective transforming rules coming from a common "ideal vision".
The aim is focused, the structure of my Argenia is in progressive increasing complexity, the results are already coming.

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Curved spacetime perspective as generative engine. Intersubjectivity & Contrapunctus

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Premise

Generative approach extends software from objectivity of a tool to a subjective poetic.

Going ahead, It's too possible to move from subjectivity to intersubjectivity. *The aim is to interact with different subjectivities inside their own complexity.* The field of relationship among different subjectivities is a channel of knowledge, of increasing complexity, of possible answers to relevant needs of our time.

This approach is based on the understanding that *identities are strengthened when they are in comparison with other identities*. This interaction opens channels of growth and supports going in deep in the own cultural references, in the own history and tradition, consequently in the own creative potential.

Creativity and innovation exist only starting from the own interpretation of reality, of existing environment, of our cultural traditions. Because this is the only way to gain complexity. A software built on our subjectivity, or that is structured as an interface between the surrounding world and our uniqueness. Our ability to interpret existing environment and our own history lets us to look forward and it is, without doubt, the unique tool that can be used directly in the creation and innovation. In *Art and Science*.

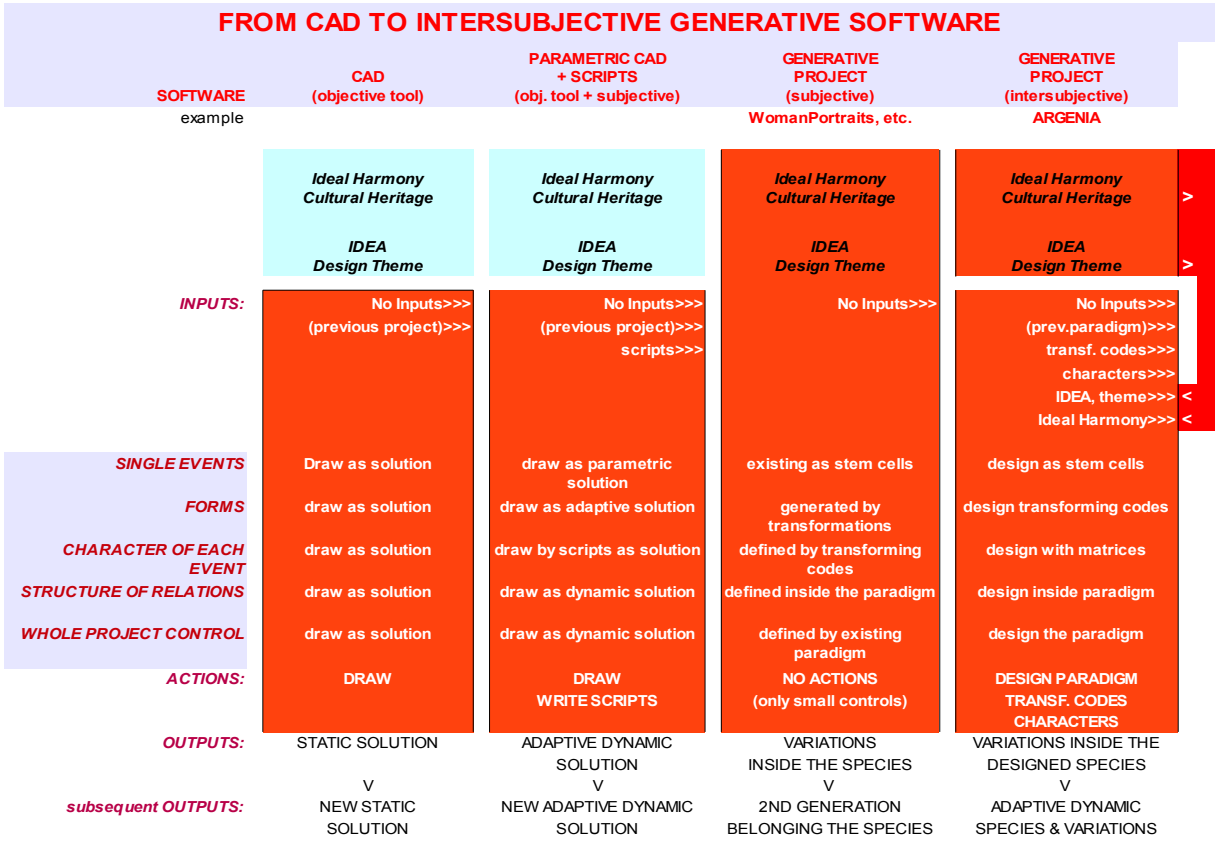
Abstract

A strong relationship exists between approaches able of generating visions of future and the **creation of subjective instruments**: the visionary people builds its own tools. (note 1) Visionary people move from instruments as "objective functional tools"

to subjective instruments, based on own interpretation of the world and its future possible incoming transformation. In other terms, based on own poetic.

The aim of generative software is gradually leaving the "safe" field of software considered as objective tool, whose processes reflect a system of objective data and of their controlled processing, to achieve software based on subjective Poetics. Moving to these software was a difficult path because they cannot be necessarily shared with everyone in the field of used approach neither of gained results. The advantage is that it *can enhance the action to get in deep*, finally, within the creative processes, design and more.

Everyone performs his own perspective of the world, and everyone uses own conceptual scheme, created through the interpretation of own experiences gained starting from childhood, to identify the own poetics and to propose possible events-forms as explicit communication of own identity as uniqueness. The advanced aim is to use this conceptual scheme for finding out a **common field** to interact with other subjectivities, an intersubjective field.



Because even those who only acquires the events proposed by others has its own perspective, conceptual scheme. This subjective approach allows to accept, reject, be enthusiastic, not only on the basis of objective data but also following the own logical thread of interpretation that is supported by own uniqueness and identity, by own peculiar way of seeing and living the evolutionary dynamics of the environment.

The foremost objective is to arrive at a common place where two or more perspectives meet, where two or more different interpretations of the world find a common space for interpretation, when the designers perspective and the users

perspective will finally meet.
Intersubjectivity: This field has always been the specific field that defines the quality of a project, of a proposal, of an artwork. (note 2)

In the generative approaches, this common intersubjective vision is not the result of progressive reductions of characters (note 3) but it is an **harmonious blend of multiple and different visions**. These visions can come from different moods of the same author, from different people of the same design team. More, these multiple viewpoints could be discovered, later, by different and unpredictable users.

Note 1. Focillon, visionary people.
Note 2. (According to Husserl, intersubjective experience plays a fundamental role in our constitution of both ourselves as objectively existing subjects, other experiencing subjects, and the objective spatio-temporal world. Transcendental phenomenology attempts to reconstruct the rational structures underlying — and making possible — these constitutive achievements. (http://plato.stanford.edu/entries/husserl). Thomas J. Sheff defines intersubjectivity as "the sharing of subjective states by two or more individuals." [Scheff, Thomas et al. (2006). Goffman Unbound!: A New Paradigm for Social Science (The Sociological Imagination), Paradigm Publishers).
Note 3. We need to avoid from reductions of character coming from the attempts to fit everyone needs by reducing the complexity of events with "optimization" at lower level.

Software as optimized tool versus intersubjective software

Building software by leaving the easy field of tools, and also the fascinating field of only own subjectivity, to move around, looking at the field of intersubjectivity, is an hard road, a road that has not yet been really explored. But it is the road shown by generative artworks, by producing variations, by leaving the door open to the subjectivity of those who can appreciate, as final user, the artwork itself, may be directly interacting with the artwork itself for creating variations.

Since the first research on generative design (C. Soddu, Città Aleatorie, Masson Pub. 1989) I tried to explore and theoretically and experimentally develop this hypothesis and I tried to trace possible approaches to generative creativity, first of all defining an approach that arises from the simultaneity of parallel and different paths.

The existence and awareness of multiple lines that come together in creative work are an essential part of our European cultural heritage and continue to be the logical framework of each harmonic "intersubjective" system.
In music, this creative approach has a name: **counterpoint**.

Each tune that blends with the other in counterpoint, maintaining its recognition, can be interpreted as one dimension of intersubjectivity. Therefore the approach to counterpoint can be conceptually defined as a *multidimensional* approach.

Experimentally I identified two possible paths and, lately, I started to develop them systematically in the new version of my software Argenia which tends to go over my own subjectivity to perform an intersubjective software:

First path:
Stimulate multiple subjective views through perspective visions, not only as representation tool but as a code alluding to possible multiple interpretations that directly **work through three-dimensional space-time transformations of events made during their generation**.

The concept:

1. Each perspective is, in itself, a subjective code of interpretation of an objective event. And we can enlarge this subjective interpretation to multiple interpretations involving multiple space-time dimensions. Each different one could be made using different “perspective tools” and geometries. (note 1)
2. Each subjective vision amplifies an aspect of the event, making the related interpretation recognizable and unique.
3. Each subjective vision, following own cultural reference, amplifies own uniqueness when interacts with other visions.
4. Multiple interpretations / variations / perspectives, together, could create an intersubjective communication of the event and of its complexity. This happens when it's possible to find out a “common” field.
5. Using and stratifying variations as multiple interpretations we pursue a dynamic communication open to further interpretations and meanings.
6. Moving from one dimension to another, and going back by using different “interpretative tools”, and fixing their appearance as stereometry we can spatially transform events increasing their complexity and multiple meanings

An explicit example of this approach are the tables and the frescoes by Giotto and Simone Martini. In these representations of medieval cities, each architectural event is represented by a different "perspective", constructed with a subjective, ever-changing, virtual viewpoint that **dynamically** relates to one of multiple subjective paths for exploring the city. It seems that each architectural object follows one of possible subjective viewpoint able to underline a particular location in the urban image, or a poiint inside a discovering path in the represented environment. (C. Soddu, the not Euclidean image “L'Immagine non Euclidea” , Gangemi Pub. 1986).
Looking at the urban images in these medieval artworks, and mentally reconstructing their whole urban geometry, each architecture appear as curved, phisically transformed from “normal” orthogonal order by their own subjective perspective.


Giotto, “La cacciata dei demoni”, Simone Martini, “Beato Agostino Novello e il bambino azzannato dal lupo”

This approach, in other words, tends to **a progressive curvature of the temporal dynamics of viewpoints that can be reflected in the spatial construction of events**.
The result is a fantastic example of the interrelations among multiple interpretation as mutual transformation of space-time dimensions of the event. This happens through the counterpoint made by different subjectivities - viewpoints.

By using this “medieval reference” in managing the generative engine I had interesting results also if it's clear that, for applying these transformations to a whole architecture, we need, as done in Giotto's and Simone's images, to apply transformations only to X and Y coordinate because of the curvature of buildings stereometry. So these transformations don't loose the horizontal surfaces of architecture, and don't introduce obvious functional problems. In the generation of objects, or parts of architecture, were all surfaces can be folded without functional problems, we can use the full transforming rules involving all dimensions.

Second path:
This second step is parallel to the previous one but it is different for the used instruments. The use of different viewpoints is not limited to perspective representation but it is extended to **multiple moving acts from one dimension to another** (i.e. cube-hypercube and viceversa) and to multiple possible subjective interpretation linked to peculiar transforming logics.

Following this approach we can manage the space, especially architectural and urban space, through progressive layers of transforming events that do not respond to one but to a variety of dynamic keys of interpretation.
Operationally *we can manage the project, during the design progressive path, through multiple generative algorithms, multiple logical processors, belonging to different “instant-mood”*. These logics are activated "in parallel" by generating events that are shaped in their complexity through progressive multiple transformations, each reported to a different but “congruous” interpretation of the event.
In the same way, when the project is made by a team of people belonging to different disciplines, each designer can interact with the others with own transforming codes. In this way each participant to the team don't enter in conflict with other but can give his own contribute to the increasing complexity, quality and intersubjectivity. We easily can discover that more each “interpretation” is different, more each contribution is appreciated.

In other words, the attempt is to gain intersubjectivity by structuring parallel "time paths" that, while offering a wide range of possible meanings/functions, could be subjectively appreciated by those who will discover them when following their needs.

Results were really good in terms of increasing complexity and of reaching the possibility to be appreciated by a more large number of users.
It is intersubjectivity? Not yet, but the way is open to move this reached complexity to an intersubjective vision.

These experimentations are based on **the concept of creative multi-transforming acts, mirrored from the concept of musical polyphony**. The concept of **counterpoint is the central paradigmatic element** and it is, beyond any doubt, the

main reference of generative creative approach related to our own tradition, the common European cultural root.

Note1. SODDU Celestino, 2010. Perspective, a Visionary Process: The Main Generative Road for Crossing Dimensions. NNJ v 12, n.1, Springer Pub.

Harmony and Intersubjective Vision

How to define the structure of a possible intersubjective target in a generative project? Or, staying in the first subjective step but looking at an intersubjective possibility, how to fit our different moods, fascinations, multiple interpretations, which are always different at different times but which, all together, talk about our vision, our poetic?
The target could be identified, intersubjectively, as "Harmony" because the “common” concept of Harmony is clear but everyone (or the same artist at different moments) pursues it in different ways.

Harmony, explicitly referring to the masters of the Renaissance and Baroque, could be constructed by using paradigms able of steering the dynamics of progressive generations, then the dynamics of parallel activities in the generative engine. As happened in constructing cathedrals where each people involved used his own ability and vision for increasing the “common” vision.
Basilicas and cathedrals, centers of experimentation and representation of the Art and of architectural culture of our history, were the results of progressive creative dynamic lines that were subjectively and parallelly developed. Each event belonged to single artists, from sculptors to masons, from painters to architects that, following their own interpretation and exchanging one each other experiences and ideas, gained together complex harmony, increasing their “common” vision.
These different artists produced contaminations and resonances, but always in reference to an identifiable harmonic vision able to establish a common cultural reference, an **Intersubjective Vision.**

Looking at town environments we can easly discover that a city was built as conglomerate of casual events or, as happened in cathedrals, following a urban harmony. This does not depend on the quality of individual buildings but on the existence of an intersubjective poetic in the citizens, people, architects, tourists and wanderers.
If there is a common love for their city, as, for example, citizens of New York, Rome, HK, Chicago, Paris and Venice have without doubt, there is an intersubjective concept that we can call the “**Ideal City**”. This concept is different in each city but it is recognizable as the common logic of looking to the future. It is **the most interesting example of intersubjectivity**. More, this “common feeling” belongs to the field of logics, of “how” to keep alive the environmental identity and uniqueness.
The intersubjective concept of "Ideal City" brings the city to increase gradually its specificity and uniqueness albeit the different and unpredictable architectural events.

This is why an "intersubjective" goal is conceivable, even desirable. The existence of a common vision, that moves from subjective to intersubjective vision, becomes

essential to trigger a route to increased quality, recognition and identity of a place, of a project, of an artwork.
Following this concept I'm extremely against to generative approaches based on emerging unpredictability through randomness. The “emergent” from random, in my opinion, is not useful because it not pursues, with consciously activated algorithmic procedures, a design vision but is rather surrendering to “not-project” and to “waiting for luck”.
How to manage the overall harmony is the first point to be developed. Without this first step, the results, even if interesting experiment, would have only the structure of a series of random events.

We can identify and design this “common intersubjective concept” as **paradigm**, as **“cantus firmus”** from what generate contrapunctus variations.
This paradigm defines the rules that build the plot of harmony defining the field of possible interpretation.

But, soon after, we need to clearify that *there are no rules that are always right*.
As in music, when you try to identify the rules of counterpoint to ensure an harmonic result, these rules are always different. There is not, and this is the interesting aspect, not even a unique code of rules regarding the musical counterpoint, but every author has tried to promote their own rules as agreed rules. (note 2)
Therefore paradigm is a subjective representation of a recognizable order.

Note 2. “Imprendere a trattare la materia de’ Modi, è lo stesso che riordinare l’antico Caos. Imperciocchè tanta si è la diversità delle opinioni degli Autori antichi, e moderni, che sembra esservi state tante sentenze, quanti furono gli Autori “Joseph Fux, Gradus Ad Parnassum. ("Undertake to deal with the matter of Modes, is the same to reorder the ancient Chaos. For there is so much diversity of opinions of the ancient and modern authors, appears to have been so many judgments as so many authors” Joseph Fux, Gradus ad Parnassum).

Paradigm, Harmony and Transforming rules

At this point a question arises: If the control paradigm of the multiplicity of possible variations follows subjective interpretations and, in the meantime, is so closely tied to the Harmony, designing the paradigm is perhaps the high point of creativity? How could it be, given its multi-subjective structure, the engine for intersubjectivity?

The question is legitimated but we must consider two question:

1. the paradigm by itself is empty. (note 1) Its quality is being ready to be easy filled with different progressive interpretations. Interpretations that we cannot know in advance.
2. also if we can consider the paradigm as “**cantus firmus**” able to define the structure of variations, the concept is the same, because this primary event cannot live by itself but can be represented only when contrapunctus will develop the complexity starting from its “topological structure”. Like the theme in a jazz jamsession. The cantus firmus is a melody belonging to his author but, when used as paradigm, it become **symbolic topological vacuum path** whose potentiality is the ability to suggest and organize incoming other melodies.

The paradigm is an "Ideal Harmony" and cannot explicit itself as artwork without the creativity of the designer, artist, musician, (but also in the broad sense of the user), without the ability of the designer to repeat himself with creative interpretations, always different. Paradigm represents itself only through "transforming events" and their variations made using the interpretative codes.

It is clear that Generative Design works simultaneously on these two creative aspects-fields: the paradigm and the interpretative codes.

During the progressive evolution of a creative work, the two fields perform different paths.

1. The **paradigm** transforms itself progressively but keeps the same recognizable idea of space-time. Examples are the harmonic structure of twelve strokes of Blues, the character of "Blue Period" of Picasso, or the unique vision of complexity in Gaudi. Or, widening the concept, the "Baroque", the "Futurism", the "Minimalism".
2. If the paradigm changes, it changes completely. And this change is called epistemologically a "**logic jump**". There is no obvious connection between the before and after. We could say with R. Thom that this moment, inside the creative dynamics, is a catastrophe, even if we can assume that the recognizability, the author's imprinting may remain, but it is not sure.
3. In contrast, **interpretative codes**, algorithms concerning progressive transformation of events, are normally not abandoned in favor of another. They don't change over time, but evolve and proliferate, creating more interpretative recognizable codes that are, overall, better able to represent the "timeless" idea of the artist, that is the idea outside the context of single artwork.
4. **The codes of interpretation are indeed stratified**. They must be layered to produce the counterpoint.
5. More the codes of interpretation are different, but still born within the same subjective poetic, more they are creatively productive.

The paradigm, therefore, should not be constructed as a functional axiom but as a structure supporting the meeting of perspective variations, as the organizational key of unpredictability, of possible multiple viewpoints, of multiple interpretations of the environmental complexity, of progressive ways of possible transformations that may vary over time even in the same designer / artist.
I, tomorrow, will be no longer what I am today and the stratification, inside my artwork, of my actual interpretation of the world, with yesterday's and tomorrow's possible interpretations, provides the possibility to generate a complex event, which could slide to an intersubjective and polyphonic event if variations are able to go in deep. Like counterpoint that is based on different pathways, on different interpretations, but where all events are part of the same dynamic poetic, the poetic of the artist in his progressive creative path.

The melodic components of counterpoint not need to be coherent one with each other but must be animated by a common intersubjective poetic. The plurality of interpretation belonging to the various melodic lines increases the recognition of the

poetic, the possibility of appreciation from different people by identifying themselves into one of the lines of interpretation, then it could bring to the construction in progress, of an intersubjective event. Like in the Bach fugues.

The progressive opening to multiple possible interpretations increases the complexity of the artwork, decreases its axiomatic aspect, that is the possibility to reduce the appreciation only to its unique function, and exponentially increases the chance of being appreciated by different subjectivities, and its acceptability. Avoiding from falling into simplifications and reductions developed in an attempt to optimize and fitting all different needs by fixing an axiomatic optimized objective function. We all know that everyone finds the own way to use the same object. And this possibility is strongly linked to quality.

it is clear that Baroc, and its polyphonic complexity, is the primary reference of my generative approach. But also "minimalist" approach needs to compete with intersubjectivity and multiple interpretations of designers and unpredictable different users. The need to propose an artwork which, despite its "minimalism", is capable of responding to multiple requests, remains. And remains the need to propose an object that can be considered *one of possible variation of shared common Idea,* of a common intersubjective concept.

When, in late eighties, Decio Gioseffi, the great historian and critic of arts (Trieste 1919, 2007), one of my main reference and a friend of mine, said me that my work was like the work of Canaletto (1697-1768), I didn't succeed in understanding all this concept at once. Following the Gioseffi's book “Canaletto. Il Quaderno Delle Gallerie Veneziane e l'Impiego Della Camera Ottica” I supposed that the relationship was only in defining and using own tools for representating own vision.
In 1987 I wrote the book “Immagine non Euclidea”, (not euclidean image), concerning the “total” perspective, a curved perspective able to contain a lot of different perspectives jointed all together in a not-euclidean representation. And Canaletto used his own tool, the camera obscura, for tracing perspective visions able to give wide images of Venice able to contain multiple different tales. But, remembering the discussions that I had with Decio Gioseffi, focused also on my generative software and my book “Citta' Aleatorie” 1989, I have identified the relationship also in the way to get the complexity using “parallel stories”, parallel developping engines, in other terms: **contrapunctus**.

In the artworks of Canaletto the perspective, very large, artificially created using the optical camera, is only a main paradigm where each possible observer can look at more closed representation of the space, because the “large” perspective push each observer to choose own space of interest. More, each observer can follow a different “story” identifying one of the represented people, or boat, or people at window, and can develop his own interpretation of how the space dynamically lives.

So I would like to dedicate to Decio Gioseffi my work for the “all different and unique” covers of the GA2010 proceedings, representing, on some pictures by Canaletto, one more story, one more point of view, one more event increasing existing complexity and, why not, existing contrapunctus. Because the Canaletto's pictures are counterpoints, like Bach's fugue. In this complexity I inserted a new event, an unidentified flying objec whose own complexity was created, as fractal, by different

parallel transforming dynamics following different subsequent interpretations. But all generated UFO are based on the same paradigm.

An experiment made this year was the generation of “flying castles” based on hypercube geometry, or rather of multiple hypercubes that define the sliding through possible dynamic point of view, all progressively built on the dynamics of space / time from inside to outside and viceversa that is proper of hypercube. Each viewpoint has own different paths belonging to different dimensions and/or to the angular size of the route point-to-infinity.

Flying Castles variations. The contaminations, the differences and the interpolations between parallel events create the complexity proper of counterpoint, produced by the dynamic progression through multiple interpretations based on sliding from a dimension to another. C.Soddu 2010.

Note 1. See the Palladio paradigms drawn by Rudolf Wittkower. 1992. “Idea and image: studies in the Italian Renaissance”.

Argenia

The aim of *Argenia* is directly opening the generative software to intersubjectivity by stratifying subjective transforming rules coming from a common “ideal vision”, or/and from each subjective interpretation of each artist-designer that will use this software. For doing that the working windows of Argenia are already focused on:

1st window. **Generator**.
The main windows where it's possible to choose how to manage the generative engine. It's also possible to define how many times and following which rule it's possible to apply “fractal” systems to the generative engine, that is how many times and how it's possible to repeat the transforming cycle.

2nd window Part A. **The Design of Paradigm**.
Identifying each event with 1. Orientation, 2. Role, 3. Topological rules, simmetries and interferences with other events. That is designing something like ***stem cells*** that can evolve, following a character, to adult events inside the project.
Orientation: When, following the obvious structure of architectural events, and its strong belonging to gravity, the previous Basilica software had only one main “orientation”, from bottom to top, Argenia uses all six Cartesian basic orientations. These orientations are applied to each event defined in the paradigm in the way to create species of objects not limited to architecture. More, orientations are not limited to orthogonality because of interactions with other rules.
Role. When we design an object, each design act, each development of our project belongs to one of a series of transforming actions like: “how this event will end?”, “how will folds?”, “How can be divided?”, and so on. In Argenia a set of different roles are identified to be used in the paradigm. I.e, when we define a roof we use a “top” orientation and a “how ends” role for the event. Following that the generative engine will refer to these roles for transforming the event starting from one of the possible matrices and using its points and vectors of congruence. In this definition of role, there is not yet the code defining “how” the event “will end” but only the indication that this event needs to follow this request. How it will follows it depend from the used matrices and the transforming rules, It is only the “starting point”.
Topological Rules, Simmetries and Interferences. For each event that we define inside the paradigm it's possible to identify the type of relationship with other events, belonging the topological structure of our project.

2nd window Part B. **The Design of Transforming Rules**.
With the possibility to blend in parallel different rules and the possibility to define where applicable.
This panel manage the own interpretation of the event and the use of moving on and coming back through multiple dimensions. Different transforming rule can be blended and different parameters can be changed. The possibility to choose how to apply each rules help to control the feasibility of 3D outputs.

2nd window Part C. **Outputs**.
The possibility to save paradigms, species and transforming rules

3rd window. **Cellular Automata 3D** for managing the evolutions of paradigm.
It's possible to define rules for evolving the topological structure of paradigm.

4th window. **Matrix Design**.
Designing, for each possible event, the structure of “starting points” of subsequent transformations identifying the congruent points and vectors to assure the adaptability of the event during transformations. This design activity defines the “characters” of the incoming scenarios.

5th window. **Matrices Activation**.

Identifies the matrices available on the specific project and it's possible to insert and use matrices coming from other projects or other designers following the possibility to activate something like a Design Team and a strong “cultural reference”.

6th window. **Viewer** with the management of further transforming rules to be applied in real time to the generated scenarios.

In this way it's possible:

1. Define and manage the basic topological structure able to be adaptive to multiple possible transformations.
2. Design a paradigms for generating a “species”. That is like an artificial DNA.
3. Design the basic characters of each event identified in the paradigm, like Stem Cells. In this way the paradigm controls the incoming transformations only by identifying the role of the event inside the whole structure, not its form that will be defined later by the transforming rules.
4. Manage the increasing complexity of paradigms using different transforming engines, like Cellular Automata. (users can manage the CA rules and number of repetitions)
5. Design own Transforming Matrices.
6. Manage the active transforming matrices. (users can import matrices from other “subjectivities” and blend them with own matrices)
7. Construct Transforming Rules able to manage each matrix and the whole. (users can define and blend together different transforming rules)
8. Apply the transforming rules separately and/or after the generation of objects for verifying their potentialities.

Output facilities of Argenia are:

1. saving generative projects
2. saving dxf (surfaces), pov, vrml and stl (solid for rapidprototyping) files
3. saving paradigms, transforming matrices and transforming rules.
4. saving images
5. importing paradignms and transforming matrices from other users.

The aim is focused, the structure is in progressive increasing complexity, the results are already coming.

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