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Transformation of digital and computational architectures

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Abstract

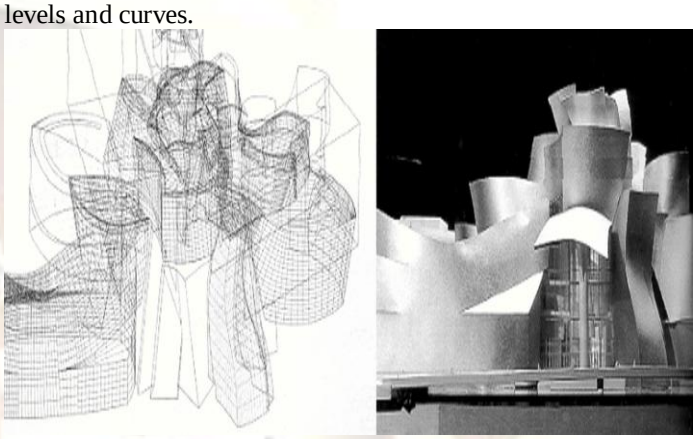
As the digital infrastructure in cities and buildings are in place, new forms and methods of spatial (location) are also growing.
In between computational architectures, such as topological spaces, and non-Euclidean geometry, dynamical systems and developmental movement algorithms are alternative technological architectures.
As Peter Zellner said: architecture , has renovated itself .Part of that, is the scientific study of topological geometry, computational part of that, is the production of plastics and part of that, is the creative visualization deals Kinetic space.
The era of information, such as the previous age, the metal industry, challenges not only the design itself but also how these designs are. Creative and productive potential of digital media has created a new dimension in architecture. Lvtsma Barrett says, instead of trying for emplacing the thought of the traditional architecture, our strategy should be such that the architecture can integrate with other Medias to create a new link.

1 - Computational architecture

Computational architecture is concerned to computational processes of shape production and shape deformation. Several computational architecture based on basic concepts such as topological space (topological architecture), the surface morphology (Architecture seemed like) movement of kinetic and dynamic (moving Architecture), stimulation or key animation (key shape animation - architecture changed) Parametric Design (Architecture parametric) and algorithms (architectural development) have been identified and introduced.

1-1 -Topological architecture

Greg Lim's paper on "non-linear curved architecture" is one of the first examples of modern architecture that uses of deconstruction logic of contradiction and paradox so to expand the more smoothly curved surfaces of non-linear continuum (Figure 1). Crucial element that separates architectural and topological deviations from Euclidean geometry is a separate volume which is offered in Cartesian space and is discussed as well as those of geometry topological rubber sheets, high continuous curves and surfaces can be used that mathematically it is called Nurbs surfaces and curves. Topological spaces, geometry implied by the transaction are not being used instead of the parametric function that describes the range of possibilities. Nurbs curves or surfaces by adjusting the control points, weights, knots and ... are controlled. Nurbs curves form, unhomogonousand self-slicked objects to provide topological space, changing the location of the control points, weights and numbers of nodes can be created for different levels and curves.

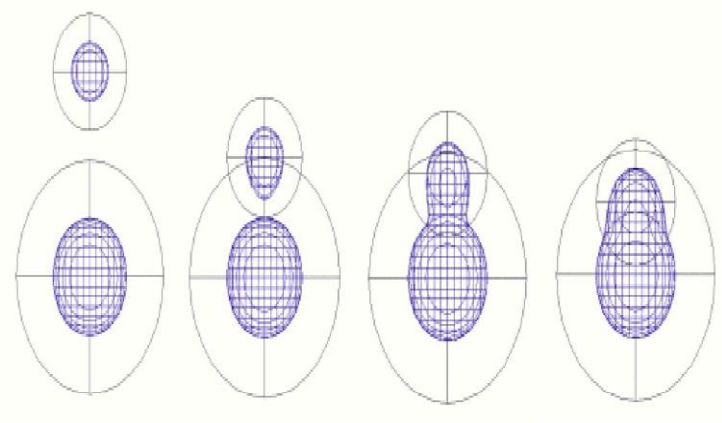


1 - Topological architecture, Frank Gehry, Guggenheim Museum, Bilbao

1-2 - Isomorphic architecture

The surface morphology shows another form of deviation from Euclidean geometry and Cartesian space. Drops, sometimes known as the isomorphic surfaces, are no-shaped objects are combined to form a series of parameterized objects with internal forces and gravitational mass. These architects apply the regions and areas of influence, which can be positive or negative, to work overtime. Geometry is made by calculating the surface area of the compound which have the same volume and that is Whyte which are said morphologic surfaces.

The is morphology surfaces are opened to another world where shapes changes are likely to raise new possibilities objects rather than occupying the space, interact together and get feedback. Logically connected to each other and by this logic, the effective added areas, creating new relationships and new possibilities are created.fig (2)



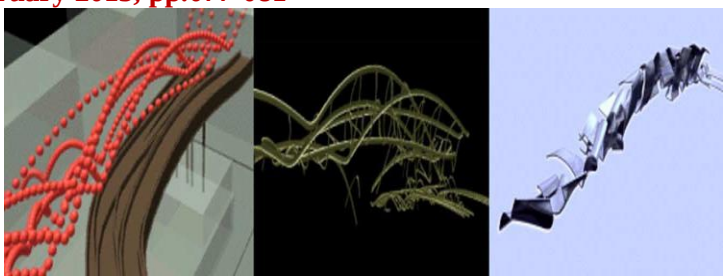
Isomorphic surfaces

1-3 - Animate architectures

Greg Lynn (Greg Lynn -1999), one of the primary architects of the software that interfaces animated software's not only as a medium to represent but also to create the shapes. According to the Lane in architectural "cinema model" movement of the force forms the articulation of the shapes and then through the concepts and techniques of "animation" that it considers. He says, as the "moving induces motion and force animation forms a shape and constituent forces.

Lin in central bus station design in New York in 1999 takes benefit of the complete set of moving modeling techniques such as "key frame animation", forward and reverse movements, dynamics and particle emissions, and movement science. And the literally mechanical motion in animation is used to study the motion of an object or a system of classification of objects regardless of the size or the forces of which influence it, . When motion is applied, the change in direction of movement on the bottom and directly in the path of upward movement in the rating of the reverse change is created. In some of Lynn's projects, like "House Prototype in Long Island", structures that are used for the covering of the negative inductive effect of different forces, lose their normal shape.

Unlike science, kinetic, dynamic simulation, the effect of forces on the motion of an object or system of objects, especially in the forces of production systems are not things to be considered. The physical properties of objects, such as the mass (volume), elasticity, static and kinetic friction (or hardness) are considered the influence of gravitational forces, the interaction of figures, the reaction ... They applied the dynamic simulation to be done. False ceiling design and lighting bus station in New York (Figure 3), which was conducted by Greg Lane, are good examples of using a system of particles that gravitational forces associated with the movement of pedestrians, cars, buses is induced is depicted.

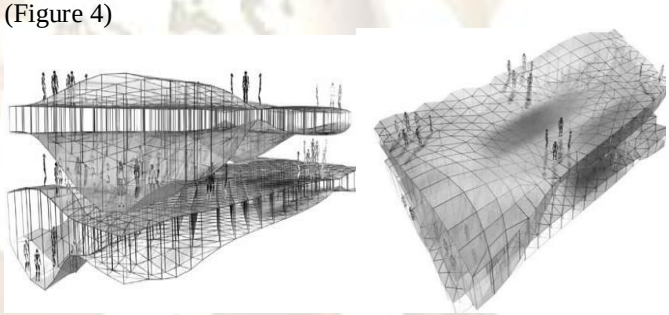


- Central Bus Station, New York, 1999

1 - Metamorphic architecture

Metamorphic forms production, including several techniques such as animation key (Key shape), the deformation space model around a model using a surrounding box (elastic deformation) deformation axis's of the coordinate system of an object in the Animation Path while moving in a certain direction, make it out of its natural shape...

In key shape animation, geometric changes register step by step, then the software will calculate the intermediate state and the deformation space model, the object model is consistent with the changes in the geometric space. . Example of this type of architecture can be found in the works of architects such as Departments Mvrfvsys, Robert Neumayr, and Coop HymlBlav and ... Found. (Figure 4)



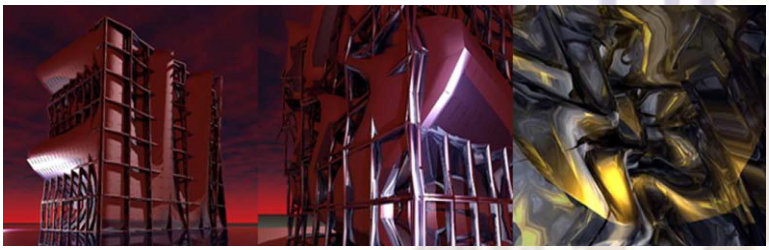
- 4Museum of Nature, Robert Neumayr, Spain, 2002

1-5-Parametric Architecture (Parametric architecture)

In parametric design, these parameters are considered to be a specific plan's, not its shape. By assigning different values to the parameters, objects and shapes can be created easily. Equations can be used to describe the relationship between the objects in a continuous geometry as they introduce constituent geometry. Thus, the relationship between objects is formed .Behavior of objects can be detected by the deformations.

Bray (1999Burry) says the ability to define, identify and combine the geometric relationship is particularly valuable. Parametric design reflects the often description algorithmic procedures. Marcos Novak (Marcus Novak) (Figure 5) in describing the architecture of our algorithm, which produces the same algorithmic structure of the architecture is the use of mathematical software, mathematical models and procedures that create the production of the

variables that do not have anything to do with the practical aspect are limited. Each variable or process gaps that external influences can be static or dynamic in terms of where the picture was painted, Novak in this study is manipulating the objects and manipulate the relationships, fields, higher-dimensional space and its curvature deals more. This is the point that parametric design, does not necessarily consider the stable shapes, As Bray (Burry) proved, it is doable to create a transformation – an isomorphic unstable and topologic spatial description using sustainable properties.



5 -parametric architecture, algorithmic View Marcos Novak, 2004

1-6-architectural evolution

Evolutionary architecture considerers the evolutionary model of nature as the process of producing the forms of architecture. In this design, as Frazer said: architectural concepts are expressed as generative rules to accelerate the evolution and development of these concepts and using computer models to be tested. Developmental language concepts are expressed in the form of a code of instructions for production. Computer models to simulate the development of the next sample is taken advantage of by their performance in a simulated environment, are evaluated. In a short space of time, can produce a very large number of developmental stages and shapes appear to be generally predicted?

The main point is that the architecture is evolutionary, developmental algorithm is a set of compatible parallel evolutionary trends in research. Its main feature, a ring-like structure is just the nature of chromosomes, in which the laws of reproduction, transformation and gene mutations are used; several parameters are considered in a ring-like structure and values during the manufacturing process changes. In this model, a similar number of people are like organism and the criteria of "suitability" predetermined, producer of the population are selected. So (organism) of selected and relevant parameters are transforming gene mutation linked to the rest of the cases diagnosed in the production of the new generation to create.
In this process, the main issue is not to figure out the internal logic of the model. Another equally important, inconsistent and often poorly defined criteria and performance criteria for selection is the best. Another issue is how the interaction between the built environment, which is attributed to metabolic processes and metamorphic.
- Concepts

1-2 - the dynamic field of forces

Arkian D. Thompson (D'Arcy Thompson) in his book " Growth and evaluation"has taken the most inspiration of Greg Lynn's works on the animated object. He expresses that shape in nature and its changes are related to the presence of the forces. Lane by his works on the dynamics of the motion to produce a form of architecture showed what Nicholas Negropontes (1970 Nicholas Negroponte) had shown in his writings, like the "architecture machine "for 30 years before.
In his writings you see that: a Considering Thompson opinion, physical form, is a solution to all the forces in a moment of time and with a range of changes are applied to that. In city categories, the complexities of these forces are beyond human comprehension. While a machine can create a form which meets the uncontrollable dynamics (moving). Such collaboration for human doesn't mean retirement but is the sign stimulus for the imagination of architects, so to find a replacement for the shapes human designers can't imagine to find it.

Lynn says, "In a traditional architecture, spatial abstraction, as a neutral space of Cartesian coordinates is considered .design space is considered as the environment of movement and force not an environment of the inert vacuum. He states that as the physical form are defined as static components force the object in virtual environment design, shape and appearance is concerned. Thus, the presence of a force in shaping the architectural object is essential. Transporting him to the importance of an active space of a static space inactivation reaction Valet knows. And that "the purity of movement and stillness independent" refers to a specific context. The transport and handling of instruments, the use of digital media such as animation software is that it's rather a means to visualize, imagine Ian as a tool to teach design.

2-2 - The Rise and uncertainty

Topological space which is open to the world and the non-linear curve shapes are not stable and undergoes changes that increase the probability. Designers can form as a result of the forces of reaction and actions look as Greg Lynn pointed to his works. However, there is no definition for the action and reaction that actually creates confusion. That causes an unexpected new shapes will emerge. The architecture of the computational capacity to generate new plans will depend heavily on the ability of perceptual and conceptual designers.

Creative interpretation of the architect's role in the design of simulation, building performance computing (topological surfaces, fields stirred, skeleton movement, force, parametric modeling, algorithm development and so on) is the study of complex calculations that constantly renovates itself. A new assessment in which graphics, form the designers' thought.

2 - Mass Production

The last decades have numerically controlled production processes and manufacturing non-standard components and have made repeatable digital data as possible. The serial production of the new logic of including local variations and different series are introduced to the topic of architectural production. Old hand building techniques to produce the different components of the same location has changed. The changes in building design and construction processes as well as digital products, more than all the buildings are found in Frank Gehry (Frank Gehry) and the Guggenheim Museum in Bilbao as one of the most dramatic examples.

Bernard Cache believes the objects are not designed anymore, but they are calculated. "This has allowed the design of complex shapes and surfaces with different curvatures to tell us that it is hard to design them with old traditional methods. And also, it is an essential for the production of non-standard methods. His goal was non-standard objects (Figure 6), especially for furniture and paneling calculated in Micro station software and industrially controlled by numerical machines.

As Cache believed, the detection of design parameters, often random parameters, is possible to produce different forms and in a series of mass production, the industrial production of objects is unique. In other words, now we can produce a set of objects of different but mathematically linked together, such as precise, detailed and fairly components, Peter Zellers believes that architecture is becoming hardware, and says that digital construction of software environment is depicting in the hardware.

Furniture - Domestic, using software micro station, Bernard Debut

3 - Conclusion

Digital architecture and computational processes of design (construction) will change, but for many architects have learned Euclidean geometry, complex and unpredictable emergence of significant shapes have a lot of problems. In the absence of a proper aesthetic theory, multi-surface shapes seem quite vague and hard to understand them in terms of space and often are separate from the other entertains mental architectures.

Remembering this story, is not unpleasant that it was the "open plan" of Le Corbusier which allowed various curvatures of the elements in the modern projects of the renaissance. Eero Saarinen relates the re-emergence of the plastic forms to technological advances of the buildings and says:

"That is the aesthetic reason which imposes the use."

Saarinen is doubtful and uncertain in using the plastic shapes, because he believes they have less efficiency and warns that plastic from although are week but they seem very beautiful and homogenous.

While the doubtful method of Saarinen is an example of modernists' uncertainty against curvature forms, the belief still exists.

This belief helped them to break uniformly of linear position or the tonality and help the emergence of a new, previously unknown geometry. Geometries those were still unsure about it. Modernists who believed that they should stay away from it: the collapsing with lack of confidence and a return to normal forms representation. The first, in the absence of the latter, and the second in the confusions that Art Novo (a style of architecture) was caught in it, would occur.

Certainly controversial theories on curved look with a sickening mixture of contemporary critical debates that followed the typical uncertainty.

Randomness has an essential role in the production of uncertainty. Perez Gomez and Pelletier say that tendency to randomness as a result of the legal output of design should be accepted. Because computer graphics systems, impose a similar and homogenous space that can't combine different structures of one source to each other.

Mark Burry suggests that the adoption of critical theory or the associated errors and events, does not bother with, and adds a error full plan, neither is assessed as a questionable plan nor is seen as a disability in art power.

Briefly, secure computing architectures requires strategies that are designed to allow the dynamic manipulation schemes with high degrees of uncertainty.

The presence of such strategies, are not a limiting factor in the design, unpredictability of uncertainty still exists as the likely to discover the

forms(shapes) still exist, the emergence of such computational techniques, seem to be unavoidable.

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