Towards a virtual architecture

Pushing cybernetics from government to anarchy

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Abstract

Purpose – This paper discusses the possibility of joining cybernetics and architecture as a continuous and open process, bridging design, construction and use, in that which is called cyberarchitecture.

Design – It develops the hypothesis that cyberarchitecture can benefit from taking the virtual into account in the design process, so that the architect is no longer the author of a finished architectural product, but of a set of instruments with which users can design, build and use their own environments simultaneously.

Findings – A set of design principles is systematised and examined in three practical realms of design: urban, building and relational, showing cyberarchitecture’s embryonic feasibility.

Practical implications – Cyberarchitecture implies architects no longer being authors of finished products and users becoming designers of their own spaces.

Value – Cyberarchitecture avoids the usual cybernetics’ approach based on control-system, indicating a less predictive and, ultimately, anarchic path for architects and users. It focuses on architecture’s intrinsic value as an event, indicating the possibility of a process-based system, which only exists (or is organised) in present-time, when users and instruments (or structures) interact.

Keywords – design process, virtual, user autonomy, interface, anarchy, process-orientated design

Paper type – Conceptual paper

1. Introduction

The documentary The corporation (2003) states that a corporation has the legal rights of an individual though has no moral values as an individual, and as an individual it can be diagnosed as a psychopath. The motivation of the discussion developed here comes from the need to stop moving with the flow, in the wave of cybernetics and new technologies orientated towards corporations, and try and discuss the possibility of cybernetics orientated towards the individual: instead of organising and governing systems from the top down, to think of developing tools or interfaces for possible self-organisation from the bottom up and, ultimately, envisaging individual autonomy. In architecture this implies an analogy with anarchy instead of the usual analogy with government (Malatesta, 1987). This means shifting to a process-orientated production of instruments or interfaces, instead of the usual product-orientated design of systems, objects, spaces and events. This also implies to take that which John
Thackara calls ‘the innovation dilemma’ into account, as instead of producing things for increasing big corporations’ profit, this view needs designers worrying about the real value of their products or processes to individuals, and how flexible and open to interaction and change they really are; that is, to worry about ‘why’ design things (Thackara, 2000). In other words, instead of designing a fridge that tells people when their milk is finishing (I would be quite annoyed with such an intelligent friend-fridge in my house), or designing an intelligent heating system that learns with users’ habit and saves energy but also stimulates the habitual uses of the space, I believe we, as individuals, would be better off with the design of instruments and interfaces enabling users to keep on designing.

This paper discusses cyberarchitecture, the possibility of architecture as a continuous and open process, bridging design, construction and use. In this case the architect is no longer the author of a finished architectural product, but of a set of instruments with which users can design, build and use their own environments simultaneously. This is developed in three parts.

The first part discusses cybernetics and its implications to architecture, the second discusses the virtual as a means to open the design to users, and the third elaborates the idea of cyberarchitecture on three practical examples.

The first part, cybernetics and architecture, introduces the main features of second order cybernetics for the arguments of the paper. It shows those features that are crucial to the development of cyberarchitecture (the inclusion of the observer in the system, its ethical focus, its conversational basis, and the constructivist approach) and discusses those concepts that are incompatible with cyberarchitecture’s open character (autopoiesis, autonomy and fixed-organisation). I must acknowledge here the influence of Ranulph Glanville, who criticised my first draft for this paper and introduced me two main sources: his own ‘Second order cybernetics’, and Maturana and Poerksen’s *From being to doing*. The discussion raised in this part ends up pointing towards the virtualisation of architecture and of the design process as a means to open up the system’s organisation and to include the user as part of the system.

The second part, the virtualisation of architecture, discusses the meaning of the virtual as a philosophical concept and its possible application in design. It draws from Pierre Lévy and Sanford Kwinter and develops the concepts of potential, real, virtual and actual by means of examples from the arts and virtual reality. It makes a critique of representation as a controlled closed-system and proposes a design approach based on open process. This evolves from theoretical arguments borrowed from philosophy (Gilles Deleuze and Félix Guattari), philosophy of science (Bruno Latour and Lucy Suchman) and design (Vilém Flusser and John Chris Jones). It argues that cyberarchitecture is a means to design responsibly, leaving it open to other people to keep on designing; designing the interface rather than the finished and closed system or product.

The third part, a set of design principles and three practical examples, discusses some design principles underlying creative thinking that can be used in cyberarchitecture. The principles are introduced and examined in three designs I have been involved: the first regarding the realm of urban design, the second regarding the realm of the building, and the third regarding the relational realm. All three examples are attempts to create open cybernetic systems (cyberarchitectures) with participation of the users in its temporary completion. This leads to the conclusion of the paper, which stresses the difference between the traditional design procedure and the one proposed here; praises the work of Cedric Price as an early development of
cyberarchitecture; and asks for architects and designers to abandon the design of finished products and closed-systems, and start developing virtual interfaces for people to keep on designing their own objects, spaces and events.

2. Cybernetics and architecture

Ranulph Glanville (1997) clearly states that ‘cybernetics deserves to be considered in its own terms, and the logic and coherence that is within it deserves to be developed in those terms’. He goes on to extend this same view to architecture, saying that ‘practitioners (sic) seems to have so little regard for its own value that they have always to describe it in terms of theories borrowed from other fields, without realising that architecture is the theory in its own right’. As Glanville, I am not concerned here with semiotics, or autopoiesis, but with the implications of possible developments of cybernetics to its own developments. I am also not interested in a theory of architecture borrowed from any other field, but with architecture itself, an event that only happens when experienced, lived by subjects (individuals), and not controlled and imposed by corporations. These two concerns, cybernetics and architecture, motivated by the need to create useful things (not only useable as the intelligent fridge), as Thackara (2000) puts it (borrowing from Bill Buxton), leads to what I would like to call cyberarchitecture. It is no longer possible to think of architecture without thinking of a human-machine relation, that is, to think of cybernetics, even if not computer-based, as this article illustrates later.

Some features of second order cybernetics are crucial to the development of cyberarchitecture, mainly the inclusion of the observer in the system, its ethical focus, its conversational basis, and the constructivist approach.¹ The inclusion of the observer and the constructivist approach can be linked together as the observer is no longer placed outside the system, as in first order cybernetics, but constructs the system through the very act of observation (Hayles, 1999), or, in other words, we construct our reality through observation. Glanville (n.d.) states that ‘from this interest in the involvement of the observer ... and a theory of knowledge determined by a knower rather than simply being “there”, comes an explicit concern for ethics’. This ethical focus is summarised in Heinz von Foerster’s ethical imperative: ‘act always so as to increase the number of choices’ (Glanville, n.d.). This means that ethics is never a predetermined rule, but a responsible choice of the observer (which I would rather call user or actor). The conversational basis questions the possibility of any meaning prior to interaction, pointing to circularity and to the impossibility of a linear system. All these are interrelated and clearly contribute to a process-orientated and open design of interfaces leading to cyberarchitecture.

However, some concepts that are at the heart of second order cybernetics can be regarded as obstacles for the development of cyberarchitecture (perhaps also for further developments of cybernetics, but this is not the main concern here). These are the concepts of autopoiesis, autonomy and fixed-organisation.

According to Humberto Maturana and Francisco Varela (1980), an autopoietic unity or system is a living-system, such as a biological system as a human body. Having an identifiable boundary is the first key Maturana and Varela described in a six-step methodology to determine whether or not a given unity is autopoietic.² Maturana also says that a cell is an example of an autopoietic organisation, while a ribosome is an example of an allopoietic organisation.³ Even if one does not understand a lot of biology, it is not difficult to see the difference in organisation between a cell and a ribosome. If on the one hand, a cell is an independent physical unity, separate from its background, and produced by processes intrinsic in its own
operation, the ribosome, on the other hand, is not entirely produced by processes that constitute its operation. This idea of an independent living-system, as a cell, with a clear identifiable boundary, having all possible output created from its own input, can only happen in closed-systems. The point that needs to be made is that cyberarchitecture (as I am only concerned with this, and not with other possible applications of cybernetics) can never be regarded as a closed living-system as it has no identifiable boundaries, frustrating the first rule of autopoiesis and being closer to an allopoietic system.

Maturana himself strongly criticises the use of autopoiesis to explain social systems (Maturana and Poerksen, 2004). His argument is that ‘autopoiesis takes place in a domain in which the interactions of the elements constituting it bring forth elements of the same kind.... Communications, however, presuppose human beings that communicate. Communications can only produce communications with the help of human beings’ (Maturana and Poerksen, 2004). For Maturana (Maturana and Poerksen, 2004), ‘autopoiesis as a biological phenomenon involves a network of molecules that produces molecules’ and to replace molecules by communications would mean to exclude people from the system, that is, to say that communications produce communications. This closed system is an impossibility for social phenomena, which have no identifiable boundaries as a molecular system has.

In biology and cybernetics an autopoietic system is also regarded as an autonomous system, as it is self-produced. Autonomy in this context means independence from external sources or other systems to produce itself. However, if we examine the origin of the concept of autonomy we can see that it is a moral idea. Kant formulated it as the ability of people to govern their own decisions by discerning and enacting of a common moral law. This means that autonomy is not an ethical but a moral issue. Morals is different to ethics, in that it is applied by others to others instead of being a ‘property of the observer’ (Glanville, n.d.). This means that only people can be autonomous, and also that it is not an independent feature or property of the person, but a relational feature. Nevertheless, even if we disregard this philosophical meaning of autonomy, and take it merely as “self-government”, we must be aware that if a system is truly open as to accommodate as many users and their demands as they may come, this ability to govern itself is not enough. Self-government is desired and welcome in closed-systems, but in open-systems we must look for self-anarchy. In other words, there is no way to control, to govern a system that has no boundaries. The proposal of self-anarchy is a more appropriate approach as it implies both self-organisation and emergent-organisation instead of a fixed-organisation.

Maturana (Maturana and Poerksen, 2004) states that every autopoietic system has a fixed-organisation; if the organisation changes the system collapses. Maturana and Varela (1980) use an interesting distinction between organisation and structure. They state that ‘the relations that define a machine as a unity, and determine the dynamics of interactions and transformations which it may undergo as such a unity, constitute the organisation of the machine. The actual relations which hold among the components which integrate a concrete machine in a given space, constitutes its structure’ (Maturana and Varela 1980). They illustrate that with a toilet, explaining that regardless of the materials used to make the parts of a toilet, it will still be a toilet if its organisation is that of a toilet. Changing materials, means changing structure, not changing the machine as a unity, its organisation (Hayles, 1999). Of course that spaces, such as a toilet, will always keep its basic organisation, though having different possible structures. However, other architectural spaces, such as
cyberarchitecture, need not to be so organised; that is, they are not required to be (and actually it is not desirable that they be) predefined, having all possible dynamics of interactions and transformations predetermined. So, the idea of cybernetics emphasising control-systems, in which designers control both structure and organisation, restricting users’ behaviour, needs questioning. The design, construction and use of spaces can shift their focus to the event and people can experiment with more freedom, as part of the system. Control, in this case, is no longer directed towards the final system, though the design and production of instruments and interfaces may be controlled. Cyberarchitecture is then a present-time emergent system, in which the idea of self-anarchy is more suitable than that of self-government.

The reason why cyberarchitecture cannot be regarded as an autopoietic system with identifiable boundaries is that it is not a predetermined system, but a social, relational phenomenon. In other words, the whole idea behind cyberarchitecture is not only to take users’ interpretation of the system into account and consider the construction of the system for the user in analytical ways. Instead, cyberarchitecture depends on really seeing the user as a physical and undetermined part of the system. In this view, the system does not exist prior to its use, but only happens with and in response to the users. The system is dialogical, and the user triggers communications within it. The autonomy wished for is that of the users, who will act within the system according to their own discernment of what they previously know. The system’s organisation is not fixed, as the function of the spaces and events proposed is not predetermined in the system, but waits to actually be temporarily assigned. Thus, once more, it reinforces the impossibility of autopoiesis, which presupposes fixed-organisation. That is why there is a need to design instruments and interfaces open enough, and with no fixed-organisation, so people can join them together in different combinations to suit their needs and desires. Thus, self-organisation is possible, though the system is not closed and predetermined.

Cyberarchitecture, as any virtual design proposal, is a cybernetic system in the sense that it is a feedback system, a circular system, a self-organised (or even better self-organiseable) system. Regardless of the criticism of autopoiesis and its following concepts of autonomy and fixed-organisation, cybernetics is still the inseparable partner for virtual architecture and design. It must be emphasised that the cyber of cyberarchitecture, though can be related to digital technology, is strongly rooted in cybernetics. This differs to the cyber used before anything that has to do with technology nowadays, which seems to have started its spread with William Gibson (1984) coining the term cyberspace. In spite of that, the cyber of cybernetics is very alive and might not be ignored.

It must be said that the developments of cybernetics do not concern architecture. In the classic article “The architectural relevance of cybernetics”, Gordon Pask (1969) mentions the straight relation of both disciplines, as they are ‘operational’, saying that ‘architects are first and foremost system designers’. However, cybernetics develops from other sort of research, which is not even inspired by architecture and its preoccupations. The relevance of cybernetics for architecture is huge, but as Pask (1969) states, ‘there is … one sense in which the reactive environment is a controller and another in which it is controlled by its inhabitants’. This alone means a disturbance of any closed or predetermined system, as the observer is no longer constructing it by means of interpretation, but actually using and transforming it. The user is active, becoming an undeterminable part of the system. If on the one hand this can be easily inferred from cybernetics and architecture, on the other, most architects
still design representing predictable patterns of users’ behaviour. That is, most designed spaces are closed systems in which users’ unpredictable interference is not always welcome; sometimes, in order to appropriate of spaces users need to radically change its predetermined structure and organisation. Cyberarchitecture intends to join cybernetics and architecture acknowledging this fusion as an open system with no fixed-organisation and with a flexible structure. This means to virtualise both architecture and the design process.

3. The virtualisation of architecture
One way of looking at the anarchic nature of cyberarchitecture is to examine it as a virtual entity. ‘Virtual’ in computer terminology is usually associated to digital representation or simulation, meaning something beyond static visual representation of reality; it indicates an environment where the user can always interact. However, the philosophical meaning of virtual in the age of information and communication technology (ICT) encompasses more than that. This article claims that ‘virtual’ can be used in design terminology as a means to open organisation, to create sets of structures to be organised by users as they wish.

Drawing upon Pierre Lévy (1996), virtual can be summarised as ‘latent event’, which is an event that is present but not manifest. Lévy’s fourfold system shows the difference between possible and virtual, and the interrelationship between possible, real, virtual and actual, in which the virtual is not opposed to the real, but to the actual, which is a present-time manifestation of the always existent and latent virtuality. The real, on the other hand, is manifest at the level of substance, and is opposed to the potential, which, though latent, also belongs to the realm of substance. The virtual belongs to the realm of the event, the real to the realm of substance. Virtualisation is defined as the inventive passage from a solution to a problem, the opposite of problem-solving. This problematising process is crucial to architecture, as opposed to the usual design strategy based on problem-solving. The relevance of the latent event in architecture is my concern here. Lévy (1996) stresses the importance of the event as distinct and separate from substance, though both work together in the world. The role of the architect is then to design virtual instruments or interfaces with which users can play with as to actualise them. That is, architects should not merely realise their designs.

According to Sanford Kwinter (2001), architecture was the first discipline to declare its postmodern emancipation from the Modern Movement, and this postmodern emancipation was a corrupted and inward critique of the innovation proposed by the modern avant-garde, emerging from a tendency to mediocrity. So, postmodern architecture is an inward critique of modern architecture ‘reproducing’ it rather than questioning and developing it further ‘following’ from it. Gilles Deleuze and Félix Guattari (1999) distinguish between two models: the ‘reproduction’ model and the ‘following’ model. ‘Reproducing implies the permanence of a fixed point of view that is external to what is reproduced: watching the flow from the bank. But following is something different from the ideal of reproduction’ (Deleuze and Guattari, 1999). ICT is used in architecture according to the model of reproduction, based on a fixed point of view and the representation of what already exists, as an inward critique. The following model, in contrast, is based on destabilising what already exists and looking for novelty. Considering architecture as an open system, the following model suits best the potential of both architecture and ICT in relation to the whole dynamic system of production and consumption of spaces, beyond representation.
The difference between reproduction and following models can be investigated as the distinction between substance and event. Substance concerns the relationship of the possible to the real; event, the relationship of the virtual to the actual. The two approaches are exemplified in two early explorations of virtual reality (VR). First, Ivan Sutherland’s helmet-set and Morton Heilig’s Sensorama, which were created to reproduce some isolated aspects of the physical world in the digital. The helmet-set enabled users to see video images as they saw three-dimensional things in the world; users could also see both physical and digital worlds simultaneously. The Sensorama, apart from stereoscopic vision, also reproduced smell, vibration and sounds from the physical world. In both devices the potential is rendered real by simulating isolated physical experiences, which are then experienced by users repetitively; their designs focus on reproducing physical qualities in digital environments, on realising the reproductive potential of digital technology.

The second example is Lygia Clark’s work, in particular Mask with mirrors (1967), which celebrates real interactivity by holding small moveable mirrors in front of the eyes, juxtaposing and fracturing reflections of the self and the surrounding world. Simone Osthoff (1997) places this work beside Sutherland’s helmet-set as the primitives of VR. In both cases, the spectator has a bodily experience. However, with Sutherland’s helmet-set the spectator experiences a reproduction, a simulation given a priori, while with Clark’s headset spectators become active participants in their own liberation as individuals, connecting art and life through their own experience (Carvajal and Ruiz, 1999 and Osthoff, 1997). In Clark’s case, the artist works as a designer who is not limited to rendering the potential into real, as ‘a person who induces and channels experiences’ (Borja-Villel, 1997), creating a place for experience, considering the virtual to be actualised by the spectator. In other words, although substance results from art or design, the final result is not necessarily substance; the final result is always the individual experience of the event. Unfortunately, most designs take substance as the final result, and the event, the actualisation of their virtuality, becomes a consequence rather than part of the design. Clark takes advantage of the event as the core of her work, consciously focusing on the virtual to be actualised by the spectator.

Clark’s Sensorial gloves (1968), proposes a rediscovery of touch. Participants experience different combinations of gloves and balls of different kinds, sizes, textures and weights, alternating with holding the balls with bare hands. The physical perception of touch is enhanced by awakening the participants’ awareness beyond habitual experience. Jaron Lanier, one of the pioneers of research on touch in VR systems leading to experiments with interactive gloves, describes a similar sensitising effect resulting from immersion in VR:

There’s this wonderful phenomenon where when you’re inside a virtual world and if you take off the head-mounted display and look around, the physical world takes on a sort of super-real quality where it seems very textured and beautiful, and you notice a lot of details in it because you’ve gotten used to a simpler world. So there is actually a sensitivity-enhancing effect (Leeson, 1996).

Although these two sensitising effects are similar, their differences indicate an important distinction in design: on the one hand, a predictable substance-based design; and on the other hand, the design of an unpredictable event; the design of the virtual.
The rediscovery of touch, the enhancement of perception, is the ‘final’ product of Clark’s work, a product which is not realised in terms of substance but is virtual and depends on the spectator’s participation in order to happen. Clark’s work points towards designing the event without designing the final experience of the user. In her work, the enhancement of perception is achieved by experiencing the work. On the other hand, the sensitising experience described by Lanier happens when one leaves the VR system. The aim of the system, and of the virtual environments it shows, is not to enhance the participants’ perception of the physical world but to partially reproduce it in the digital environment. The VR he describes has as its ‘final’ product the presentation of the virtual environment to the users who, immersed in the system, have most of their senses restricted. The product of such a system is substance-based: the realisation of the potential of the physical world in digital format, often reducing it. It aims not at enhancing perception of the physical qualities of the world, but at extending the world, mainly for communication purposes, by reproducing physical qualities digitally.

The design of VR systems and of virtual environments, and design in general, including architecture, is often concerned with realising potentials, with solving established problems rather than raising questions for the user. Clark’s *Mask with mirrors* and *Sensorial gloves* are designed creating not a result in terms of substance, but rather ‘instruments’ which enhance experience by raising questions to be answered differently by each spectator. Substance works as a key to open up the virtuality of the work when the spectator becomes a participant, actualising it. These examples do not design the experience, but create a piece for experience. They provide the user with tools to enable them to play with their own sensory capabilities, without leading them to any predesigned perception. The participant is pushed to explore new territories, perhaps without moving, exploring new relationships with things in a non-habitual way.

If the designer assumes the reproduction model based on the atomist approach by designing the experience, then experience itself will be limited by the restrictive control of the designer. This is usually the design approach, which Lebbeus Woods (1996) defines as ‘a means of controlling human behaviour, and maintaining this control into the future’. But if designers assume the following model, designing for experience, they either give up control altogether, or control the production of instruments without restricting the user experience. Unfortunately, designers usually set an agenda based on substance. This article indicates cyberarchitecture as a possible means to overcome this.

Cyberarchitecture is an event-based space directly depending on people’s present-time interaction. Cyberarchitecture is in principle an open process which recognises that there is no such a thing as finished architecture, because people are always part of architecture regardless of it not being designed as an open process. Bruno Latour (1999) summarises this in his *Pandora’s hope* when he states that instead of replacing one commander by another the reader should recognise ‘the impossibility of speaking of any sort of mastery in our relations with nonhumans, including their supposed mastery over us’. Latour (1999) demonstrates that ‘responsibility for action must be shared among the various actants’. In line with Lucy Suchman’s argument on agency (Suchman, 1999), he demonstrates that regardless of what is at stake, responsibility for action always concerns the interrelationship of everything involved, and nothing has the sole power of premeditated mastery.
In architecture this means that regardless of the intent of designers to master their plans and to predict the use of the spaces they design, the final use of spaces will always happen according to the interrelationship of every actant involved, including the very space itself. Of course that the more closed, finished and restrictive the space is, the more difficult for people to use it differently to the intended plan. This limitation is well explained by Vilém Flusser (1999) when defining design as ‘obstacle for/to the removal of obstacles’. Flusser (1999) argues that everything designed is always an obstacle, as ‘an “object of use” is an object which one uses and needs to get other objects out of the way’. According to Flusser (1999), every design, be it substance-based or event-based, is an obstacle with a purpose. However, he puts an interesting question: ‘what form must I give these projected designs so that people coming after me can use them to help them to continue and at the same time avoid being obstructed as much as possible?’ (Flusser, 1999). This question has no direct answer, but opens up a discussion on responsibility, which Flusser (1999) defines as ‘openness to other people’. According to him, the problem is that most designs are created irresponsibly, that is, orientated to the object rather than to its openness to people. In his words ‘the more I direct attention towards the object in the creation of my design (the more irresponsibly I design it), the more the object will obstruct those coming after me’ (Flusser, 1999). Moreover, Flusser stresses that this irresponsible design has been almost inevitable since the Renaissance, as since that time there is a need to master everything.

If we learn from Latour that there is no mastery, and from Flusser that designers are imposing their will to mastery onto their designs, we can start questioning the irresponsible design and envisaging that which Flusser (1999) calls inter-subjective, or dialogical, or responsible design. This is the aim of cyberarchitecture, designed as an open process, without attempting to define a finished product, recognising that ICT can bring more to architecture than shifting the place of command from the object to the subject or to technology by acknowledging that in fact there is no need for any command.

According to John Chris Jones (1991), ‘the design-as-process outcome is the design process’. Jones’ critique of design methods, and particularly of his approach to design-as-process, is that the method ends up being a product. In his words: ‘the fault in method-making was that we made methods as “products” and handed them on to the designers expecting them to use them, as “tools”, as a means to an end. Which became a logical trap, turning the idea of process into its opposite’ (Jones, 1991). Moreover he states that they ‘didn’t realise that the people inhabiting the world-designed, if [the method-makers] changed to process-design, have to be designers, everyone of them’ (Jones, 1991). Jones proposes the continuation of design into the world. This has two implications: first, if there is any design method at all it is not a product; that is, it is not finished and ready to be used by designers. The method, or set of rules, or directions, must be open enough to enable architects or designers to keep designing. Second, the design-as-process produced by designers (which I call interfaces or instruments) are to be interacted with by users, and only them become temporarily complete. This means that there is no predetermined end, only an open means to achieve whatever end results from interaction.

Jones’ design-as-process and Flusser’s responsible design are yet abstract ideas that can very easy become a method-product, as Jones have already criticised. Looking at architecture’s methods, it is not difficult to understand that since the Renaissance there is a tendency to create models and rules that can be reproduced by other architects. These methods are always prescriptive no matter if based on moral
principles, nature’s laws or are a set of rules drawn from the architect’s belief. They usually become a black box that people use ignoring the nature of their principles (Banham, 1999). Taking the virtual into account in the design process is a means to overcome these usual problems, as demonstrated above with the work of Clark.

4. A set of design principles and three practical examples

If we are moving in the direction indicated by Jones, designing designing, that is, keeping design open for people to keep designing, we need to do that responsibly, as wants Flusser. It is necessary to design spaces or instruments open enough not to obstruct people, so they can be creative. We must bear in mind that ICT still enables the most democratic environments for creative thinking and acting. The analogy with computer programs here is inevitable. To look at cyberarchitecture as programming is an alternative to prescriptive drawings of finished buildings. In this context programming means not to predict or predetermine the outcome, but to create tools or environments open to people’s interaction. This interaction will really trigger a process between users and the machine as to create specific outcome for each case. This can be seen in commercial software such as Macromedia Director and Flash, which are programmed so people can create their own programs within them, with more or less openness depending on their ability and will. These sorts of software, as also other design tools said to enable creative thinking, have already been studied. The design principles underlying them can also be used in architecture. In fact, they are crucial to virtual architecture.

The creative potential of tools is found to be crucial to any design tool or environment. According to Mitchel Resnick and his colleagues (2005), ‘almost by definition creative work means that the final design is not necessarily known at the outset, so users must be encouraged to explore the space’. The design principles developed by them are described here.

Drawing from Resnick and his colleagues (2005), the first four features of a virtual design are related to design supporting exploration. They are: i) the easiness to try things out and undo them, ii) the self-revealing flexibility enabled by the design (interface), because if it is not apparent it will not be used; iii) the easiness to use for first timers, though not banal to experts; and iv) the pleasure and fun in using the design (interface), so people will not need to concentrate their efforts in learning the environment but on playing. Apart from that, they also mention an important feature that should come together with the easiness for first timers (‘low threshold’) and the sophistication for experts (‘high ceiling’), which they call ‘wide walls’. This feature concerns the support and suggestion of a wide range of explorations. The best example of this is traditional LEGO bricks and the MIT’s programmable LEGO bricks, with which kids are encouraged to ‘create anything from a robotic creature to a “smart” house to an interactive sculpture to a musical instrument’ (Resnick et al, 2005). Furthermore, it needs to be open to different users; that is, to be able to accommodate different procedures of use. As it also should support collaboration and interchange, which means that it can be used by teams in collaboration and that it is open to accept other pieces or logics of use not designed in it.

Three designs I have been involved with are examples of cyberarchitecture’s, or virtual architecture’s, principles set up above, though the first two are not yet hybrid environments, but steps towards it. They are developments of three different realms: urban, building and relational. First, in the realm of urban design, is the project we presented for a competition of ideas for the Plan of the Technological Park of Belo Horizonte, Brazil.” Second, in the realm of the building, is the ‘interface of
spatiality’ developed by our research group MOM/LOW (living in other ways). And third, in the relational realm, which is the current focus of our investigation at LAGEAR (Graphics Laboratory for Architectural Experience), is the project “Occupying Spaces”, a partnership with the ONG Oficina de Imagens, which intention is to create interfaces for spatialisation of communication connecting people of two remote physical places.

In the first case the virtual is taken into account to establish an open and abstract logic of occupation. Instead of defining the roads, pavement and plots, we propose only a main road and create a very simple set of rules for occupation. These rules are based on what we call relative units of occupation (RUsO), which are stripes placed side by side perpendicular to the road. Each Ruo has seven metres in width and varies in length. The rules state that:

i) Everyone acquiring RUsO ought to take at least three of them, and if RUsO are to be left between your set and the neighbour’s, these can never be less than three. This guarantees that the minimum size of the final plot will always be greater than the required by the local urban legislation.

ii) The pavement is of responsibility of the property and must give continuity to the neighbour’s pavement, though it is not obligatory that it form a parallel line with the road.

iii) At least at every set of seven consecutive RUsO it must have a connection, by means of pavement, between the road and the bushes or the stream behind them, depending on the side of the road they are.

These rules are in fact our design proposal, and they are like abstract objects or obstacles intending to obstruct the least possible, attempting to be responsible. They aim to enable future architects designing the buildings of the Park to keep designing the Park. This is the case of designing responsibly a logical structure of occupation, leaving it open to other architects to keep designing from it. Even if a very limited example, this non-plan strategy was proposed in opposition to predicting the final spatial configuration of the Park and limiting the architects to place their designs in a pre-established grid, without taking part in the design of the Park. It points in the direction of designing an open urban structure, taking the virtual into account, as the design is kept open to other architects. Whether or not these architects will keep their designs open is another matter. The final design of the Park, as we propose, could become as close as the winner design, as its openness would depend on other people’s designs. But this is a risk we must take if we are willing to open up our designs to other people, to design interfaces rather than products.

The second example, the interface of spatiality, is more concrete than the abstract logic of the RUsO, as its application is more direct; that is, users can simultaneously design and build their spaces. In this case the virtual is taken into account to open the design for user interaction without predicting the outcome. This interface is a set of plastic pipes—with modular sizes of 60 cm, 120 cm and 180 cm—spatial joints made of laminated wood, clothes of different fabric, size and colour, ropes and pins to stabilise the structure. The general idea was to design a kit of parts easy enough to assemble so people could experiment different spatial arrangements. The aim of this interface is not only playful, which has proven to be a great success, but mainly social, that is, to check people using it in order to perfect it as a building
system to be used by low-income families and individuals to decide upon and build their own spaces.

Observing the playful uses of the interface and a pilot test with a group of teenagers of a favela in Belo Horizonte, Brazil, we can say that people are not passive in relation to space because they are naturally passive. People are quite active when given the opportunity, that is, if the space is not so obstructive as to discourage people to make changes. It made us question the fixing of most spaces and how people are willing to play with space, to change it, when faced with challenges and possibilities. When interacting with this interface people are at the same time designing and building. This kit of parts enables continuity of design into the world, that is, ourselves, the architects, are no longer the authors of a work, a finished space-product; we only provide means, instruments, interfaces, so people can design their own spaces.

This kit—this design—has most of the features described above. The kit is very easy to use, as its pieces are very light and not too big. Everyone sees its potential flexibility and is able to try it out and undo what is done, even though the connection pieces sometimes make the joints too tight to be undone. We have tested its use in situations in which we assembled a space and people could change it, and in situations in which the kit is there unassembled and people need to figure out what to do. In both cases the users had no difficulty in playing with it, and also architects were quite kin on figuring out ways for exploring the interface beyond its obvious potential, which is to create orthogonal spaces. The playful aspect of the kit was certainly achieved, but it still lacks ‘wide walls’; that is, its repertoire of bits and pieces is very limited and limiting of what can be done, and it also needs more flexibility to accept other pieces not designed to be used with it. We intend to keep working on it and try and resolve these faults.

Nevertheless, one of the most important features of this kit of parts is that it transforms the logic of designing and building: design is no longer an intellectual process of foreseeing a finished product, and construction a hard process which never welcome workers’ decisions. Design becomes a process of producing instruments or interfaces for users, and users become at the same time designers and builders. This interplay of designing and building as users’ activity, on the one hand, and designing interfaces as architects’ activity on the other, is crucial to the development of cyberarchitecture, and of any virtual architecture.

In the third case, the project “Occupying Spaces”, the intention was to enable socially excluded people from two remote places to establish relations by means of a hybrid of physical and digital spaces; in other words, to design a virtual space for remote communication, a sort of third space that only emerges in present-time with people’s interaction.

If we believe as Norbert Wiener (1954) does, that messages and communication facilities tend to play an ever-increasing part in the development of society, we can no longer ignore communication as the main condition for the production of spaces. In this way, not only communication is crucial, but also the spaces that emerge with it. Usually, communication interfaces, the spaces of communication, are not designed as ‘places’. The telephone is an example: an instrument which enables communication and at the same time emphasizes the placelessness of the meeting. The two people communicating by phone stay in their original places, without the phone connection creating any sort of shared place. Following the logic of designing virtual entities, we created an interactive visual circuit connecting two different favelas in Belo Horizonte in one evening. For that we have used the Internet with web cameras and a set of
projected interactive environments, so people not only interacted with each other remotely, but created their own spaces by means of projected digital images, as they communicated and interacted with the digital interfaces. We designed collaborative interactive interfaces, which were projected enabling people to interact with each other and with the environment by means of gesture (using different coloured lights in their hands). Some interfaces were puzzle based, requiring two users collaborating in order to move the pieces to form an image, others enabled more freedom, as the one which is a sort of digital graffiti, with which people could create whatever they want.

The two main features of this experiment are to enable the emergency of a third space, a shared place, as people interact with each other and with the hybrid environment, and to have ‘wide-walls’, as the physical space can accommodate other projections or other events people could propose, and also, the Internet connection can lead to other digital environments available on the web without losing the remote connection.

5. Conclusion
It is important to distinguish between two approaches to design. First, the traditional design, the one in which architects make themselves acquainted with possible uses of the space in question and anticipates these in a finished proposal of space. This is as determinist as every Modernist architecture, which has the architect as the author of a finished product. The other, the open or virtual design, in which cyberarchitecture is included, is the one in which architects understand the way people deal with their spaces in order to create means for a continuous design proposal. This, though the interface designed can be determined, is not determinist, as the space itself depends on people’s interaction to happen—be it by designing and building simultaneously, be it by merely interacting and completing the building temporarily when having feedback from the physical and/or digital structures.

It is crucial to cyberarchitecture, as an open design process, to keep the product open to users interaction, which means that the ones designing must understand how people deal with their daily spaces, but also be able to create something that moves beyond reproducing patterns. Designers of interfaces, be them architects or users, need to evaluate which features are of collective decision and which are of individual decision in order to produce an interface whose determined bits are related to collective decision and the open bits related to individual decisions. The ability to separate collective and individual features when looking at how people deal with their spaces is more important than to identify their needs, as the purpose is not to solve a problem but to create means for users to solve their specific problems. So, instead of planning for the users or with the users, the non-plan strategy needs attention. In order to enable users autonomy and engagement in the constant production of their spaces the architect must create instruments, interfaces.

Sometimes these instruments for autonomy are already out there in the environment, and the last thing needed is a designed building or an urban planning. According to Arata Isozaki (2003), Price’s proposal for the CCA Competition for the Design of Cities in 1999, ‘A Lung for Midtown Manhattan’, was actually not a design proposal ‘but rather to let the site remain an open urban space—his own unique interpretation of ma.’ This designless proposal was recognised by judges Isozaki and Philip Johnson as the best one, though Johnson was not prepared to award him the first prize arguing that ‘if his proposal comes first, the competition will forfeit all social significance’ (Isozaki, 2003). What he meant by social significance is not quite certain, as Price’s proposal seems to be the best suited to social significance in long
term. However, the immediate social significance of the competition seems to be understood as having a product, regardless of its relevance or even of its real necessity. This was not the first time Price proposed not to build as a design proposal. An often quoted example of his attitude is his statement that ‘the architect/planner must exercise all his expertise, on being asked for artifactual conditioning, on the relevance of or necessity for doing anything at all. (The best technical advice may be that rather than build a house your client should leave his wife.)’ (Price, 1966).

While architects such as Johnson still try to keep control over design by means of predetermined styles and expected attitudes towards design, Price moved much further than this proposing a value-free architecture in which people should be able to add their value and create their own meaning. He was concerned with time and social relations and not with architectural products. He argued that ‘no one should be interested in the design of bridges—they should concern with how to get to the other side’ (Price, 2003). This attitude towards problematising relations rather than working or reworking obvious spatial solutions makes Price central to the discussion on cyberarchitecture. This distinction between Price and Johnson is similar to the distinction Henri Lefebvre (1991) makes between users and architects. Lefebvre (1991) adopts the term ‘lived space’ to distinguish between users’ and architects’ approach to space: for users space is always lived—relational, subjective and concrete—, while for professionals such as architects, urbanists and planners, space is a representation—conceived and abstract. Cyberarchitecture abandon the side of architects, abstract, predetermined and dominant spaces, and join the side of users, looking at the open features of spaces—relational, subjective and concrete.

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i For a comprehensive account of second order cybernetics see Glanville’s paper
“Second order cybernetics”.

ii http://www.gwu.edu/~asc/biographies/Maturana/EXEM/matvar.html

iii http://www.gwu.edu/~asc/biographies/Maturana/BMA/matcell.html

iv I have developed this argument further in my “Towards a virtual architecture: the
mobility of essences and the ‘open-in-hand’ in the production-consumption of
spaces”.

v Lygia Clark is internationally known for her interactive art. For an overview of her
work see Osthoff (1997).

vi See for example Françoise Choay, *The rule and the model*, where she gives an
account of Thomas More’s *Utopia* as a model and Leon Battista Alberti’s *Ten books
of architecture* as a rule. In both cases the method is abstract, coming from
intellectual rather than practical observations.

vii This National Design Competition happened in 2003, and the Brazilian architect
Renato César Ferreira de Souza and I were awarded the second prize. The juri’s
report indicated that most flexible features of our proposal were to be used by the
winners when implementing the design, but that our design was not fit to the first
prize as it was a sort of meta-design, too open to enable one to grasp how the Park
would look like after fully occupied.

viii http://www.arq.ufmg.br/mom

ix http://www.ocupar.org.br