Equipotential Space in Housing as a Strategy for Adaptability

José Luis Bezos Alonso
Escuela Técnica Superior de Arquitectura de Sevilla
Universidad de Sevilla
Sevilla, Spain
jbezos@us.es

ABSTRACT

Architecture must provide answers, in the domestic realm, to the constant and vertiginous change in contemporary society's needs and lifestyles. For this reason, we propose to examine the concept of 'adaptability' in housing based on the study of a series of projects in which we find a specific arrangement of rooms, which we call 'equipotential' or 'checkered' space. This configuration favors the generation of an open logic of relations between spaces, and acts as a mechanism that prepares the house for adaptability, allowing us to conceive it as an open, elective, dynamic and combinatory playing field.

Architects Tatjana Schneider and Jeremy Till, authors of Flexible Housing, *talk about the confusion that tends to exist between the concepts of 'adaptability' and 'flexibility', and resort to the definition that Steven Groák proposes for both terms to differentiate them. According to it,* adaptability would have to do with the capability to accommodate different social uses throughout time; flexibility, on its part, would be related to the potential to admit different physical arrangements (Schneider & Till, 2007). We could therefore deduce that the second of these terms, flexibility, would refer to a condition related to what's built, to materials, while the first one, adaptability, would point out to the characteristics of space itself, understood as space-support with its capacity of accommodate different uses and to 'arrange itself' in the face of new needs and changes that may require it.

Schneider and Till also indicate another one of the possible categorizations around the strategies that induce an open logic of spaces and which they explain based on the concepts of 'base structure' and 'polyvalent organization':

> *"One can identify two, apparently contradictory, approaches to providing this open future: the idea of base structures and the idea of a polyvalent organization. In the first, faced with the volatility and diversity of potential occupancy, the reaction is to provide a frame and within it empty generic space that can be infilled and adapted over time (...) The second approach to providing for the uncertainty of demographic change acts in apparent opposition to the first. Rather than the provision of open space, it starts with a cellular structure. Flexibility over time is provided in two ways. First, the rooms are indeterminate in their function. Secondly, the divisions are laid out and structured so as to allow them to be connected together in a variety of configurations." (2007, pp. 39–40)*

Focusing on housing and starting from this second approach of open condition that speaks about 'polyvalent organization', we can find, since the second half of last century, projects that incorporate ways of distributing their spaces through a configuration that we call 'checkered'. This configuration is also related to the concept we're proposing of 'equipotential space': the arrangement of the house as a field of possible relations that does not favor any specific direction nor establishes hierarchies in the distribution and use, originating an habitable space that is isotropic and has the same potential in all its directions. This supposes the conception of domestic space as an open board that allows a combination of relations that promotes its evolution and its polyvalent condition. From the following examples we can extract lessons to generate tools for the configuration of spaces that may promote adaptability in the spaces of the house.

ROOMS AND THE CHECKERED SPACE

The use in architecture of the English term 'room' may lead, for instance, to the deep spatial concept that Louis Kahn constructed around it and, more specifically, to his sense of the arranging of spaces as a set of basic living cells or a system of room-spaces. This term implies, as Antonio Juárez

proposes in *El universo imaginario de Louis I. Kahn*, a broad and complex concept that transcends the mere compartmentalization, the functional or the structure:

> "The concept of 'room' for Kahn is a wholly spatial notion. When speaking about 'room', Kahn refers to a way of understanding space and generating architecture beyond the meaning of 'bedroom', 'chamber' or any other translation of the term (...) it is to be noted now that when Kahn speaks to us about the notion of room as the origin of architecture, of the project, as 'a society of rooms', he is very close to the project for the Adler House. These 'chambers', these autonomous spaces clearly defined by their structure, whose gathering together constitutes the project, will become Kahn's definition of 'room'." (2006, p. 115)

Each room is considered by Kahn as an individual part, as a basic cell for living, so that a home could be composed of a grouping of these rooms, which – identical in size and shape – compose an open checkerboard of relations which are the ones that actually define the living space. As examples, the projects for the Fleisher House (Figure 1) or the Adler House, in whose floorplans we may see that it isn't the specific uses assigned to the rooms in relation to the hierarchies or various sizes what commands the possibilities of relations, growth or use, but to the contrary, the arrangement of rooms similar in size and ambiguous in their uses.

In the Fleisher House, the arrangement of rooms lays at the foundation of a 4 x 4 matrix that is modified locally with some variation. Each one of these rooms is considered as an individual element of the house, a piece within

a 'checkerboard' that composes the floorplan of the house. In fact, in the floorplan and the model's own rendering, the perimetral chambers are set in a way that they stay close with the others but separated tectonically.

It is basically Kahn's reflections on the Palladian floorplan – due to his correspondence with Colin Rowe in 1955 – what influences the proposal and generation of the house as an arrangement of independent parts (rooms) that, nevertheless, integrate an ensemble:

> "Colin Rowe submits to him along with his letter a drawing of a floorplan by Palladio and a geometric analysis of the same, which he believes may be of interest to Kahn. His comments on the analysis of Palladio's floorplan are highly expressive of what Rowe understood for composition: the tethered structure of the parts. The ensemble stands united in its whole, but each element can be extracted from it one by one, without the group ceasing to be seen at any given moment as a complete organism (...) The game or discussion about forms, in which Rowe centered his interest on the floorplan, seems to be related to a notion of transparency. His comments on the Palladian floorplan are proof of what's been said. It is 'transparency and the diversity of formal readings' what fascinates him about it." (Juárez, 2006, p. 175)

Colin Rowe and Robert Slutzky develop in their article 'Transparency: Literal and Phenomenal' (1963) a concept of transparency that refers to an understanding that is linked to the phenomenological and not only to what is conventionally – or

from a simply tectonic perspective – understood as transparency. This 'transparency' has to do with this special synoptic and simultaneous spatial sense that we associate with these types of architectures that are arranged in 'checkerboard' patterns and that allow spatial possibilities that are broader and more open than what they initially seemed to contain.

So, in respect to the Palladian references (Figures 2 and 3), Kahn ends up orienting his reflections around the checkered arrangement and structure we're mentioning:

> "I have discovered something that perhaps anybody else could have found: that a system of portals is a system of room-spaces. A room-space is a space defined by the way in which it is made (...) An area conformed by 16 x 6 spans (...) Is composed actually by 16 x 16 rooms (...) For me this is a good discovery (...) The Palladian floorplan has this quality (...) Someone asked me how can the notion of space-rooms be developed within the complex problems of a house. And I point out to the De Vore house, which is strictly Palladian in spirit, highly ordered for the needs of a contemporary space." (as cited in Juárez, 2006, p. 176)

In the arrangement of floorplans like the Fleisher, Adler o De Vore houses there exists, in this way, the intentioned assumption of a matrix or checkered shaped space structure that constitutes the room system, of room-spaces that transform the house into a device open to habitation and which enables a complex range of relations.

Only one year earlier (1958) than Kahn's proposal is Aldo van Eyck's

Four Tower House (Figure 4), which presents a structuring similar to the Fleisher House. While in the latter the spaces are supported and generated from within four points that anchor their arrangement and constitute the start of the landing and the central elevation, in van Eyck's Four Tower House, the four supporting points from which the house space is created are originated by the skylights above.

An image of an interior perspective for a preliminary study shows us a sensibility oriented towards concatenation – through the transparency of the walls and their sequence – of the different compartmented spaces in the floorplan, opening ultimately to the exterior garden. The arrangement of the house plan starts from a rather rigid formalization of a four-part matrix (subdivided in turn) that is drawn together in another central grid of 3 x 3 openings.

The peculiarity of this four-part compartmented structure, and which gives the house its name, is conditioned by the number of family members. The intention of this subdivision is to allow the reversible functioning scheme of the house, so that these four rooms can be accessed both from a common central space as from the exterior independently and directly to each one of the four units "so each can come and go freely" as van Eyck specifies (as cited in Ligtelijn, 1999, p. 111). This intention of reversibility that the house poses is located, then, at the basis of its open formulation and acts as the main premise for the generation of the spaces.

The result of this structuring is the creation of a space that has, on the one hand, the unity and vastness of a more public space and that, on the other hand, allows a nuanced subdivision of spaces

that provides some intimacy if desired. The plan of the central nucleus clearly features this character, showing how it works with the coherence of a single and continuous space from a visual perception, but with the possibility – through a series of veils and translucid separations – of carrying out different activities in each one of the nine cells in the 3 x 3 matrix of openings that compose it.

It is, then, a space that seeks to enable a combinatorial, simultaneous and transparent living space. The inclusion of the exterior in the interior (and vice versa), is also intentioned and manages to charge the space of the house with relations and urban character that balance the intimate and the public.

A scheme similar to the Four Tower house is developed six years later by Marco Zanuso for his Vacation House in Archazena (Figure 5). In this case, the protagonism of the central space resides in a semi-covered courtyard that becomes the space that connects and over which the corner parts and the perimetral spaces are articulated. The floorplan is arranged with the sobriety of a matrix of three by three spatial areas, the chambers being configured with similar dimensions and allowing a multifunctional use.

Unlike the van Eyck house (which visually seeks the exterior space), Zanuso's house closes in around the interior courtyard. But, as in the House of the Four Towers, this central space is proposed with the aim of allowing multiple connections with the more private and opaque rooms in the corners. To emphasize this possibility of relation, instead of doors, it's the corners of these rooms themselves that open up towards the central space. The space of the

house is transformed, in this manner, into a board of possible relations that are presented open to a usage that may combine privacy and common space.

Already in 1982, the Wohnhaus project (Figure 6) by architect Anton Schweighofer also proposes a similar checkered scheme composed by four identical rooms located at the corners of the floorplan's rectangular space. These rooms have more than one point of access and relation, enabling diverse combinations of connections between them and the central space. The analogous size and the equipotential condition of the different rooms, along with the undetermined nature of its functionality, seek the adaptability of the spaces to the different ways of family cohabitation, or even of partition or rental, on the part of the house.

We also find similar examples around the beginning of the nineties. It's then when Yves Lion poses his proposal for Maison Phénix. The model is framed within a series of initiatives and investigations by 36 teams of architects (36 modèles pour une maison) around the regeneration of the pavilion home (traditional low cost industrialized single-family housing prototype) in France. Lion also reflects, when proposing the scheme of the house, on the versatility and the degree of reversibility of the domestic space by proposing a matrix or checkered pattern that parametrizes the area of the house (Figure 7) based on – also in this case – the cornered position of four anchored spaces. In the middle lays a central space that, by the potential subdivision into nine modules, can adopt different configurations according to the needs of the user.

EQUIPOTENTIAL SPACE: COMBINATORY HOUSE

The checkered arrangement of rooms in the domestic space that we find in these proposals dating from the late fifties is revealed in the contemporaneity as the foundation of an effective and necessary mechanism, since it allows the habitable space to adapt to the different requirements of the new forms of living and cohabiting, enabling at the same time the combination and reversibility in the relation between the rooms of the house.

The 'Liquid life' that Zygmunt Bauman (2006) talks about, and that today also takes on the domestic realm, has affinities with the ways in which cities and public spaces are lived. Somehow, the speed of the changes and the need to conceive the urban space as an isotropic and homogeneous stage (that allows its 'arrangement' to enable any personal, but also collective expression) is transferred to the home, transformed now into an elective, dynamic and combinatory playing field.

This sense of transparency, the isotropy and the homogenization related to the spaces in the city, is particularly well expressed by the concept for a city that Toyo Ito (2000) draws in his article 'Architectural landscape of a city wrapped in transparent plastic film', first published in 1992. Behind the strangeness of the title, we find the intriguing analogy that Ito establishes between the presentation of consumer goods in the shelves of stores and the landscape of the contemporary city:

> *"The shelves are packed with all kinds of articles necessary for everyday life, without any apparent difference in category between them (...) perishable goods are wrapped in transparent plastic film and due to this they are homogenized and relativized (...) The transparent film had the original purpose of preserving the freshness, but now it plays a much more important role, establishing a homogeneity that guarantees equality in the selection process (...) No matter how much all architectural works insist in their originality, when they are located within this city they start to resemble food wrapped in that transparent film that we see in convenience store displays. Or stated the other way around, all personal and phenomenological expressions are given the possibility for their realization by being wrapped in the said film. Without it, transparency and homogeneity could not be preserved in this city." (2000, pp. 118–119)*

The importance of this analogy in relation to the city points at the understanding that every architectural work located in it ends up becoming a part that is equated with the rest. It's about a necessary homogenization that enables contemporary life. The vision that Ito proposes of this uniform city dissolves the objects based on their equation, their contiguity, and allows them – precisely for this reason – to harbor any personal, quotidian, or phenomenological expression. This conception describes the 'isotropic' condition of contemporary cities. The city is, thus, seen as a grill, a rack with homogeneous and interchangeable items. This transparency implicit in Ito's vision is, besides, a phenomenological condition that speaks about a city that is vertiginous and fleeting, timeless. A city arranged as a playing field, an equipotential checkerboard of interchangeable and lasting pieces and phenomena.

But we can also find in some contemporary proposals a transposition to the house of this 'phenomenological equating' concept that Ito describes. It is presented based on the generation and organization of living spaces from an equipotential plane as device that allows to establish an organizing logic for the relations within the home with an open sense and with possibilities for evolution. It is what happens in proposals like the House in China (2003) by Ryue Nishizawa (Figure 8). The house is organized based on a relentless grid[1]. The project is explained and develops from a diagram (Figure 9) that, in a very basic way represents, as if it were a mineral sample box, the different activities and furnishings associated with each one of this grid-spaces[2].

Far from generating anodyne spaces, this way of proceeding derives into a possibility of connection of spaces that is rich and full of combinations. The space always ends up giving something more than what the floorplan allows to see, inviting the user to define and organize his 'lived' house. The spaces develop a program based on an equality of conditions in all directions, allowing to accommodate this condition of gameboard that has to be 'assembled' and sensed by those inhabiting it, to reveal its spatial relations and the possibilities it allows. It must be the inhabitant the one who must find a way of living and organizing the house, of taking over the spaces, of prioritizing the connections that are relevant for him in the course of his everyday activities. The importance of volume and form of the house disappears, in favor of a containing grid that poses the relations between spaces based on the activities, their furnishings and associated objects, in a playful manner and open to possibilities.

Ryue Nizishawa uses this same approach to space in a work built around the same time, the Funabashi Apartments (Figure 10), in which spaces are arranged in a grid pattern and connected on many of its sides, so that the position of the dweller in the house also becomes something relative, which impelled that the way of establishing and living the connections should be something derived from inhabiting it, and not pre-fixed.

The space is thus transformed into the potentiality of a phenomenology, in something that must be 'charged' with everyday content, of experiences, and is assimilated into the concept of space that Manuel Delgado attributes to George Simmel:

> *"Space, which already in Simmel is a form without effect, something that must be filled or be moved by applying sociological or psychological energies. This same idea in Simmel of space as a potentiality, as virtuality available for anything and which exists only when this anything occurs." (1999, p. 121)*

Like those items covered by foil in a shelf that Toyo Ito mentions, or like the minerals exhibited in their squared box, living in each one of these spaces seems endowed with the same qualitative importance, all have their own 'equality' in the process of inhabiting guaranteed. The hierarchies that may originate a structuring of the house disappear diluted by this ambiguity that allows to weave the spaces of the house from within any relation and connection. There are no common spaces from which to access the private ones in the conventional sense of family space. In fact, the inverse functioning is perfectly possible.

Prefiguring this contemporary behavior of the house, Toyo Ito argues the following:

> *"One could say that the scheme for a house in which every bedroom is placed in direct contact with society and where the living and dining room would lay in the background as arbitrary spaces, would be much closer to real life. So, the centripetal character of the house is lost and at the same time the cosmology of the house is decomposed. And the house has no other choice but to transform into a plain and homogeneous space." (2000, p. 121)*

The proposal for SANAA exemplifies, in an essential way, the will to organize the space from an equipotential perspective. This is the mechanism that will allow to organize the relations within the house in a free way and with the possibility of evolving and becoming adaptable.

All these examples have in common this resolute matrix or checkered structuring and compartmentation of space, which, far from being a rigid configuration, acts by arranging the space as an open gameboard that will allow the development of an open logic of relations. From the proposals by Kahn, van Eyck or Zanuso (structured in matrix) to those by SANAA (where the open and combinatory conception of all the relations and paths within the house are taken to the limit) the space is presented full of possible connections, as a 'society of rooms': in a certain way independent, but operating as a whole capable of charging according to the different combinations from a phenomenology originated by everyday living.

We can extract from these examples the notion that adaptability in the

domestic realm has to do with the potentiality and, more precisely, with the equipotentiality of space. The configuration of the house is thought more as a field of choices rather than an imposition of a hierarchical design. The possibility of a new combinatory in the ways of inhabiting the house and of recording its circulations is valued above the univocal design. In the end, the house is conceived 'arranged' rather than 'composed'. This seems to be a necessary strategy in contemporary society. The continuous – and ever more vertiginous – changes in our ways of living and our culture implies domestic spaces that are increasingly affected by uncertainty and by the futility of establishing predictions, and in which it is impossible to foresee the match between the space 'projected' and the one 'lived' from a simple implementation of a program or from the gestures learned from the form. In this situation, strategies or devices that we may synthesize based on these projects and the potentiality that we find in the design of their floorplans may help us in the design of houses, arranging the medium capable of dealing with uncertainty. As architect John Habraken used to say: "When considering housing of the future, we should not try to forecast what will happen, but try to make provision for what cannot be foreseen" (1972, p. 42). ▥

<u>NOTES</u>

(1) We also find this strategy present in the equipotential and matrix arrangement of some of SANAA's public buildings and facilities. Such is the case with the project for the Glass Pavilion at the Toledo Art Museum (2001, Ohio, USA), in the proposal for the New Mercedes Benz Museum (2002, Stuttgart, Germany) or in the Theatre and Cultural Centre in Almere (1998, the Netherlands), in which, besides, the grid, based on the plan, is formulated from progressive variations of the matrix pattern.

(2) It is also possible to find precedents of this type of arrangement in projects that are originated from the setting up of prefabricated technological systems that can be regulated and manipulated by the dweller, like Richard Horden's Yatch House in New Forest (1992, Hampshire, UK). In this case, the project was shaped by a light aluminum and steel structure 2.5 m high over a concrete base forming a perfect cubic 5 x 5 cell matrix with 3.7 m spans. The different modules of roof and walls could be moved and redistributed changing the space configuration in response to the needs of the user. The images of the interior space show great affinity with the ones in the proposal for Nishizawa's House in China, seeking a concatenated transparency of the spaces that seeks to constantly dissolve the difference between an interior and exterior space. The disposition of the project offers, besides, the possibility of growth and extension following the cubic grid's own coherence and hybrid and with different functions – not only those pertaining to the house – uses of the spaces, giving rise to numerous versions and variations over time.

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