Spaces of Mutable Shape and the Human Ability to Adapt

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Abstract. Life in our present world demands of man an increasing degree of mobility, and increasing flexibility from his environment. Users and recipients demand more and more from architects. Architecture should be a reflection of specific individual characteristics of its user. Introducing dynamic aspects to architecture is rooted in history. It always had its causes, since architecture functions as a mirror of social phenomena. Man's social and environmental evolution maintained equilibrium. However, the application of mechanisms for mobile facades, or mutable shapes in general, exposes the individual to even more dynamic conditions in his or her immediate spatial surroundings. This prompts us to consider human's actual adaptive capabilities, so as to maintain optimal conditions for live in such a dynamic environment. By introducing artificial control over the intensity of changes in the space surrounding us, do we risk disturbing the evolutional equilibrium of the individuals living in that space?

Keywords: architecture of mutable shape, dynamic, perception, identification with the user, modern mechanical systems, mobility of form.

1 Introduction

It is not obvious whether the human need for change is a need inherent in every individual or results from the necessity to adapt to a changing environment. Giving spaces and surroundings the ability to change their shape or location could conceivably unbalance their reception and make their intended use difficult. At the same time, previous research shows that permanent stimulation of our senses can improve the quality of our lives by creating highly luxurious conditions. Architecture by itself can, through mutability of shape and space, respond to the questions and anticipate the needs of its recipient.

"Not only is man part of a considerably more mobile world than the rest of nature, but he also treats the basic idea of mobility in a completely different way. For man, the norm is living in changing conditions – changing of lifestyle." [1, own translation]

"Representatives of the technology cult overestimate the role of changes caused by technology, while being convinced that man is fully able to accept [those changes]. (...) Therefore, the adequate thing is a quest for compromise between that which is constant and that which is changeable, which [the quest] would consider the evolution of external conditions as well as man's mental preferences." [2, own translation]

The subject of mobile architecture is at present widely considered. Currently existing objects of mutable geometry delight and interest the observer. Architects aim for more and more daring applications of mobile architecture, but is man able to fully adapt to such unstable conditions? Do the signs and symbols present in architecture give testimony to man's continued need to experience change? By examining the problem of mutable space in confrontation with man's nature and predispositions, through his way of comprehending the world we can try to find a recipe for consciously forming that space without harm to his psyche.

2 Factors Inhibiting Adaptation

2.1 Change and Tradition

"Humanity eventually became a recipient of information – after having been only a carrier of immutable and genetically determined information. This in turn prompted for an ongoing update of the coding system, which should constantly be present in the mind of the sender (…)" [3, own translation]. The nomadic lifestyle constantly reasserted the human ability to adapt, demanding of man full flexibility and the skill to adapt while maintaining cultural identity, with constancy and immutability being the leading principles in building culture (cf. [4]). Tradition and history are without doubt the roots of our social existence: "The pre-industrial eras, beginning from the middle ages up to the emerging of primal forms of capitalism, were ages that contributed to the association of constancy with history – the identification of that which is unchangeable with that which is valuable, important and binding."[2, own translation]
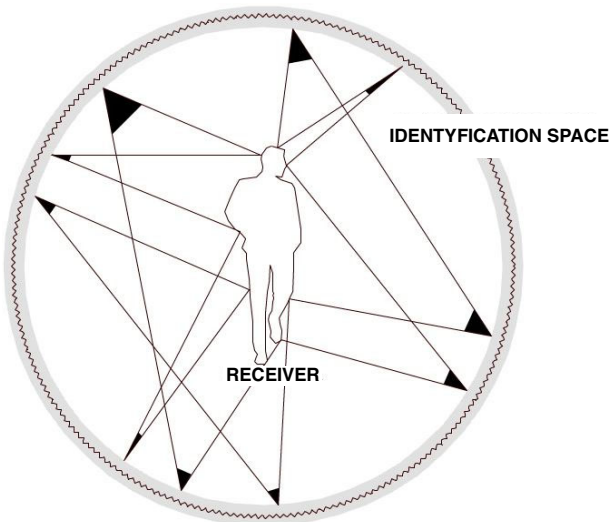

Fig. 1. Obszar przestrzeni identyfikowanej

2.2 The Mind's Limit to Absorb

Every individual has adaptive capacities unique to him or her. How can we find a balance and formula for creating mutable spaces, suitable for each and every recipient? Though the use of systems controlled by parameters derived from a given person it should be possible to create an interior that this person can identify with. The individual and the space surrounding them could then become an entirely compact 'unit'. The user could then perform a larger number of activities in the same amount of time; the flow of information would increase. Automation of performed actions, application of rules between changes – the mutable space would be an additional tool, facilitating life and work (cf. [5]).

2.3 Spatial Memory and Feeling of Security

One particularly important factor for promoting a feeling of security is the possibility of the recipient to identify with the place. It manifests itself when seeing and experiencing familiar scenes, sounds or smells. Familiar places allow the individual to prepare for a number of situations and events while affording the possibility to assess possible threats. Therefore, mutability of spaces should have clear and visible limits, so as to allow for conscious use without inducing an experience of chaos and instability.

On an urban scale, a system of multiple object being subject to a change of their geometry can create new spaces, new systems of communication. Such transformations should be finite in number, so that the basic layout of objects and functions within the city always remains recognizable.

A space with the ability to undergo a large number of mutations would be best suited as a place used repeatedly by the same persons. Every transformation would eventually become know and predictable.

Change of the surrounding shape stimulates and sharpens the senses, and prohibits the task of going from place A to place B from becoming a routine. Such a mutable place would be a place of ongoing activity, increasing the efficiency of e.g. workers or consumers (cf. [6]).

3 Motivations for Adaptation to Mutable Shapes

A space of mutable shape can influence the human being in different ways. Depending on its radius of influence it operates on a different scale of detail that man is able to recognize and process.

3.1 Private Space – Small Scale

The degree of mutability of a space is constrained by its size. In the scale of the closest surroundings a multitude of arbitrarily complex constructs can be realized, while the size of the objects being geometrically mutated can concievably be very small.

Possibly mutable properties include the position, shape, transparency, function or size. Mutation can be controlled either automatically, e.g. by interpreting the movements or biochemical state of the recipient, or conciously through explicit actions of the recipient. Such systems are currently applied in places where space is limited but suitability for a wide range of activities is required. A small apartment can, by use of sliding and telescopic elements, be transformed to perform many functions, e.g. bedroom, living room, kitchen or bathroom. While this is an excellent example of a flexible space, it mainly is a result of necessity and limitation of available space, and not so much of inherent human need. This prompts us to consider present experiences and extend the area of application of such solutions (cf. [7]).

3.2   Public Space – Large Scale

On an urban scale, on the other hand, mutability must operate on larger shapes, in order for the idea of the change to become visible. By applying objects of mutable geometry, it is possible to communicate with the recipient and thereby facilitate their conscious use of the urban space. Such communication must necessarily be capable of addressing a larger group of people, and constitutes an intrusion into both public and semi-private space. An aggregation of objects with similar capabilities for change can constitute a mutable, flexible space, assisting the recognition of the changing function of this part of the city. Today's streets are increasingly more closed, narrow spaces, maximizing the built-up area and overwhelming their inhabitants. By introducing buildings of mutable geometry, we can allow the passer-by to be drawn into the function of the building, or alternatively, to open the function up to him (cf. [8]). The form of the objects can serve the role of a road sign to relevant places and facilitate the use of the city space (cf. [9]).

The presented examples (Fig. 2-9) are a schematic representation based solely on horizontal and vertical transformations of the basic form of a cube. They illustrate the comprehensibility of different layouts and the multivariant characteristics of a single space.
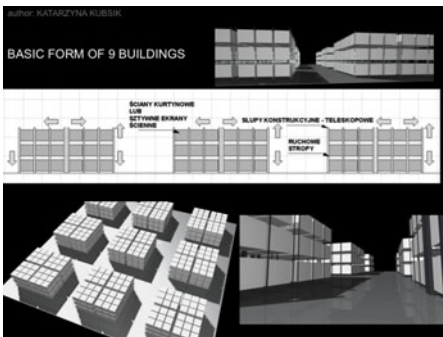

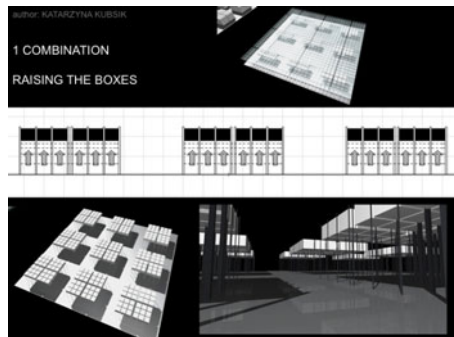**Fig. 2.** Basic form in the case of 9 objects of mutable gemoetry and similar capabilities
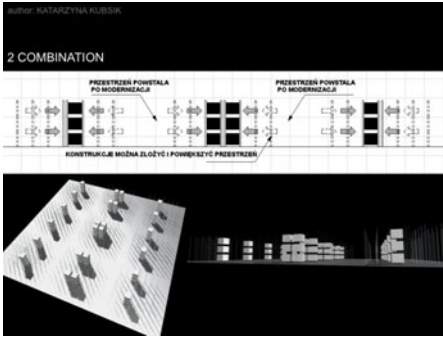

Fig. 3. Free ground floor

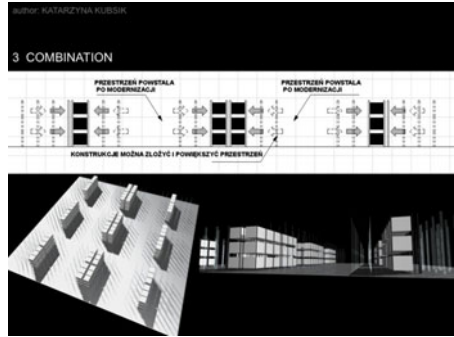**Fig. 4.** Maximization of open space

Fig. 5. Creating new paths

The objects forming the rows can create a tunnel, drawing in the users and accelerating their movement to the destination at the end of the tunnel. By minimizing the built-up area, on the other hand, the objects can create a free space e.g. for exhibition purposes. The environment is able to serve and communicate with its users, without any effort on their part to search for information. In an era where time is an increasingly scarce resource, such solutions can be a salvation (cf. [10]).
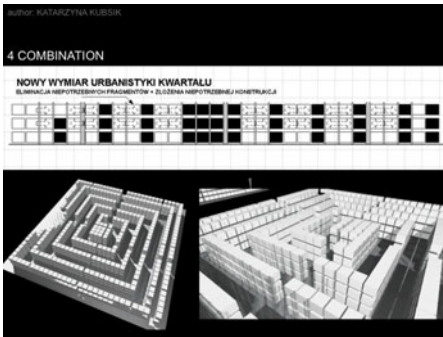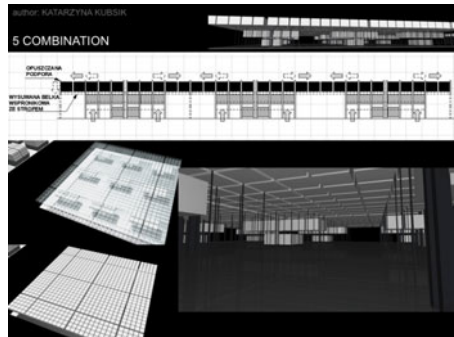

Fig. 6. Casual space
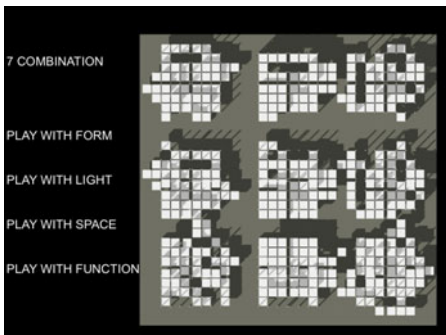

Fig. 7. One roof - asylum

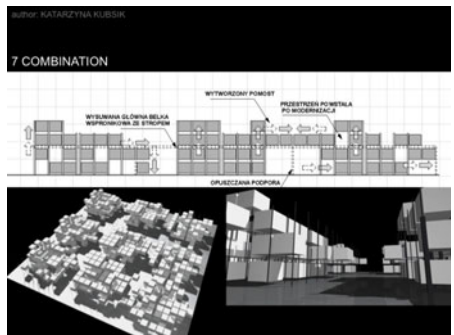**Fig. 8.** Creating individual spaces – ground plan

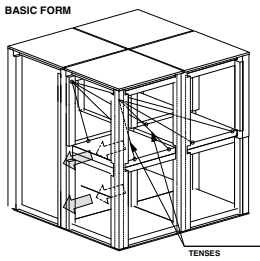**Fig. 9.** Creating individual spaces

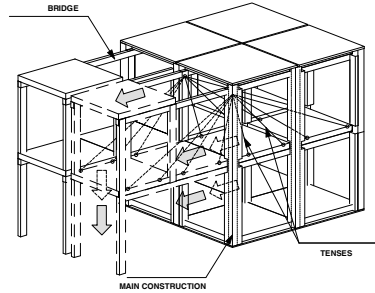**Fig. 10.** Detailed solution – basic form   **Fig. 11.** Detailed solution - transformation

Objects of mutable geometry can respond to atmospheric conditions as well and perform transformations protecting the users, with multiple objects forming e.g. a temporary roof or wall.

4 Summary and Discussion

Analysis of the arguments advocating mutability of space as well as those opposing it prompts us to be mindful of the emerging problem that is conscious manipulation of man's private space. Subjecting the recipient to artificially modified shapes and rules can disturb their autonomy and independence. However, preceded by proper analysis of the effects, it can offer a significantly higher standard of perceived reality.

Dynamism in architecture is a response to man's changing needs, who – owing to his adaptive capabilities – is in constant movement and ceaselessly searches for new elements accompanying him in life. The possibility of change encourages him to search for new solutions capable of improving quality of live. These need not be perfect from the start, as the conditions that initiate progress themselfes tend to be inharmonic and full of contradictions. However, even these first solutions bring man a step closer to finding a surrounding perfectly suited for him.

Fig. 12. "Camera Lens" Window at Institut du Monde Arabe, Paris

Analysis of human sociology and psychology allows us to confront ongoing civilizational changes with new requirements imposed on architecture. Application of mutable shapes can be a salvation or hurt man in his evolution. Therefore, it is imperative to constantly monitor the reactions to innovative procedures of intrusion into the recipients space. The conscious influence of spatial form and architectural procedures on the recipient touches the significant problem of morality in manipulating the user.

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