

Urban planning

PATTERN METHOD IN URBAN STUDIES AND PRACTICES

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Abstract

Introduction: The paper addresses an issue of describing templating in the urban environment. It also declares an approach to studying and designing urban space using patterns — spatial prototypes of the area. **The purpose of the study** is to provide insight into the pattern method applied in urban studies and practices. **Methods:** Using the theory of C. Alexander, the authors model the concept of pattern in urban planning, describe the process of urban environment development based on spatial “templates” of its formation. **Results:** City development is based on localization of design models for area planning or natural landscape-shaping mechanisms. Such design models and natural mechanisms are called patterns. Patterns are imprinted in the city fabric as locally coherent urban-planning formations — elementary urban units. Properties of patterns (integrity, limitation and repeatability) are listed. Principles of their use in studying urban-planning structures, preserving the genetic code of local areas, and modeling new spatial forms using urban-planning strategies and regulations are described.

Keywords

Pattern, urban morphology, integrity, development, landscape.

Introduction

The information paradigm of the late 20th – early 21st centuries required the use of automation and optimization tools in urban planning. Such tools allowed operating with big data and simplifying resource-intensive procedures in studies and design.

In the 20th century, urban design was mainly based on manual control. In fact, the pre-computer technology of urban-planning documentation development contributed to that. Automated design systems (and later — geo-information systems) placed stringent requirements for data structuring, classification of basic design processes and urban environments.

At the time, in world science, theories pointing at repetition, copying of real (physical) objects and processes appeared. A theory of patterns (where patterns are actually sustainable models of individual or group behavior), which first emerged in social psychology and biology, became one of those. In the course of IT development, programmers started to use the “pattern” term to designate design patterns (Leitner, 2015b).

In 1977, British architect Christopher Alexander in the book “A pattern language: towns, buildings, construction” (Alexander et al., 1977) identified more than 250 typical situations in urban design space planning, characterized

by stereotypical problems and solutions — from park benches to a “community of 7000”. Alexander called such situations “patterns”. He also described their features and ways of resolution. His idea was rather pragmatic: typification and generalization of common phenomena allow saving the means to resolve them, using ready-made developments instead of searching for new solutions.

In the Russian urbanology, the phenomenon of patterns was noted by M. V. Shubenkov and N. N. Shamarov (2008). They referred to those as “domain models” — prototypes of planning and development, spatial “templates”. However, as early as in 1975, A.G. Rappaport examined in detail the phenomenon of prototypes in engineering. His research relates to criticism of the prototype approach and its replacement with the “design methodology” as a new (at the time) approach to solving design problems. The pattern method we declare remains relevant for two reasons. First, despite the fact that designing with prototypes was criticized more than 50 years ago, this approach has not been overcome yet and remains a stable form of professional activity. Even in the concept of C. Alexander, declaring the need for a “completely new design organization, which is not based on samples or prototypes,” according to A.G. Rappaport, “traditional patterns of the “form” (elements of

particular prototypes) play a significant constructive role" (Rappaport, 1975). Second, although the pattern method exploits prototypes as spatial-historical phenomena, it is not limited to their reproduction, using them mainly as an analytical tool, which will be discussed later.

The principle of "patterns" can be applied to the classification of urban environments. It is noted that the formation of urban space occurs in "portions", or plots, and each of those develops according to a stereotypical "template" — pattern.

These patterns appear as spatial-historical precedents (phenomena of urban development), being caused by social and economic, technological and other factors. Each new major phenomenon in culture gives rise to a new stereotypical method of spatial organization (Bystrova, 2011). Urban-planning evolution is, in fact, evolution of stereotypical methods of spatial organization, replacing each other.

Patterns that are stable over time become some sort of spatial archetypes. Individual housing is one of the most vivid examples of an evolving pattern preserving its archetypal nature.

Patterns represent concepts of area development or natural mechanisms of spatial growth. Each such mechanism is reflected in the urban space more than once, becoming a stereotypical pattern.

Moreover, perception of the urban environment establishes the "stereotypical" nature of the spatial structure (Filanova, Nikonov, 2016) and it is sensitive to violations of the integrity and deformation of the original patterns (with the phenomenon of infill construction being one of the most typical cases of such deformations).

Thus, the pattern structure of space is an objective phenomenon, based on which we can formulate research and design principles of area planning.

These observations lead us to the following **hypothesis**. Optimization of urban planning is possible due to: 1) identifying spatial and planning stereotypes (patterns) at the stage of city research; 2) managing development of such stereotypical units; 3) creating new patterns. These three operations can be combined into the pattern method.

Thus, the subject of the study is essence of pattern method application in urban studies and design.

The purposes of the study are as follows:

- 1) to describe the concept of pattern, its essence and properties.
- 2) to describe pattern method application in classification of city's spatial environments;
- 3) to suggest using the pattern method in strategies of local areas' spatial development;
- 4) to specify the basis for designing new patterns.

Methods

In the present paper, methods of theoretical modeling and concept definition are used.

Results and discussion

Essence of the pattern phenomenon and its properties

According to the results of author's studies of the Novosibirsk spatial structure (Gashenko, 2016), the urban fabric is based on patterns — spatial templates of buildings or landscapes. Pattern is a spatial and historical stereotype reflected in the urban structure in the form of an incarnation series (imprints) — locally coherent urban-planning formations or urban units (Figure 1). Each pattern has its own typical idea, concept, or natural mechanism of spatial formation, which translates into the corresponding urban units. It manifests itself in numerous characteristics: functional, architectural and planning, stylistic (environmental), and semantic.

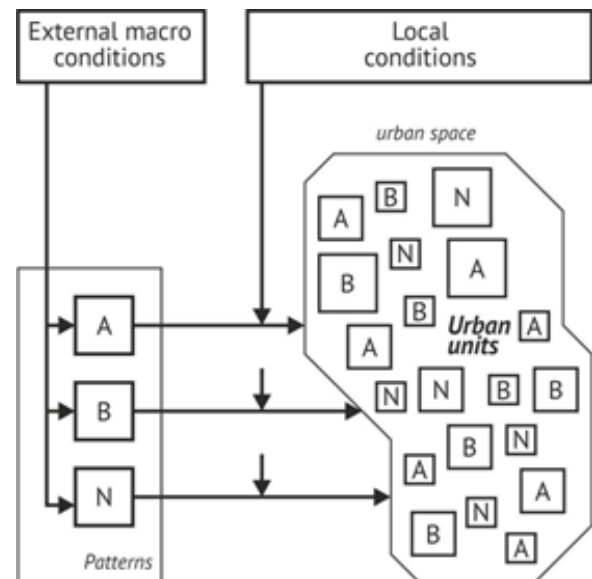


Figure 1. Pattern structure of space.

A city block serves as a pattern example. It is the most prevalent and at the same time the most multivariate spatial and planning stereotype. There are numerous variants of city blocks, but they all have a single basic planning scheme. In the city block pattern, planning characteristics of the space mainly manifest themselves, and functional, architectural, as well as figurative and semantic characteristics may differ significantly in different manifestations. As for the micro-district pattern, all its characteristics are more pronounced, but in terms of planning it also has many different interpretations. Public and mixed housing areas almost entirely depend on the function and semantics given a wide variety of planning forms.

This suggests that the urban morphology is not reduced to mere development morphotypes, but rather described by a set of the listed characteristics with different ratios of their manifestation. We can distinguish architectural, stylistic, social, semantic and functional features of the environment morphological integrity.

Each pattern is a phenomenon of urban evolution with unique features and parameters. Their study is important in terms of inheritance of urban morphology samples and its translation into urban planning documents. Preservation of environmental samples through spatial



Figure 2. Guangzhou districts.

prototypes (patterns) allows reproducing the “genetic code” of an area.

Patterns also have several a priori properties that define their essence.

Integrity of anthropogenic patterns is predetermined by the project-based method of their formation. Every idea strives for integrity and completeness. It is natural for a designer to make a completed work within the originally specified boundaries. The urban environment based on this principle represents a patchwork of scattered fragments, mechanically stitched along the lines of the street-and-road network. Therefore, linking of conflicting,

locally coherent formations (elementary urban units) based on various patterns, and filling in the gaps of the urban fabric are carried out using non-standard, unique solutions. Integrity of natural patterns (landscapes) is predetermined genetically, but here we can also observe cases of spatial deformations.

Integrity is related to another pattern property — **limitation**, i.e. territorial certainty. Patterns are localized within rigid boundaries as separate integral “portions”, forming the mosaic of the urban fabric. In their pure form, patterns manifest, for example, in the formation of micro-district structures disregarding the urban context. Direct



Figure 3. Repetition of residential groups in the Snegiri micro-district in Novosibirsk.



Figure 4. Identification of hypothetical locally coherent urban-planning formations created by the corresponding patterns, and their limitations.

application of such spatial patterns is a phenomenon of the modernist culture. This can be observed in works of students, when a complete but self-contained formation is implemented within the specified boundaries. Obtrusiveness of primitive patterns characterizes the modern development in Chinese residential areas (Figure 2). Thus, adaptation of patterns to an uneven urban structure without integrity loss can be considered the art of urban planning.

Repeatability is the main pattern property distinguishing the pattern from individual and unique design solutions. It is the whole point of its template and prototype structure. However, repeatability is conditional, and the degree of conditionality depends on the physical size of the urban-planning structure set by the pattern. On the one hand, replication of ribbon residential development groups in micro-districts is almost identical in all pattern properties. On the other hand, templating of urban areas is very weak despite the fact that in modernist Soviet cities it was a standard. This can serve as an evidence of the uneven and multi-layered urban structure. In fact, difficulties of studying the phenomenon under consideration are associated with that.

Pattern identification and studies

As it was mentioned, patterns are reflected (displayed, imprinted) in the form of a series of incarnations — locally coherent urban-planning formations. A method to analyze and describe such local units is proposed, where the identification stage is based on the pattern theory and involves the following.

At the *identification stage*, a fragment of the urban space is associated with the locally coherent urban-planning formation, where the pattern (or patterns), that formed it, is recognized in the environment area (Figure 4).

For these purposes, a historical and genetic analysis is performed, revealing the spatial and temporal dynamics of the evolution in the given area (Kubetskaya, Kudryavtseva,

2017). The analysis allows identifying "epoch footprints" and restoring the original picture of the urban environment development. This is especially important in case of multiple layers of different patterns (development or landscape templates). At this stage, all possible sources are used that indicate the element character of the urban space: data of cartographic databases, materials on urban toponymy, historical descriptions (essays, articles on regional studies, sources of oral history).

The search for morphology sources regarding the local area is necessary for reconstruction (regeneration) of its original integrity. Studies are conducted within the boundaries of the existing elements of the planning structure — micro-districts, city blocks and other elements fixed by red lines. Depending on the complexity of the urban-planning situation as well as spatial and temporal dynamics within the same element of the planning structure, up to several hypothetical locally coherent urban-planning formations, created by different patterns, can be identified¹. In such case, conditional boundaries of spatial environments become boundaries of urban units.

At this stage, the hierarchical structure of a locally coherent urban-planning formation can be revealed, where within the same unit (e.g. a micro-district), smaller units are identified, such as residential groups, school and kindergarten areas, as well as public hubs. Fractality of patterns and the urban environment formed on their basis is one of the interesting spatial phenomena. The hierarchy mentioned is used in urban studies in design concepts of the social infrastructure or in descriptions of cognitive levels of spatial environments as macro-, mezo- and micro-spaces (Krasheninnikov, 2015).

Management

To regulate development of an architectural and historical environment, it is advisable to use the pattern method, the essence of which is to apply spatial development strategies to areas formed by particular

¹ This is typical, for example, for central historical districts subject to multiple transformations of the spatial environment.

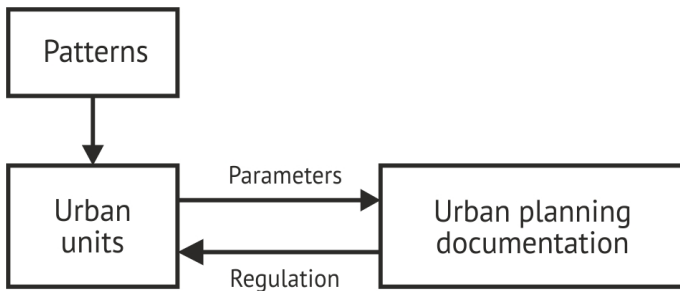


Figure 5. Mechanism of pattern reflection and translation of urban morphology.

patterns, leading to their transformation or preservation. In this case, those strategies serve as patterns — typical ways of solving the problem in accordance with the objective.

For instance, when dealing with almost dilapidated quarters of the 1940s–1950s, constructed near factories, it is possible to apply the following pattern strategies:

- a) redevelopment — development of built-up areas with demolition and new construction without morphotype preservation. A particular case of such redevelopment — development of an area with dilapidated or dangerous buildings — is established in the town-planning code in the form of a special law mechanism (Trutnev et al., 2006);
- b) modernization — evolutionary development of an area with nuanced changes in morphotype characteristics;
- c) contextual regeneration — comprehensive reconstruction of an area (Brownfield) with new construction according to a historical or similar morphotype.

In the second and third cases, we need to know peculiarities of the initial pattern, e.g. its architectural and urban-planning morphology, which will be reflected in further development of the area.

Strategies for spatial development of an area (at the stage of spatial planning) and urban-planning regulations (at the stage of urban development zoning) represent a way to establish a particular pattern.

New patterns

Design of new urbanized forms for mass use is, in fact, formation of new patterns. It is performed during urban-planning modeling without reference to a specific situation. That way the micro-district concept was formed. The process of pattern designing is accompanied by:

- calculation of typical technical and economic indicators that can be used in predicting development of the area formed by this pattern;
- visualization of a “sample” of the urban development environment for the purpose of public presentation.

Experimental design, architectural competitions for development of new principles for construction organization can also be considered as creation of new patterns. As for the Russian urban planning, the methodology of such work has not been studied sufficiently despite the long-standing problematization. This points to the fact that methods of designing new urban-planning patterns represent one of the current trends in modern science (Ptichnikova, Antyufeev, 2014).

Conclusion

The performed study allows drawing several conclusions. It has been confirmed that the urban environment is based on patterns — spatial and planning prototypes of buildings or landscapes (or “templates” of spatial formation). Patterns a priori represent holistic structures, therefore, their “imprints” in the city fabric can be called locally coherent urban-planning formations. In order to identify such territorial elements, an imprint is compared with the generating pattern.

To preserve the genetic code of a local territory, or transform it, laws and principles of spatial pattern formation are used in spatial strategies and urban-planning regulations. Formation of new stereotypical forms of environment organization is, in essence, creation of new patterns.

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МЕТОД ПАТТЕРНОВ В ГРАДОСТРОИТЕЛЬНЫХ ИССЛЕДОВАНИЯХ И ПРОЕКТИРОВАНИИ

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Аннотация

Введение: В статье поднимается вопрос описания шаблонности городской среды. Декларируется подход к исследованию и проектированию городского пространства посредством паттернов – пространственных прототипов территории. **Цель исследования:** раскрыть сущность метода паттернов в градостроительных исследованиях и проектировании. **Методы:** Опираясь на теорию Кристофера Александера, моделируется понятие паттерна в градостроительстве, раскрывается процесс развития городской среды на основе пространственных “шаблонов” её формирования. **Результаты:** Выявлено, что развитие города происходит путем локализации проектных моделей организации территории или естественных природных механизмов формирования ландшафта. Такие проектные модели и природные механизмы названы паттернами. Паттерны отпечатываются на теле города в виде локально-целостных градостроительных образований — элементарных планировочных единиц. Приводятся свойства паттернов (целостность, ограниченность и повторяемость). Описываются принципы их использования в исследованиях градостроительных структур, сохранении генетического кода локальных территорий и моделировании новых пространственных форм при помощи градостроительных стратегий и градостроительного регламента.

Ключевые слова

Паттерн, морфология города, целостность, застройка, ландшафт.