Designing comfortable urban environment using methods of applied behavior analysis

A N Gushchin, M N Divakova, N S Mironova

Department of Urban Planning and Landscape Architecture, Ural State University of Architecture and Art, 23, Karla Liebknecht St, Ekaterinburg 620075, Russia

E-mail: alexanderNG@yandex.ru

Abstract. The article is devoted to the application of the methods of applied behaviour analysis in the practice of designing a comfortable urban environment. The use of methods of applied behaviour analysis changes the very formulation of the design problem. In the new production we are talking about the management of the behaviour of a resident in the urban environment. Management is carried out with the help of incentives: tracks, benches and other accessories. The article uses the method of fixation and description of the behaviour of urban residents, developed by the authors. It is demonstrated how to identify the conflicts of interests of all living in the urban environment through behaviour analysis. Identifying and resolving conflicts is the first step towards creating a comfortable urban environment.

1. Introduction

Creating a comfortable urban environment is currently a priority project of the Government of the Russian Federation [1]. What is the evidence of the existence of a public request for the quality of the urban environment? If one carefully read the passport of the priority project "Formation a comfortable urban environment", then he discovers the following problem: in the project passport the term "comfortable urban environment" is unusable at all. In return, the term "accomplishment" is used. This observation indicates that the project managers vaguely understand of how the improvement of public spaces differs from a comfortable environment. Famous specialists in the field of landscaping create their own criteria for the comfort of the urban environment, as an example, you can specify the system of "12 criteria" by Jan Gale [2]. Of course, that a comfortable urban environment should be landscaped, but a landscaped urban environment will be comfortable? Everyone can conduct a mental experiment to create security problems in a landscaped, accomplished urban environment, as a result a landscaped urban environment will no longer be comfortable. From this it follows that the comfort of the urban environment, in the final analysis, is determined by the behavior of the towns’ people.

The idea to control human behavior has long been known and the scientific direction "behaviorism in architecture" has been developing for a long time from the 60s of the last century to now. An overview of the main trends in architecture can be found in the reviews K.M.Hays [3], V.I. Iovlev [4], N.F. Metlenkov [5]. However, among the classical behaviorism, a new scientific method has emerged - the applied behavioral analysis (ABA) by John O Cooper et all [6]. By itself, applied behavior analysis has become widespread in problem areas far from urban problems: treating children with
autism spectrum disorders [7]. Recently, the scope of the method has been expanding, from education [8] to industrial safety [9].

The purpose of this article is to demonstrate the possibilities of applied behavior analysis in the conceptual design of a comfortable urban environment. First of all, it is necessary to explain the formulation of the problem more fully. The idea of applied behavior analysis lies in an extremely "technical" approach. First, behavioral analysts reject various speculative theories, preferring to focus on the study of the dependence of behavior on the environment. Secondly, behavioral analysts focus only on observable and verifiable facts, for the establishment of which methods of mathematical statistics are widely used. Third, behavioral analysis is focused not just on accumulating facts, but also on the study of the fundamental dependencies between behavior and the environment within the limits previously designated.

2. Statement of the design problem a comfortable urban environment

To describe the problem of designing a comfortable urban environment, it is necessary to introduce the terminology of applied behavior analysis. More detailed information anyone can read in the quoted book [6]. Behavior - any activity of a living organism. The concept of "behavior" is so general that for its description the dead man's experiment is used: "If a mortal can do this, then this is not behavior." In the stated context, behavior is all that people perform in public spaces. It is important to emphasize that behavior is always functional, i.e. pursues a specific goal, and that any behavior generates changes in the environment. The basis of behavioral analysis is an accurate and unambiguous description of behavior. It was said above that behavioral analysis practices a "technical" approach to describing behavior. The foundation of the technical approach is an accurate and unambiguous description of the behavior. The requirements for the description of behavior are formulated in [6]. Any behavior produces changes in the environment. Environment - in our case, the common area.

The second postulate of behavioral analysis is behavior can be controlled. There are several ways to manage: reinforcement (the desired behavior), weakening (unnecessary behavior). Finally, the latter, behavioral management is made through various stimuli. There is no precise definition of what a stimulus is. Incentives are defined through their properties. It is important to emphasize that the environment is filled with incentives, it is through this that it forms a certain behavior. In our case, incentives are the organization of space and amenities.

In the stated context of the work-the design of a comfortable urban environment-the task of designing itself is changing. The task of designing a comfortable urban environment is the task of managing the behavior of the citizen. Management is carried out through a variety of incentives. Incentives, which are at the disposal of the architect are very diverse: creation of functional zones for different categories citizens, such as playgrounds, creation of special zones for different forms of behavior, for leisure, for sports, the creation of special routes, etc. Equipment of urban spaces with special "urban furniture": small architectural forms, benches for rest and so on [10,11].

The urban environment should be comfortable for different categories of the population: for children, for the elderly, for people with limited mobility. Generalizing this conclusion, we conclude that the comfort of the urban environment is determined by how different types of behavior it allows. The more different behaviors the urban environment allows, the more comfortable it is.

Figure 1 illustrate how the presence of a fountain stimulates a certain type of behavior (the area in front of the shopping center "Passage." Ekaterinburg).

Returning to Figure 1, we note that in the winter the fountain is worthless, the place is empty and the intensity of the use of the territory, and the variety of behaviors is much lower. Let us consider what the use of behavioral analysis in design techniques introduces.
3. Features of the process of designing a comfortable urban environment

The first step to using applied behavior analysis to design a comfortable urban environment is the problem of fixing behavior and detailed description of behavior. Requirements for the description of behavior are given in the work of Olga Shapovalova [12]. The requirements are as follows:

- the conditions under which the behavior occurs,
- the boundaries of behavior (when the behavior begins and when it ends),
- when the episode should be recorded,
- the unambiguous definition of behavior,
- the validity of its definition.

These requirements authors consider in the context of the general methodological requirements for observation as a scientific method. So Russian methodologists A.M. Novikov and D.A. Novikov put forward the following requirements to the method of scientific observation. «Scientific observation consists of the following procedures: the definition of the purpose of observation (for what, for what purpose?); choice of the object, process, situation (what to observe?); choice of method and frequency of observations (how to observe?); the choice of ways to register the observed object, phenomena (how to capture the information obtained?); processing and interpretation of the information received (what is the result?)» [13, 14].

For a precise specification of the behavior of the townspeople the authors believe it is necessary to use approaches borrowed from information technology. The widespread introduction of information technology has been made possible by the precise specification and formalization of processes. Therefore, borrowing some techniques is fruitful. In particular, the authors used for the precise specification of the behavior of the template developed by the well-known it specialist Carl Wiegers [15,16]. Carl Vigers used his own template to describe precedents in the "use case" methodology. The authors supplemented it with the template specification of the behavior of the spatial reference. Thereby obtaining a template for the description of behavioral precedents.

Next, the observation of patterns of behavior, filling in information about each of the seen patterns of behavior. The description of behavior is made according to the developed template. As a result, we get a set of patterns of behavior. Next, you create a spatial reference diagram of the behavioral precedents. An example is illustrated in Figure 2. Icons mean the main actors of behavioral precedents in public space, on the square in front of the trade center.
The use of behavioral precedents and the collected database of precedents provides a basis for an accurate analysis of the situation. The behavioral precedent records under what conditions the behavior is observed, when the behavior begins, when it ends. A set of precedents (case database) allows you to use a scenario approach to design. A classic scenario is a set of scenes with its own internal structure. Similarly, a set of behavioral precedents is also a scenario. Therefore, the task of managing the behavior of citizens is the task of designing a scenario based on behavioral precedents. Scenario design has received well-deserved recognition in architecture. Scenario design is used in a wide range of applications: from design to development of agglomerations [17] to design of public spaces [18].

The next advantage of using behavioral precedents in the design is the ability to accurately analyze the conflicts that arise on the territory. As we know, contradictions and conflicts are the driving force behind scientific research. The systematization of conflicts in the territory was conducted by the outstanding architect and teacher VA Nefedov [19,20]. Figure 2 illustrates that there are two behavioral precedents. Actors: bicyclist and pedestrian. In an uncomfortable environment, the emergence of a number of these actors leads to a conflict over a common resource, for public space, as demonstrated in Figure 3.
In a comfortable urban environment, the conflict is resolved through the allocation of bicycle paths, which only bicyclists use. For a full analysis of conflicts in the public space, the authors recommend using the tables of the following type, as table 1.

Table 1. Table for mutual analysis of behavioural use cases of Figure 2.

| Number of behavioural use case | 1 | 2 | 3 | 4 | 5 |
|--------------------------------|---|---|---|---|---|
| 1                              | - | + |   |   |   |
| 2                              | - | + | + |   |   |
| 3                              | + | - | - |   | + |
| 4                              | + | - | - |   | - |
| 5                              | + | - | - |   | - |

The table uses the notation: x - are conflicting precedents of behavior that competing for a common resource: public space, elements of accomplishment, + - complementary precedents of behavior.

Using the techniques of applied behavior analysis, due to the creation of the necessary stimuli, the behavior of the cyclist can be radically changed. Here is the script of the cyclist's behavior on the square in front of the trade center "Passage", observed by the students of the applied magistracy of the Ural State University of Architecture and Art. «The participant comes to the central part of the city; stops at a traffic light; descends from the bicycle; Carries a bicycle on the permissive signal of a traffic light; Do not sit on a bicycle, and walk passes the distance to the recreation area at the Passage; the bicycle is bicycling; sits down on a bench; resting, enjoying; gets out the phone, communicates with someone; takes a bicycle; continues to move». Thus, the behavior of the cyclist has been fundamentally altered by the creation of a recreational zone and the location of the appropriate incentives: benches, bicycle parking lots, etc.

4. Summary and Discussion
The changes presented above in the design methodology demonstrate the prospects and feasibility of introducing techniques of applied behavior analysis into the practice of designing a comfortable urban environment. The methods of behavioral analysis presented above are introduced into the educational process when teaching students of the master's degree in the specialty "Architecture", the direction "Landscape architecture". Introduction to the practice of designing elements of applied behavioral analysis contributes to the formation of scientific thinking in students. What is achieved through scientific accuracy in the collection of material and the development of conceptual thinking in students in the analysis of conflicts and in the design of the desired behavior of actors.

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