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# Study on the Path of Improving Urban Housing Quality Based on the Optimization of Community Sports Facilities Construction

**Xiuhai Shang<sup>1</sup> and Yingmei Duan<sup>1,\*</sup>**

<sup>1</sup> Department of Physical Education, Changzhou Vocational Institute of Industry Technology, Changzhou, Jiangsu, 213000, China

Corresponding authors: (e-mail: [sxh3624@sina.com](mailto:sxh3624@sina.com)).

**Abstract** Based on the theory of spatial syntax, this paper analyzes the influence of the current community space on the housing quality of the residents through the convex spatial analysis method, the line segment method and the line of sight analysis method, and investigates the correlation mechanism between the layout of the sports facilities and the housing quality. It is found that there are problems of planning imbalance, uneven quality of facilities and management of community sports facilities nowadays, which limits the enhancement of housing value to a certain extent. Aiming at the above problems, this paper proposes the paths of improving infrastructure, optimizing planning layout, and upgrading management level to promote the optimization of sports facilities construction, so as to promote the upgrading of the quality of urban housing and provide theoretical references for the coordinated development of urban and rural communities.

**Index Terms** spatial syntax, community space, housing quality, sports facilities layout, housing value

## I. Introduction

In the process of rapid development of today's society, residents' requirements for community environment have been upgraded from basic residential functions to comprehensive needs covering multiple dimensions such as healthy life, intelligent services, and public space [1]. As an important public service facility, the planning quality of community sports facilities is not only related to the satisfaction of residents' daily life, but also has an impact on the value of neighboring residential assets [2]. Nowadays, community sports facilities generally have uneven regional distribution, inappropriate resource allocation, operation and maintenance of the absence of phenomena, resulting in idle waste of resources, and can not effectively meet the requirements of housing quality improvement [3]. Therefore, using the spatial configuration analysis method to explore the coupling relationship between the spatial distribution of sports facilities and housing quality has both innovative value and practical guidance significance [4].

In this paper, the theoretical framework of spatial syntax is systematically sorted out, including convex spatial analysis, line segment method and line-of-sight analysis method. Combined with the prevailing problems, the paper analyzes the main bottlenecks in the construction of community sports facilities from the quality of facilities, planning layout and management level, and puts forward the paths of infrastructure improvement, optimization of planning layout, and innovation of management mechanism, to explore the strategy of improving the quality of urban housing with the construction of sports facilities, and to provide references for the sustainable development of urban and rural communities.

## II. Spatial syntax

The quantitative analysis of the spatial configuration of the community through spatial syntax theory can further the relationship between the layout of sports facilities and the behavioral needs of residents.

### II. A. Convex space

The core of the convex space analysis method is to define the spatial properties through geometrical features. If the line between any two points in the space is included in the spatial range, and the conditions for visualization between the two points are satisfied, the region can be defined as a convex space. On the contrary, if the connecting line is beyond the boundary of the space or there is visual obstruction, it does not meet the convex space characteristics. Convex space, as shown in Figure 1, is used as a basic tool for spatial morphology research, and the method delineates the target area in a covered manner through a minimum number of maximized convex

spaces, and then analyzes the topological correlation between each convex space. This kind of correlation can effectively map the spatial behavioral patterns and perceptual characteristics of urban housing [5].

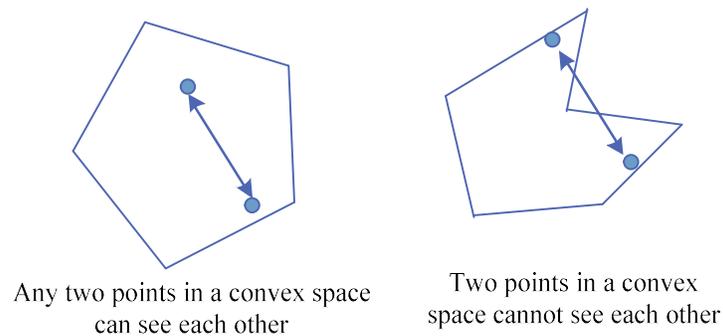


Figure 1: Convex space

### II. B. Line segment method

The line segment model is a new linear spatial analysis technique developed on the basis of the traditional axial analysis method. Figure 2 shows the line segment method. Due to the use of finer spatial division, the line segment model can provide more accurate quantitative spatial analysis results, and the line segment model is more refined than the axial model, which retains the overall characteristics of the axial analysis method and exhibits local variations in the short line part.

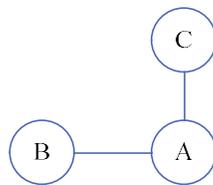


Figure 2: Line segment method

### II. C. Line-of-sight analysis

In spatial syntax, line-of-sight analysis is a two-dimensional analysis that refers to the range of planes that can be observed in space. Line-of-sight analysis observes the relationship between points for spatial processing, as shown in Figure 3 on the street point a can directly see point b, indicating that there is one line-of-sight depth between the two. And point c can not directly see point e, need to be observed through the point b to point e, it shows that point c and point e between the existence of two line of sight depth. Line-of-sight analysis is usually performed using a grid partitioning method, which requires setting the grid size and dividing the space into equal-sized cells. Each grid cell is regarded as a basic analyzed element, and the visibility correlation between the elements is established by the topological calculation method of spatial syntax. Through this method, the spatial optimization results obtained are more intuitive and clear.

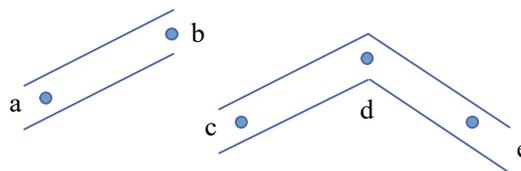


Figure 3: Viewshed analysis

## III. Challenges in building community sports facilities

The current actual construction of community sports facilities and urban housing quality improvement, there are still significant problems, based on the spatial syntax, need to be diagnosed from the quality of facilities, planning layout and management mechanism of the three aspects of the exhibition [6].

### **III. A. Quality of facilities**

As the awareness of national fitness rises, the construction of sports public service facilities has entered a phase of rapid development. Through a diversified model of government-led and social capital synergy, the coverage of sports facilities has increased significantly, but challenges remain in such areas as balanced regional development and facility quality control. New urban communities have formed a composite facility network including professional sports venues, multi-functional fitness centers, and constant temperature swimming pools, etc., while some old communities still suffer from a shortage of basic sports venues and a shortage of professional training venues, etc., and this discrepancy reflects both the contradiction in urban resource allocation [7]. In addition, there is a double imbalance between the total number of facilities and their distribution, the per capita sports area in some high-density residential areas has not reached the national standard, the phenomenon of idle facilities in suburban communities coexists, the quality of the construction is a safety hazard, and some of the projects have a high rate of wear and tear of equipment due to lax implementation of construction standards, and the mechanism of maintenance and renewal has not yet been sound.

### **III. B. Imbalanced planning layout**

Research based on the perspective of spatial matching found that there is a significant structural contradiction between the current layout of community sports facilities and residential space [8]. Many community residents still fail to realize the coverage of 15-minute fitness circle, and the index of sports accessibility around housing is low, highlighting the double imbalance between facility supply and spatial and temporal distribution of residential population. In the dimension of functional integration, there is a generational gap between the existing facilities configuration and the development of smart communities. However, there is a great understanding that it is still traditional fitness equipment, and intelligent equipment is much less than traditional equipment, making it difficult to support the digital fitness needs of residents of all ages. This has led to a decline in the quality of housing in the neighborhood, and some of the backwardness of housing facilities is centered on the lack of planning mechanisms. Insufficient implementation of land mixed-use policies has led to new communities not reserving flexible sports space, and the lack of a financial subsidy mechanism has led to a high rate of cost-shifting for intelligent renovation, ultimately creating a vicious cycle of primitive and inefficient use of facilities, and leading to more residents who would not choose to live in that community.

### **III. C. Management level to be improved**

The current operation of community sports facilities facing institutional deficiencies and governance effectiveness attenuation of the double dilemma, today's residents fitness and commercial operations of the two-track management standards, resulting in many communities appear site use conflicts [9]. Part of the community public welfare weakening tendency, the original free open policy implementation degree now gradually become community organizations charge, causing dissatisfaction of many residents, the quality of urban housing to enhance the many disturbances. The structural contradiction of the governance system is highlighted by the division of powers and responsibilities there is a system vacuum, more than half of the governing documents do not specify the main responsibility for the maintenance of the facilities, resulting in equipment for failure, the repair cycle is also beyond the scope of the plan, and there is also a lack of standardized mode of mixed mode of operation. Existing community sports service contract, profit distribution provisions complete rate and its insufficient, which leads to social capital participation in the system bottleneck, managers of property rights allocation system is not sound, the community exists in the field there are multiple rights interlaced, that is, belongs to him also belongs to him, this problem clearly responds to the managers of the negligence.

## **IV. Paths for improving the quality of urban housing**

These problems show that the construction of community sports facilities requires not only hardware investment, but also soft synergy through institutional innovation. This paper proposes optimization paths from infrastructure, planning layout and management mechanism to enhance the quality of urban housing for the optimization of community sports construction.

### **IV. A. Improvement of infrastructure**

The optimization of the spatial layout of community sports service facilities needs to be optimized from the construction of basic sports facilities, which is a necessary prerequisite for improving the quality and level of the construction of community sports service facilities, and is the key to realize the synergistic improvement of community sports facilities and the quality of urban housing [10]. Efforts should be made to improve the engineering quality and sustainable operation of infrastructure, continuously follow up on the assessment of the

completion quality of sports facilities, including the optimization of the environmental health of the housing neighborhood, establish a sound system of operation and management norms, and innovate the standards of property management and maintenance of sports facilities, so as to guarantee the quality of the newly constructed sports facilities and the sustainability of the development of the community sports service facilities. Provide long-term support for the preservation and appreciation of housing value, sports social scene reconstruction to enhance community cohesion and housing sense of belonging, as soon as possible to improve the implementation of the community sports service network, so that more residents in the community can quickly learn about the availability of sports facilities that are convenient and fast, and then form a “facility optimization - behavioral improvement - housing premium” benign cycle. A virtuous cycle.

#### **IV. B. Strengthening the planning and layout of community sports service facilities**

Strengthening the planning layout of community sports service facilities is one of the key steps, especially in building a symbiotic system of sports facilities and housing quality at the community level. To optimize the spatial configuration of community sports facilities, it is necessary to fully consider the spatial empowerment effect of the location planning of different functional facilities on the premium of neighboring housing. In the preparation of community sports facilities distribution plan, the degree of land intensification and radiation radius should be taken into account to ensure a balanced distribution of urban functions [11].

In addition, through market research fusing housing price gradient data for cross-validation, analyzing the demand for sports services in different areas, clarifying the coupling relationship between the construction demand for different types of sports facilities and the demand for community housing renewal, and reasonably arranging different types of sports facilities, such as badminton halls, basketball courts, swimming pools, athletic fields, etc., in accordance with the planning and layout plan, and prioritizing the configuration of community intergenerational shared sports complexes. The concept of sustainability should be strengthened in the planning and design of community sports venues, taking into account the dynamic correlation mechanism between the investment costs of facilities, operation and maintenance costs and property valuation, as well as ecological protection requirements. A supporting management and maintenance standardization system should be established to ensure a positive interaction between the long-term operation of sports venues and the value-added of real estate.

#### **IV. C. Improving the management of community sports service facilities**

Community sports service facilities are the basic support for maintaining the physical health of the general public and promoting mass sports. At this stage, the operational effectiveness of residential fitness venues is relatively weak, resource investment and hardware configuration short board, the optimization of residential fitness venues location planning as one of the key initiatives to break through the dilemma. Enhance the operational effectiveness of residential fitness places is an important prerequisite for improving the planning, to strengthen the establishment of residential fitness places system; the establishment of the system is a key task in the operation of residential fitness places, through the development of a scientific system, the responsibilities of the various levels of government, relevant units and social organizations. In the policy design stage, it is necessary to take into account the realistic conditions of each region, integrate the local level of economic development, cultural traditions and social structure characteristics, and implement a locally adapted and systematic management mechanism. Improve the technical specifications of community sports facilities; the technical specifications of community sports facilities are the fundamental basis for ensuring the planning and operation of diversified community sports facilities.

In order to ensure the quality and safety of sports facilities, it is necessary to strengthen the construction and optimization of the standard system, establish and improve the supporting mechanism covering the planning, supervision and audit of facilities, and increase the intensity of supervision. To improve the operation and management of community sports facilities, efficient operation is the prerequisite to ensure the sustainable use of the facilities. The systematic optimization of the system should be carried out to clarify the division of powers and responsibilities of the management bodies at all levels, consolidate grassroots governance and talent reserves, cultivate specialized technical teams, and implement social collaborative governance and responsibility implementation mechanisms, so as to achieve standardized maintenance and efficient use of the facilities.

To summarize, improving the operational efficiency of community sports facilities is a key element in upgrading the quality of urban living. By optimizing the system, improving the technical specifications and strengthening the operation and maintenance mechanism, we can ensure the sustainable development of community sports facilities and provide a strong guarantee for improving the urban living environment.

## V. Conclusion

Based on the theory of spatial syntax, this study reveals the mechanism by which the layout of community sports facilities affects housing quality. The results show that imbalance in facility planning, insufficient construction quality and loose management are the core factors constraining the improvement of housing value. This paper proposes the optimization paths of strengthening infrastructure construction, focusing on urban-rural balance and sustainability, optimizing planning layout with spatial syntax to achieve spatial synergy between facilities and housing value, and improving management policies and standards to promote the social operation of community sports facilities. To make a solution for the optimization of community sports construction and the improvement of urban housing quality. Future research can further explore the dynamic correlation between intelligent facilities and housing quality to provide a basis for the innovation of community public service system.

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