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Similarity-Based Algorithm for Urban Street Refinement Design Model Extraction Research

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Abstract

INTRODUCTION: The function of many public street spaces in Chinese cities is declining, but urban street space is essential in cities. How to enhance the street's fireworks and reshape the street's rich living atmosphere is worthy of further research and discussion.
OBJECTIVES: Based on the similarity algorithm urban street enhancement-related theories, paper summarizes the current problems of urban street space in China, researches the corresponding enhancement strategies according to the issues, and makes a strategic research and summary on the relationship between the interfaces of the scope of the visual field and the human behavior, as well as the relationship between the pedestrian and the vehicular traffic.
METHODS: An in-depth study after defining the concept, summarizing the idea and extracting the urban street refinement design model using the similarity algorithm.
RESULTS: The new urban street refinement design model can improve the psychological satisfaction of people walking in the application; the street space design model of the walking experience will also use the algorithm to simulate the joy; lastly, a recommended optimization technique is presented for the construction of a humanized street scale and other related factors.
CONCLUSION: The study of urban street space is a refined design strategy for the improvement of the urban landscape; the growth of the happiness index of urban residents is of great significance and, at the same time, for the enhancement of China's modernization level, improve the human habitat environment are of great importance, and should pay attention to the urban street refinement design.

Keywords: similarity algorithm, city, street space, refinement design

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1. Introduction

In many roads in China, the function of public space has been reduced. Urban space is an essential public space in the city where people often walk. With the rapid development of urbanization, some areas pursue excessive economic benefits in road construction, unquestioningly building large frequency bands and street areas, which promotes the continuous expansion of the residential regions. More and more enclosed areas with roads and large buildings have replaced the friendly and pleasant environment of the past(Liang et al., 2021). Currently, the weakening of the function of public space on the street is gradually attracting people's attention with the campaign to clean up public space.

China adheres to green development and low-carbon environmental protection and vigorously promotes the "green and civilized tourism" model. More and more people are rooted in reality and rely on low-carbon tourism, paving the way for a new trend of green tourism in society. Walking zones are the most common form of walking in communities, and their spatial environment directly affects the walking experience and people's enthusiasm to continue walking. According to this, it is why local governments are increasingly focusing on improving the overall value of pedestrian areas.

The current situation of urban space in China is analyzed, the problems between metropolitan areas and pedestrian needs are summarized, the concept of pedestrian experience is decomposed, the delicate design of Chinese urban streets is summarized, and typical urban streets are studied. Urban road conditions and the general ambiance are enhanced, while the significance of the pedestrian encounter is incorporated into the design of urban streets. Finally, detailed analysis methods and types of urban street planning based on improving the walking experience are examined, and master planning strategies are summarized(Liang et al., 2021). Research within China has mainly focused on the factors and forms of urban space, and relatively few systematic studies have been conducted on urban space theory from the perspective of the human walking experience. According to people's traveling mode, urban roads are selected as the main roads. The relationship between urban space elements and walking demand is systematically analyzed, and the conceptual strategy is summarized. The theoretical and methodological system of urban street design is improved and deepened, complementing the existing street design theory.

2. Research background

With the improvement of people's physical living standards, spatial experience and emotional communication are getting more and more attention. Through careful design and the creation of quality urban environments, it has become a standard that people are constantly looking for for themselves. However, efforts to modernize cities will further enhance and improve the quality of road transport in urban areas. Many road projects involve traffic rather than pedestrian experience. Only by prioritizing pedestrians and respecting needs and feelings in the development of urban spaces can pedestrians be guided to a more humane path. This paper discusses spatial optimization strategies and formal management methods to improve the pedestrian experience, combining theoretical research and the current state of urban space(Wang et al., 2021). Strategic analysis is conducted to deepen the relationship between the road interface, human vision and behavior, and pedestrians and vehicles. It has practical value in optimizing existing urban spaces and building new roads.

This study investigates strategies for planning complex urban streets based on pedestrian experience. The paper outlines the dynamic nature and trends of urban planning in terms of its conceptualization and development and urban development needs. The role, function, and interrelationships of changing urban spaces are analyzed based on metropolitan areas' concepts, types, and organization. Appropriate adaptations of urban spaces to the changing patterns, characteristics, and experiences of pedestrians are outlined, detailed pedestrian-based street designs are proposed, and more systematic approaches are explored(Spyra et al., 2021). The pedestrian experience in urban spaces is analyzed, pedestrian typologies and characteristics are developed, perceptions and hierarchies of pedestrian spaces are examined, and vital factors influencing the pedestrian experience are analyzed.

This paper builds on the sensory walking experience based on different scales of urban space and establishes a "human-centered" hierarchy. Intelligent and quiet transportation planning reduces conflicts between pedestrians and vehicles on roads. The primary location of pedestrian life on the road should be determined with due respect to bicycles and cars to create "harmonious and common" road traffic(Li et al., 2021). By setting design criteria for density, clearance, coherence, and diversity of interfaces, the aim is to create a "public space" with an excellent spatial experience for urban roads. Based on the needs of pedestrians, an urban spatial optimization strategy using typical city streets is proposed, analyzed, and validated. The proportion of original street lane sizes in major cities in China is shown in Figure 1.

Figure 1 Proportion of original street lane sizes in major Chinese cities

The innovation of this paper focuses on the issue of urban street design in China, reaffirming the fundamental human values and design principles of urban street design that focus on pedestrian experience. Based on the pedestrian experience, specific sensory and emotional experiences are analyzed in depth, and the relationship between the pedestrian experience and the urban environment in terms of walking, pedestrian behavior, and form perception is identified. Based on the communication and analysis of typical streets in the visual area, and attempts to infer analytical methods and planning strategies based on the human walking experience(Kam et al., 2021). A specific approach is considering urban streets as linear spaces and strategically studying and synthesizing road traffic interfaces and visibility, human behavior, and relationships between pedestrians and vehicles—the proportion of lane sizes on retrofitted streets in major Chinese cities, as shown in Figure 2.

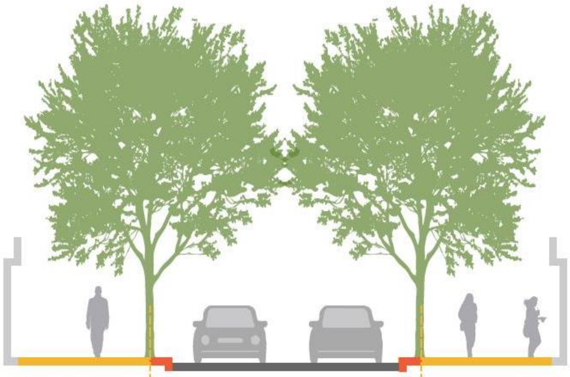

Figure. 2 Proportion of lane sizes on retrofitted streets in major Chinese cities

3. Research Methods

3.1 Trajectory similarity algorithm

With the rapid development of sensor technology, wireless communication technology, satellite navigation, and positioning services such as BeiDou Navigation and Positioning System, especially the widespread popularization of 5G technology, a large amount of ballistic data has been obtained(Shibo et al., 2023). The trajectory data provides necessary data support for public security, intelligent transportation, population, smart tourism, smart cities, and other fields. For example, the Ministry of Security can compare cell phone routes with vehicle routes to determine the appropriate relationship between people and vehicles and investigate passengers traveling in the exact car or vehicles. In traffic planning and control, relevant services can assess traffic flow based on the traffic characteristics of vehicles on the same route. Designing new roads to reduce congestion and its measures Sellers can use similar methods to analyze customer characteristics to improve marketing efficiency and profitability; in the prevention and management of new coronary infections, it is essential to understand the representative features of each route and to create individual portraits based on these routes. Route information can quickly validate patient diagnoses. Use tracking data to identify people. Measuring flight path similarity is crucial for studying flight path data(Xiao et al., 2021). It is used not only for trajectory research and correlation analysis but also for location-based services such as trajectory recommendation, trajectory clustering, and target prediction, attracting the attention of many researchers in China and abroad. These routes are adaptive due to device type, signal strength, and environment.

Traditional ballistic similarity measurements can be categorized into two groups: ballistic similarity measurements for spatial similarity and ballistic similarity degree measurements for temporal similarity. The methods based on spatial similarity can be categorized into point similarity, formal similarity, and segment similarity. Point similarity metrics include Euclidean metric, dynamic time distortion, maximum joint segmentation, processing distance, and EDWP. Euclidean metric is the simplest way to measure ballistic similarity. The main idea is to compute Euclidean measurements between different flight path points and combine them with the final measurements. DISIM combines the time data and determines the total cost of the Euclidean measurement function between two tracks. European distances require the same number of routes, sampling intervals, and massive routes. The Dynamic Time Warping (DTW) algorithm calculates the cumulative sum of the spaces between the best-fit tracks, which allows for comparisons across trails of varying sampling speeds and lengths through local stretching or scaling (Thai & Huh, 2022). This paper proposes a local sequence comparison algorithm based on DTW. Due to the correlation between the Euclidean measurements and the computation of the distance between two points, it suffers from track noise.

To avoid noise, LCSS mainly uses track similarity as a measure of track similarity and bypasses uncontrolled track points by setting a threshold. These properties make LCS noise-resistant. However, LCS needs to include the different parts between the corresponding segments, which leads to inaccurate estimation.EDR, ERP, and EDWP are commonly used processing distances based on chain matching. There is a requirement to augment the distance separating the EDR and LCS. Two formal approaches that rely on similarity are the Fraser distance and the Hausdorff distance.

Fraser distance considers not only the position of the trajectory but also the order of the trajectory shape points. However, the Fraser distance requires that the correct point be found for each end and is therefore particularly sensitive to noise. The point similarity methods described above require that the distance between two spheres at points with high computational complexity be computed when calculating the position of the trajectory(Alsaadi et al., 2022). Commonly employed techniques such as Optimal Weighted Distance (OWD) and multi-band Local Invariant Pattern (LIP) distance localization are utilized to mitigate the computational complexity of the similarity separation-based methodology. The OWD metric is a similarity measure that gradually diminishes the degree of similarity as time progresses. The method starts with a bus problem in which time series values are uncorrelated, and only similarities in spatial data formats are considered. The SFT index was created utilizing JD Justin's spatio-temporal data management platform to simplify the computation of trajectory endpoints and identify potential carriers of the 2019 New Crown Pneumonia epidemic.

3.2 Algorithm Characterization and Modeling

Deep learning techniques require a large amount of data preparation, which is difficult to provide due to the complexity, diversity, and confidentiality of tracking data. Due to the dynamic nature and nature of real-time ballistic data, it is necessary to pay more attention to the speed of data detection, management, and analysis. The authors introduce a novel trajectory similarity method that leverages the computer vision correlation pyramid concept. This technique is built on a temporal correlation pyramid(Asadabadi & Sheikholeslami, 2022). The basic idea is that two items are considered identical if they remain in a room for a time. Since there is no fixed criterion for determining temporal and spatial regions, the tracks can be divided into different particle sizes in time and space, and other particle sizes can be assigned to different weights. The larger the particle size, the more accessible the spatio-temporal range and, therefore, the lower the mass; the smaller the particle size, the tighter the time interval, and the higher the group (Oppersma, 2021). The technique for measuring spatial pyramid ballistic similarity should have the following characteristics:

(1) Due to the spatio-temporal characteristics of the flight path data, the corresponding model of the spatio-temporal pyramid divides the paths into different particle sizes in the spatio-temporal dimension. When the tracks have the same temporal particle size and the two approaches are encoded with the same spatiotemporal particle size, the two paths are aligned within the same spatiotemporal particle.

(2) Due to the secrecy of ballistic data, obtaining training data corresponding to the flight path takes work.

The similarity algorithm trajectory is modeled as follows:

$$tile_x = \frac{lon+180}{360} \cdot 2^x \tag{1}$$

The trajectory is further optimized as follows:

$$tile_y = \left(1 - \frac{\ln(\tan(lat\frac{\pi}{180}))}{\pi}\right) \cdot 2^{x-1} \tag{2}$$

Equations (1) and (2) in thetilex、tileyare are two fixed function variables, but they are computed differently, as shown above.

The time coding problem of the trajectory algorithm is modeled as follows:

$$t = \frac{t_0}{temporalScale} \tag{3}$$

Equation (3) optimizes the similarity of trajectories in terms of temporal granularity, where the denominator of the temporal scale is the temporal granularity and the initial time. After further planning, the following method is derived:

$$P = \left\{(g_i^t(p), t_i^{t0}(p)), 1 \le \mathrm{i} \le n, 1 \le l \le L\right\} \tag{4}$$

$$Q = \left\{(g_i^t(q), t_i^{t0}(q)), 1 \le i \le n, 1 \le l \le L\right\} \tag{5}$$

Equations (4) and (5) in the$P$、$Q$are, respectively, the two free variables corresponding to the function 、QIt is necessary to calculate both the position of the matching on the$P$、Qfunction forms are more similar.

3.3 Definition of related concepts

Urban space. Urban space is an essential component of public space that facilitates the mobility and communication of citizens. In addition to transportation, social, recreational, and commercial activities, the main difference between roads and highways is the variety of services provided to people and vehicles(Yap et al., 2021). Building or horizontal interfaces on both sides of the roadway are essential to perceiving roadway traffic or interfaces. As the most common architectural space in people's daily lives, it significantly impacts people's lives and socialization. Streets with different characteristics play different roles in people's use. As a linear space, it connects other areas of the city and implements the activities of its inhabitants, which is the main task of the city. Walking on the street enhances the experience of perceiving and participating in the street space. The refined management plan (partial) is shown in Figure 3.

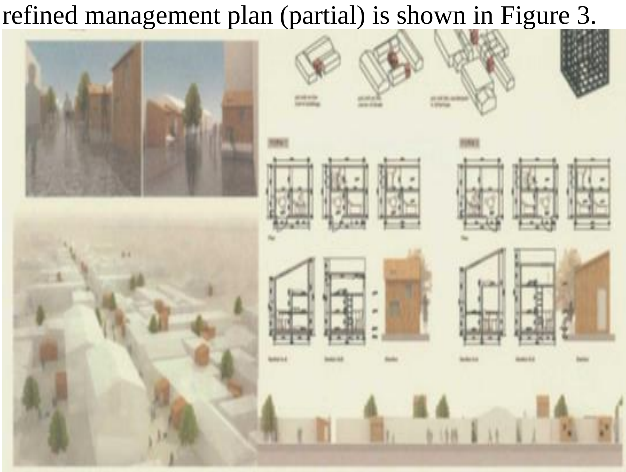

Figure 3 Refined management floor plan (partial)

Walking experience. The pedestrian experience is a subjective human emotion. Pedestrians can influence different elements in a room and produce other emotional, physical, and psychological sensations. The experiential object of urban spatial observation is the physical environment of the street(Song et al., 2023). Specifically, the experience of walking in street space is the experience of people staying and walking in the street environment, focusing on the subtle relationship between people and street space. A good walking experience depends on the quality of the external environment and the physical organs and psychological impressions of people walking in freedom. The quality of walking affects whether people walk further or not. Schematic diagram of the traditional walk-through zone, as shown in Figure. 4.

Figure 4 Schematic diagram of traditional walking through the zone

Walking is a complex multilevel behavior that includes intimacy, environmental awareness, recreation, etc. Walking on urban streets depends on the street space and the pedestrian system. The walking system's location, timing, comfort, sensory stimulation, and different spatial features influence the pedestrian's walking experience. In addition, pedestrians pay different levels of attention to other interfaces of urban space, and environmental factors affecting spatial experience vary horizontally and vertically(Almukdad et al., 2023). In conclusion, to create a richly layered space to increase the attractiveness of an urban area, satisfy the material and spiritual needs of pedestrians, and build an excellent urban space, it is necessary to plan and program the ecological spatial elements wisely according to the various psychological and pedestrian needs to create a high-quality urban space—schematic diagram of the new pedestrian passing zone, as shown in Figure 5.

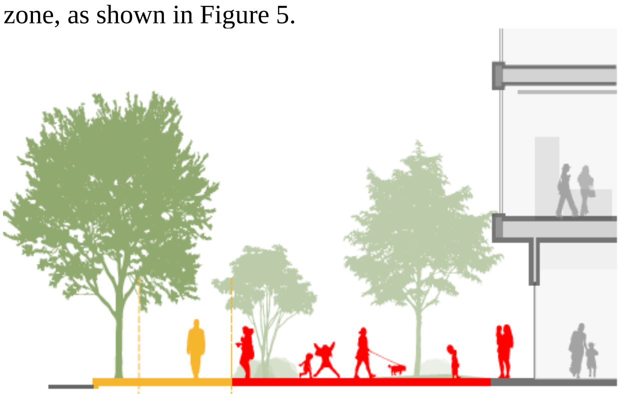

Figure 5 Schematic diagram of the new walk-through zone

3.4 Related Research Theories

Behavioral psychology. Behavioral psychology's study of human behavior involves the motivation behind human behavior and the relationship between the physical environment and external human behavior. Pedestrians may be attracted to certain environmental factors in urban spaces, which may arouse curiosity and force a shift from walking to standing and observing. This stopping behavior can continue to change due to many psychological changes—Shared Street 1, shown in Figure 6.

Figure 6 Shared Street 1

Common Streets. A public street is a roadway that all users have the right to use. Integrating pedestrian and vehicular transportation systems into a single integrated system violates internal boundaries and serves a standard function. Conventional roads place pedestrians, bicycles, and automobiles at a level of visibility, eliminating material insulation and complementing the liberation of urban space. As narrow streets and sidewalks disappear due to location constraints, public roads alleviate the need for more public space. By allowing unobstructed vehicular traffic, public roads provide cyclists with more walking area and energize Shared Street 2, shown in Figure 7.

Figure 7 Shared Street 2

4. Results and Discussion

4.1 Basic research results of walking experience in urban street space

According to the needs and motivations of urban road users, street walking can be divided into three categories: suburban, residential, and recreational(Forte & Figueiredo, 2021). Work is the most basic and standard activity on roads. These actions usually have a clear goal based on the most immediate objective. These activities have a clear motivation to walk, but when choosing a walking path, such as shopping, eating out, and attending social events. These activities are relatively sporadic and more clearly studied for public transportation services. Leisure activities include walking and escorting. Relatively free walking trips include hiking, trekking, recreation, and fitness—relatively low productivity and seeking greater comfort in the roadway environment. The project calls for connecting nodes through a pedestrian network to facilitate access for residents.

Street conditions can be seen, and pedestrians express and understand knowledge of the urban space and environment through the organization of visual information. The road pattern can be considered static and dynamic depending on the driving conditions. Static observation mainly refers to pedestrians directly seeing and observing the environment on the street through static behaviors such as resting and stopping. People receive elements of the physical environment primarily on a visual level. When pedestrians are relatively stationary, their line of sight typically drops 10 degrees(Noh et al., 2021). Sufficient time will be allocated for comprehensively examining many aspects of the roadside environment, particularly during static behaviors, enabling extensive observations of the characteristics of roadway materials, forms, and their intricate features. Dynamic observation is an illustrative response to changes in street and pedestrian space. When walking, the streetscape changes depending on the viewer's location. People conceptualize the time and space around them as time and space change. For example, as one walks down the street, the perception of green areas is dynamic and variable, creating a sense of change and heightening the importance of emotional behavior. The pedestrian street design is envisioned as shown in Figure 8.

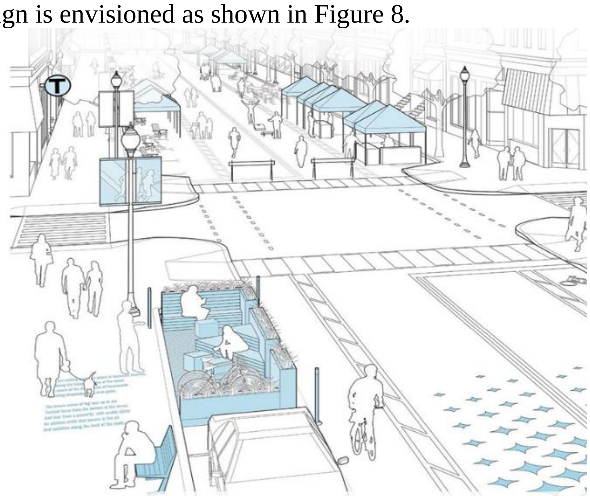

Figure 8 Walking Street Design Scenarios

The sensory layer is the space where external information is received directly through the sensory window through sensory experience. Sight, hearing, and smell are essential to sensory experience during street activities. Emotionally, the emotional experience of walking is a subjective process of expression. More and more people seek spiritual life experiences(Yong㏒et al., 2021). According to the design concept of reinforcing social, spiritual, and personal qualities, urban streets represent human presence and provide space for emotional communication and belonging.

Based on the level of walking experience, the need for a walkway environment is categorized from low to high. It is reflected in five groups: displacement, safety, operation, environmental comfort, emotional enrichment, and analysis by relevant scientists. Roadway space should ensure regular pedestrian traffic and unobstructed access to destinations, as reflected in reasonableness, comfort, and walkability(Jiang et al., 2023). Roadway dimensions, touchscreen sidewalks, available ramps, and crosswalks are appropriate for the roadway environment. Roadway safety must ensure pedestrian safety, such as street safety, street lighting, and pedestrian safety. Important parts of the roadway are non-slip surfaces, street lights, and "eyes on the road"—service function. Urban roads emphasize improved road performance, which is reflected in the functionality and mix of roads, the abundance of road services, and the efficiency of the road structure.

4.2 Street space design model based on walking experience

Walking is a linear movement from point A to point B but usually contains more information than regular walking. Walking can be a quick and targeted exercise or an exercise for strolling, recreation, and enjoying life. Indeed, the leading cause of China's urban development problems may be the flaws in the planning system and related concepts. Understanding whether the path is suitable for running is crucial if the walking experience is considered a good planning factor. This chapter focuses on analyzing some of the factors that influence walking observations, examining the attractiveness of pedestrian-friendly, human-centered, practical, and user-friendly street models, and improving the quality of walking and the standard of living in society. Some researchers must pay more attention to modern design, especially in public spaces such as meetings and walks. Therefore, studying large-scale urban planning issues is one of the most important directions for solving current urban problems(Egedy, 2021). This section examines road transport design criteria from a "practicality" perspective, including road transport experience and usability, safe road design at scale, good walking experience, and humanization of rich social life.

The measurement is a standard people use to compare and describe objective objects. On the road, the sense of scale affects the experience; understanding the external state and environment also includes psychological factors. Therefore, it is essential to study the scale issue in urban planning. The range of purely visual observation and communication varies from 100 to 25 meters, and as the distance decreases, their senses begin to activate, resulting in a complete sensory experience(Wen & Chatalova, 2021). As a reference point, visibility on an urban road is also 100 meters. At less than 100 meters, it is possible to see what is happening on the first floor of the street and how people are moving. Street design should be visible in only short and straightforward streetscapes. If the continuous distance of the visual perception of the road is too large, people will gradually lose their sense of space, dulling the street experience. Twenty-five meters is the distance at which people interact, and another 25 meters is the distance at which they get to know each other: the facial expressions, the body movements, and emotional factors. The closer the distance, the more people begin to communicate with words and their senses, and the closer they reach their level of contact. If the urban space is dominated by a neighborhood or communication function, the 25-meter ceiling is often used as a relative indicator in its design. According to the Urban Pedestrian Design Model, as a linear public space, human contact in an urban area must be monitored within 25 meters, i.e., the maximum width of a street section must not exceed 25 meters, which is the maximum distance observed from one end of the roadway to the other(Yang, 2022). In addition, speed is closely related to scale observations. Generally, a person walks at a rate of about 4-5 kilometers per hour. At this speed, there is enough time to track what is happening on the road, the details of the road design, and its attractive elements. Traditional street design is a large-scale design that focuses on detecting and experiencing walking speed.

The absolute scale of a road is the physical data of its cross-section, mainly the linear distance between the interface at one end of the road and the interface at the other. The absolute size of street space is an essential factor influencing people's psychological experience, which largely determines how they perceive it. An appropriate fundamental criterion would be a human pedestrian function that meets the city's needs without motorized and moving traffic. At the same time, the reduction hurts macroeconomic dynamics and the quality of the urban environment and landscape. Pedestrians: The urban space sidewalks are divided into three main parts: sidewalks, objects, and building facades. Things follow mainly street objects; landscape objects use urban areas; building facades refer to street buildings consisting of old apartments and event spaces. Together, these three factors influence the experience of a given pavement. Bike lanes: Today, urban transportation promotes environmentally friendly and low-carbon bicycles. The general-purpose bicycles seen on the streets today are an essential sign of the changing ways people travel. Creating an uninterrupted, uninterrupted, and safe bicycle network ensures the bike is used. Absolute scale design for street space, as shown in Figure 9.

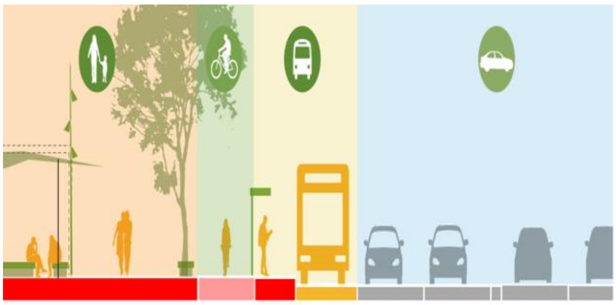

Figure 9 Absolute Scale Design for Street Space

4.3 Street Space Optimization Strategies for the Walking Experience

Build a ladder to the beaten path. Regarding path size and density, urban courses emphasize support for road traffic, while spatial form emphasizes people's attention and experience. The trail has transparent street walls and correspondingly dense neighborhoods that provide a comfortable and enjoyable hiking experience. Urban streets are typically narrower and more petite than suburban neighborhoods. More distant roads can result in people being too far apart to communicate, and broader streets can become empty and dull as pedestrian density decreases. The expansion or contraction of building blocks is also related to the buildings on either side. Dense buildings, narrow streets, or low-density buildings with wide streets should be avoided in roadways whenever possible. Studies have shown that streets with a 1:1 aspect ratio are more intimate and secure. 1:3-degree roads tend to lose their sense of closure, while 1:5-degree roads lose their sense of security. To achieve this objective, one may employ user interface strategies, such as strategically positioning dense pedestrian elements and including flora, to reduce the visibility of expansive road networks.

They are optimizing the integration of public space. To mitigate the issue of inadequate allocation and disunity of public space within urban road networks, it is imperative to strategically enhance the integration and elevate the overall quality of these areas. Combine essential nodes in a block to better utilize space and distributed objects. Optimize distributed nodes in public space and connect them through roads to provide coherent and consistent community public space. They are strengthening community capacity and services, addressing service gaps inside and outside the fences, mobilizing communities, promoting positive social interactions, and integrating and mobilizing closed community resources by promoting community roads. Small pocket spaces such as sunshades, entrances, and corners were designed with the help of maintenance and micro interior techniques—targeted solutions for integrating streets and public spaces based on green and micro landscaping.

Create a permanent pedestrian network. Relatively short paths increase the number of intersections and turns and provide residents with more vibrant courses and activity options. The number of sidewalks, density of meetings, and distance from houses and homes are essential factors in creating a pedestrian network on the street. Within the current limited road space, more paths can be excavated on the corner surfaces of buildings, and high-quality network paths can be created to increase the capacity and usability of the transportation network. An angle can be added to the pedestrian environment by constructing a walkway without stairs, such as a slightly inclined sky corridor, which can facilitate commuting and reduce psychological distance(Nelson et al., 2021). To promote pedestrian mobility, sidewalks on both sides of the roadway should more easily connect to entrances and exits of residential buildings, bus stops, and various commercial establishments, thereby reducing the number of bicycles on the way to employment and providing adequate walking opportunities for residents. Pathway continuity also requires a sensory experience. Street's architectural integrity and significance help maintain the urban fabric's continuity and expand the urban environment's visual stimulation. A harmonious and fully submerged intersection ensures sidewalk accessibility and capitalizes on the tactile and visual senses of those crossing the street.

Improve the efficiency of road transportation. For example, the popularity of urban spaces depends on the diversity of activities and population density. To foster diversity within road transport, it is imperative to improve the integration of various components, particularly evident in the amalgamation of architectural elements and the diverse array of public areas inside metropolitan environments. Complex social streets are usually dispersed in the center of fortified and well-known neighborhoods. Social street spaces with functions such as public transportation, business promotion, recreation, and entertainment are a natural balance that provides functional, solid support for the social life of the street. Low-lying spaces on both sides of city streets serve as corporate meeting places and must cater to diverse consumer experience needs. In some areas, forms of commercial activity closely related to the population's life should be considered to meet the nutritional and recreational needs of the people. Business development is free and flexible, optimizing the surrounding network of roads and stores to improve traffic availability and facilitate low-income purchases. Building frontages are fully utilized to increase parking, support street life, increase store mobility, and enhance the atmosphere of street life. Optimizing street space is essential for social interaction and spiritual connection. Achieving this function requires creating more interactive recreational opportunities for everyday outdoor activities to meet the social needs of residents.

4.4 Pedestrian Street Sensory Enhancement Strategies

Improve the viability of the roadway interface. Social roadway interfaces that are aesthetically pleasing, attractive, and informative will provide a good experience, and pedestrians' overall perception of the roadway will be better—soft Agents. Flexible roadway planning is an effective way to improve the quality of roadway interfaces in today's world of closed and rigid urban roadway boundary conditions. The design follows the local layout and combines spaces with street furniture to create a narrow, flexible boundary that enhances the sense of closure and reflects the area's spirit. The soft edge facilitates sharing and creates visibility between the street and its spaces. In flexible paths, avoiding rigid walls, railings, or changes to the road boundary is desirable. Utilizing various features such as green spaces, arboreal swimming pools, sitting arrangements, and waste receptacles engenders diverse adaptable demarcations that facilitate the communal utilization of pedestrian areas and their surroundings. Roads can be made flexible without adding space. They are laying out and installing rooms, adding narrow fences, and painting unique artistic elements and street surfaces such as fences, building facades, and municipal transformers. The appropriate decoration creates a cultural atmosphere of gratitude and peace. Starting with the "sub-interface" of the street, adapting pavement materials, textures, and colors for flat, dull roads creates an orderly, rhythmic sub-interface that provides a dynamic visual effect for pedestrians and enriches the walking experience.

Modernize road infrastructure. Limited roadway space no longer allows for roadway activity. Improvements to roadway infrastructure can improve the variety of functions of existing public spaces, providing vital, affordable, livable, and tourist areas from the smallest to the largest—coordination of the street system. Quickly repair faulty roadway structures. Quickly removing failing roads reduces unnecessary disruption to sidewalks, maximizes usability, and avoids road safety risks. They improved Pedestrian Support. Providing roadway services related to traffic management, safety, and comfort and organizing walking routes increases the frequency of roadway planning and static traffic for people. Pedestrian supports include comfortable seating, traffic signs, rain covers, and uniform street lighting. Adjust facilities to improve quality. Improve corner spaces to enhance roadway service. Quality improvements include posters, vending machines, public restrooms, gyms, and recreational facilities. Billboards have been converted to sidewalks to provide pedestrians with necessary reading areas and directions.

Create unique street pictures. The redevelopment of street space should focus on emotional experience and social participation to create living street images, enrich street language, and create streetscapes. A rich street language enhances the visual language of different aspects of urban space, improves the understanding of traffic signs, integrates a complete visual image, and balances the relationship between "common sense" and "individuality" in urban space. An illustrative instance is implementing a red control mechanism to facilitate building evacuation. This mechanism enables retailers to personalize the appearance of store signs and exhibit them in transparent and superior-quality showcases.

Consequently, it enhances the visual experience of individuals traversing the pedestrian street, enabling them to engage in parking and navigation activities. Moreover, this initiative serves as a platform to showcase the community's humanity. Create a social atmosphere. Through technology and intelligent operations, building facades and corners are integrated into a more interactive center that creates a series of meetings, conversations, and friendships for community residents. For example, modules such as "space flashes" and interactive time units have fast, real-time capabilities that generate an even magnetic field and provide new touchpoints for social generalization.

Promote greening of roads. Green landscapes and closed green spaces will also directly lead to the decline of the road comfort index. Green ecological design street greening not only has decorative value but also has environmental value and should play a role in regulating the ecological environment. Road planning should combine urban greening with the natural environment, using greening activities to create a regional network ecosystem. For example, use green road stormwater systems, rainwater harvesting signs, and green roads to create green landscapes essential in managing green stormwater and providing ecological benefits to the local area. Provide green space for loved ones. While some existing city streets are green, most green places are enclosed with poor boundaries and inaccessible to pedestrians.

5. Conclusion

Currently, communities involved in urban road construction in China continue to focus on improving the road environment, making it easy to forget the complexity of road transportation operations and the diversity of activities. A rigid climber can hardly meet the needs of future social development. This paper explores the street as a linear space in urban space and strategically researches. It summarizes the road traffic interface, human views and behaviors, and the relationship between pedestrians and vehicles. Urban space is a business card to show the appearance and vitality of the city. The study of optimization strategies for urban space planning is crucial for improving the appearance and well-being of urban residents. The demand for public space on urban streets has shifted from functional to spiritual and cultural needs.

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