

# Research on the Integration and Construction Design Strategies for "Lost Space"

Shuo Cui

Faculty of Humanities and Arts  
Macau University of Science and Technology  
Macau, China

**Abstract**—With the rapid development of urbanization and motorized transportation, there is not only the absence of humanistic care, but also the separation of urban form during the development of some cities, and then along came the "lost space". Starting from the figure-ground theory and linkage theory, this paper analyzes the current situation of urban lost space, and then discusses the construction and design strategies for urban lost space, aiming at shaping the integrity of urban morphology, the diversity of urban vitality and the sustainable development of urban structure.

**Keywords**—lost space; urban space; integration; construction

## I. INTRODUCTION

With the development of economy and the acceleration of urban modernization, on the one hand, the cities are expanding to the suburbs; on the other hand, many cities are facing material aging and the decline of urban structure and function, which leads to the traffic congestion, poor living environment and more hidden dangers of social security, whilst the society is also undergoing comprehensive changes and is up against the reality of reconstruction and renewal. Lost space arises from this. How urban space can adapt to people's pursuit of high-quality life and social development needs has always been a concerning topic. The spatial form of urban space presents a trend of pluralistic development. What kind of expression should it develop to in order to accommodate the changing urban life and synchronize with the development of society has become an urgent task of contemporary urban space research.

## II. RELATED CONCEPTS

What is lost space? What's the different between it and positive urban space or "inherent and traditional" space? Lost space is an unorganized landscape outside the bottom floor of the middle and high-rise tower or a sunken square which is out of pedestrian activities and no one is interested in; lost space is a ground parking lot located in the city which surrounds the city center and cuts off the connection between commercial center and residential area; it is unmaintained and unused land along both sides of the freeway; lost space are also unused riverbanks, abandoned railway yards, retired military bases and former sites of factories that have been relocated to suburban areas for better transportation or perhaps for lower taxes; they are the empty lands left over by

urban renewal nowadays that have never been developed and neglected to be cleaned up for many reasons; they are the unmanned remaining zone between each urban area and the freely developed commercial area; lost space is a decaying park or a public housing project that cannot be demolished and rebuilt due to the failure to achieve the intended goal.

Lost space is unpleasant and anti-traditional urban space requiring redesign, which is not beneficial to the environment and users; they have no boundaries that can be defined and do not connect landscape elements in a coherent way. Yet, the existence of lost space also provides designers with an excellent opportunity to redevelop the city and to stimulate the creativity to fill those space barriers. At the same time, it is necessary to rediscover many unexplored resources in the city therefrom.

## III. ANALYSIS OF THE EXISTING MAJOR PROBLEMS OF LOST SPACE

In front of today's cities, the challenge facing designers is how to create an outdoor environment with an integrated and unified structure for the upcoming development. While the designer's current work is only to repair and improve those fait accompli space, which is in poor shape and planning but actually the first space used by the public. In the general process of urban development, buildings are usually regarded as the independent objects standing in the landscape, not part of the larger spatial texture such as streets, squares or open space. The planned development model based on two-dimensional land use does not take into account the three relationships between architecture and space, nor does it really understand human behavior. The development mode decided by applying the land use planning based on the two-dimensional perspective does not include the three-dimensional relationship between architecture and space, nor does it really include the understanding of human behavior. In all these ordinary processes, urban space is rarely even considered as an external space with shape and scale attributes and associated with other space. Therefore, it is found that a formless "negative space" emerges from most of today's environmental formation process.

Over the past few years, the totally changed economic, industrial and employment patterns have made the problem of lost space in urban centers more prominent, especially the barriers appeared because of expressways, railways and

waterfront areas have seriously damaged the overall continuity of urban form. Pedestrians are often blocked from the important destinations, and the route is often impassable and misguided. It is important to first identify the barriers in continuous space, and then fill them with the buildings that attract new investment opportunities and the open space that interconnect each other. Lost space, which is underutilized and decayed, provides us with a special opportunity to rebuild the city center and attract people back to the old city in order to prevent city's wanton spread and suburbanization.

#### IV. DESIGN THEORIES FOR INTEGRATION OF "LOST SPACE"

##### A. Figure-ground Theory

"Figure-ground Theory" is a study based on the proportion of land use occupied by building masses as the solids (figure) and open space as voids (ground). Every urban environment lies on the combination of building solids and spatial voids. Analyzing the figure-ground relationship in spatial design is to elaborate this relationship by increasing, reducing or changing the combinatorial spatial geometric shapes. Its purpose is to define the urban spatial structure of a city or a district by establishing spatial order. In this order, the spaces of different scales are not only enclosed independently, but also connected in order. The main "space domain" consisting of building solids and spatial voids represents the urban pattern or texture, and is marked by buildings and spaces, such as providing visual focus and main signs or open spaces of sub-centers in the region. Figure-ground Theory is a graphical tool to illustrate a mass-to-void relationship. It is a two-dimensional abstraction of the plane view for defining the structure and order of urban space.

Space is the intermediary of urban experience, which provides the sequence between public, semi-public and private spheres. In order for these sequences to work, fences and continuous gullies must be minimized or completely eliminated. Spatial orientation is determined by the blocks that make up urban areas and neighborhoods. The definiteness and difference of the solids and voids constitute the texture of the city, and establish the spatial sequence and visual orientation between places. The analysis of figure-ground is particularly useful in revealing these relationships. The essence of the voids of urban space depends on the layout of the surrounding solids (buildings, architectural complex and urban blocks), the scales, and the horizontal openness between vertical elements or the surface of the horizon. The wider combination of street space forms urban areas, in which all the spaces create an urban characteristic of leading and unifying isolated spaces. The figure-ground study reveals that there are various solids-voids combinations in spaces, such as vertical/oblique composite (modified grid), random organic type (determined by terrain and natural features) and node-centered type (linear and circumferential with activity centers). Most cities are a combination of these types, with changing, enlarging or shrinking.

In short, the core of Figure-ground theory is based on the control and organization of urban building solids and spatial voids. When the spatial relationship between the urban solids and the spatial voids is complete and perceptible, the urban spatial network can play a successful role, and local areas can be included in the structure and demonstrate the characteristics of urban areas. If the balance between the solids and the voids is broken, the local area becomes the separated area and is placed outside the structure, resulting in lost space. In order to recover our lost space, people must reconsider the building solids and evaluate the "ground" rather than worshipping the "figure". The design of building solids must take into account the connection with the voids so that buildings and spaces can coexist effectively.

##### B. Linkage Theory

Linkage Theory involves the linear organization that connects all parts of the city, and the spatial "parameters" used to design the connection between buildings and space on these lines. In urban space design, the spatial force lines affecting the site provide similar basis for design. The spatial parameters can be area boundaries, traffic flow lines, organized geo-axis or building geo-boundary lines. Together, they form a continuous connection system that must be taken into account when attempting to change the space environment.

Fumihiko Maki, in his influential book *Investigation and Study of Group Form*, discussed several elements of creating spatial connected structure. He believes that linkage is the most important feature of urban outdoor space: "Linkage is the cohesion of the city, in order to organize various activities in the city, and then create the spatial form of the city... The concern of urban design is to establish understandable links between isolated things, that is, to create an understandable, extremely large urban integration by connecting all parts of the city."

##### C. Form, Space and Order

Whether urban design or architectural design, in addition to meeting the pure functional requirements of the design task book, it is also necessary to conform to human activities in terms of material expression. The arrangement and combination of the space and form elements determine how architecture and urban space stimulate people's enthusiasm, initiate the echo, and express a certain meaning. The elements and forms of a city should be interrelated to form a comprehensive and integrated urban space system with a unified and coherent structure. When form and space are all parts of the whole city and interrelated, the urban order can be created; when the association is perceived, recognized and subordinate to the basic characteristics of the integration, the order can be more lasting. The urban order is materially embodied in the form and space of various elements of the city, including solids and voids, interior and exterior, and it produces in sensory sense the knowledge of matter through continuous experience, such as approaching and leaving, spatial sequence of movement, functional activities and even changes of color and landscape. The elements of a city or building can be decomposed into three basic elements: point,

line and surface; one form can be divided into three basic shapes, such as circle, triangle and square; the other form can be combined in different forms, such as concentration, dispersion, linearity, radiation, group and grid. Form and space are the unity of opposites. Form restricts space but is also limited by space. For example, the lifting and sinking of the ground creates a more independent space. The enclosure or opening of building combination determines the privacy and openness of space. As a city or regional center, the space requires striking symbolism and formal openness, while as a landscape space, it requires the form with ornamental passage, etc. The order of urban space or architectural space should be unified and changeable.

## V. STUDY ON THE CONSTRUCTION STRATEGIES FOR "LOST SPACE"

### A. Rhythm of Enclosure and Openness

Rhythm of Enclosure and Openness is a design technique that brings different spatial feelings through the change of the degree of enclosure of spatial units. In plane space design, it can be embodied in the change of enclosure interface. By changing the degree of closure of interface, different types of space are created, such as the enclosed space, open space and semi-open space. Usually, public space needs more open space atmosphere and visual image, while private space needs to be relatively closed and quiet, so as to minimize the crossing of sight around urban space. In urban space design, the enclosure degree, the height-width ratio of interface and the line-of-sight range are often created. When the enclosure interface is closed, the space is separated from the surrounding environment, and when the enclosure interface is opened, the space can establish more connections with the surrounding environment. The depth-width ratio of the interface affects the visual distance and angle of the observer to a certain extent. The higher the aspect ratio, the more local perception the observer could obtain. The smaller the aspect ratio, the more holistic space the observer can enjoy. In addition, the method of designing the rhythm of enclosure and openness in three-dimensional visual space can be quantitatively analyzed and further studied by using evaluation methods such as spatial openness and sky visibility, so as to further design and control the height and dimension of three-dimensional buildings and create different rhythms of enclosure and openness to achieve diverse urban space environment.

### B. Combination of Virtual and Real Spaces

The combination of virtual and real spaces is a common contrastive method in urban space design. It emphasizes the interdependency of image and background, object and non-material virtual space, and the virtual and real space, which exists and can be transformed into each other. The remarkable difference of space between virtual and real contrasts impacts people's mood and psychology through the interruption of continuity. Before the emergence of the main space and the adjacent space of the main space, the method of virtual and real contrasts is used to achieve the purpose of highlighting the main space by comparing the closed space

with the open space. Before the emergence of the main space and for the space adjacent to the main space, this method of virtual-real comparison is used to highlight the main space through the comparison between the closed space and open space. The combination of virtual and real can make the urban space completer and more unified, make the arrangement of real space ingenious and the layout of virtual space appropriate, and the integration of virtual and real bears the overall aesthetic feeling. Urban space design and architecture combination require continuity and integrity of space. Whether between new buildings and new buildings, new buildings and old buildings, or buildings and streets and lanes, they should echo each other, so that the building and external space can be unified in a complete urban space environment while forming three-dimensional and multi-dimensional space-time, and each part of the urban landscape can depend on each other and foil each other with countless changes and unceasingly circulating, so as to shape the spatial landscape with "less effort but more interest in simple form but infinite artistic conception".

### C. Spatial Sequence

Sequence is the basic design method to create spatial order. The formal beauty of sequence is similar to a beautiful scroll painting. Sequence can give a certain order to the urban space or the architectural space while making the space rich in changes in the unity. The experience of changing from one space to another in a city can make people have the impression that the space is much greater. Different spatial combinations form urban spatial sequences, which provide conditions for people's different activities and psychological feelings. By changing the height of the building, concave and convex layout and the display of greening ornaments, the space on both sides of the street can be constantly changed and the space between buildings can also be infiltrated and borrowed through the decorated walls, ornamental perforated windows, corridors and so on, which can not only enrich the space contents, but also achieve the space effect of "see a world in a grain of sand". Different spatial combinations may change the rhythm of enclosure and openness of space, which constantly regulate people's psychology and physiology while reducing the sense of visual fatigue.

## VI. CONCLUSION

To enjoy a continuous, complete and vibrant city is the dream of everyone living in it. However, nowadays the fragmentation and heterogeneity of cities are becoming more and more serious. The destruction of urban texture cannot be avoided for many reasons. The city itself is a very complicated and dynamic developing system. There are many profound and complex reasons in the process of the generation of urban lost space. Nonetheless, in the diversified and complex urban system, how to face these problems is indeed what people should actively explore. For the urban lost space emerged in the dynamic process of urban development, to figure out how to adopt reasonable and humane methods and strategies to construct a city is of great practical significance for the integrity of our urban

form, the diversity of urban vitality and the sustainable development of urban structure.

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