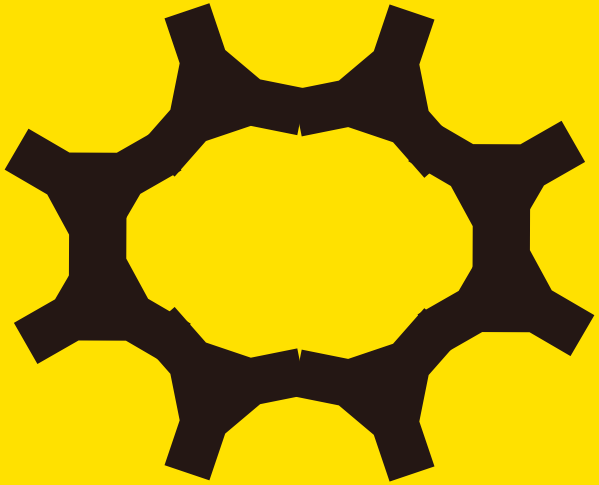


THE HAT POLYKITE SERVICE MANUAL

CONTENT

1 - 1

LIMITATIONS

:

" The Rigidity of Modernist Urban Design "

LIMITATIONS :

Based on my personal growth experience, I have always been an “idol breaker” since childhood. I am passionate about challenging various dogmas, which has made me highly sensitive to “order”. Through my observations, I have found that “order” and “grid” are always interdependent, and this relationship is fully reflected in the “urban texture”.

From prehistoric times to modern urban design, almost all design models have emphasized the importance of grids, regarding them as key tools for creating order and efficiency. However, in my urban observations, this rigid grid layout has gradually shown its limitations.

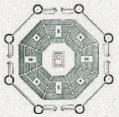
Although it can create a sense of visual order in the short term, it often ignores the needs of organic urban development. As Jacobs (1961) pointed out, overly strict planning may kill the vitality of a city.

LIMITATIONS :

Tuba
Slavery (productivity

B.C 400

Vitruvius
Slavery (productivity



B.C 25

Rome | executed
Slavery (productivity

203

"Ideal City"
Feudalism (Land Resource

1450

Dürer
Feudalism (Land Resources

1527

Cataneo
Feudalism (Land Resource

1574

Scamozzi
Feudalism (Land Resource

1616

Lorini
Feudalism (Land Resource

1611+

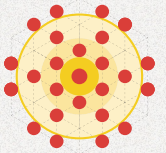
"Garden City" | G1
Capitalism (Finance

1898

"Garden City" | G2
Capitalism (Finance

1944

"Garden City" | G3
Capitalism (Finance



???

LIMITATIONS :

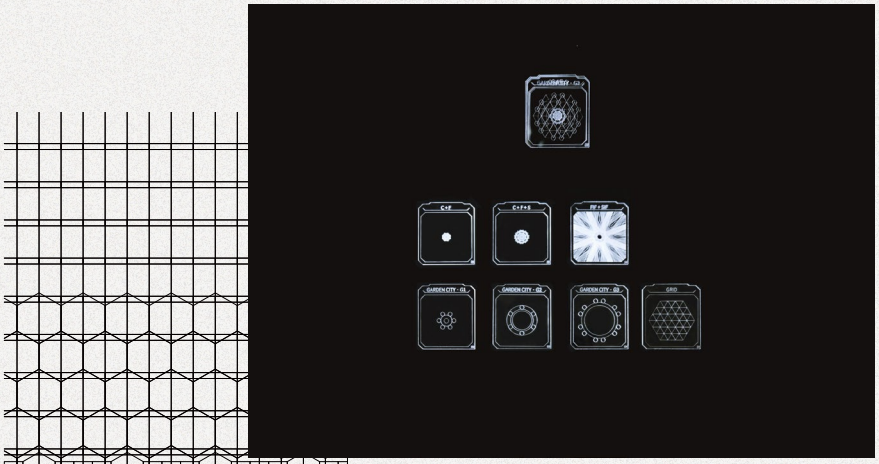
Such rigid patterns are common in contemporary cities. Take Beijing CBD as an example, while its strict grid layout creates a sense of visual order in the short term, it has led to serious traffic congestion and community isolation problems.

A similar situation exists in Manhattan, New York, where its iconic grid streets have improved space utilization efficiency but also created a “street canyon effect”, highly affecting the city’s ventilation and sunlight conditions.

These phenomena have made me think: is there a more organic model of urban development?

Grids
Text

LIMITATIONS :



Grids
Visualization

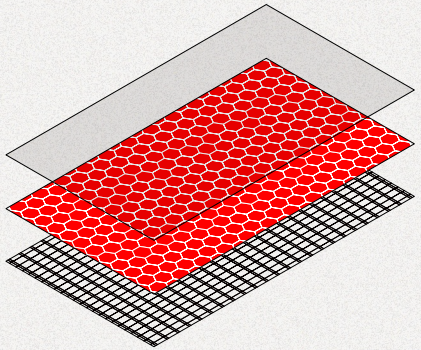
LIMITATIONS :

The dangers of such rigidity are mainly reflected in three aspects: limiting the natural evolution of cities, ignoring regional characteristics and cultural differences, and hindering the organic formation of communities.

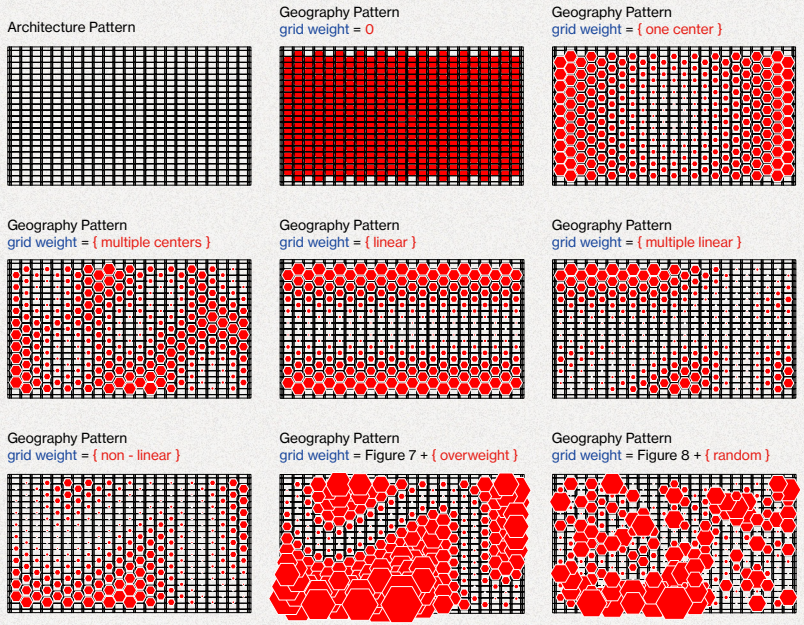
I think it is precisely these limitations that have pushed us to consider new solutions. As Lynch (1984) suggested, urban planning needs to re-examine the concept of “grid”, making it more flexible and adaptable.

This is because it represents the core needs of contemporary urban development.

LIMITATIONS :



Geography Pattern
Second-order Weighted Grid
Block Pattern
Basic Grid
Architecture Pattern
Basic Grid



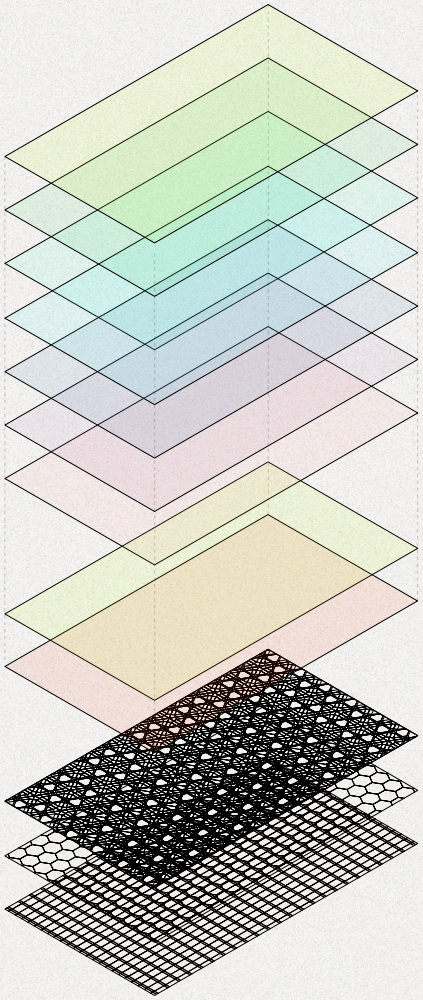
LIMITATIONS :

So, what kind of influencing factors can give rigid grids more flexibility and vitality?

I think Hill-Hansen and Jensen (2023) answered this question in “Doughnut for Urban Development: A Manual” - a new type of city should be sustainable and green in its development, while human factors such as diversity and equity should also be taken into consideration.

Impact Factor
Text

LIMITATIONS :



Climate Stability Pattern
Second-order Weighted Grid
Healthy Ecosystem Pattern
Second-order Weighted Grid
Geography Pattern
Second-order Weighted Grid
Responsible Pattern
Second-order Weighted Grid
Equitable Pattern
Second-order Weighted Grid
Inclusive Pattern
Second-order Weighted Grid
Connected Pattern
Second-order Weighted Grid

Circumstance Pattern
First-order Weighted Grid
Social Pattern
First-order Weighted Grid

Urban Pattern
Basic Grid
Block Pattern
Basic Grid
Architecture Pattern
Basic Grid

Impact Factor
Visualization

1 - 2

NEW CONCEPTS

:

" Sustainable Urban Development Framework "

NEW CONCEPTS :

Actually, even before Hill-Hansen and Jensen proposed their sustainable urban development framework, Moreno et al. (2021) had already started promoting the 15-minute city theory.

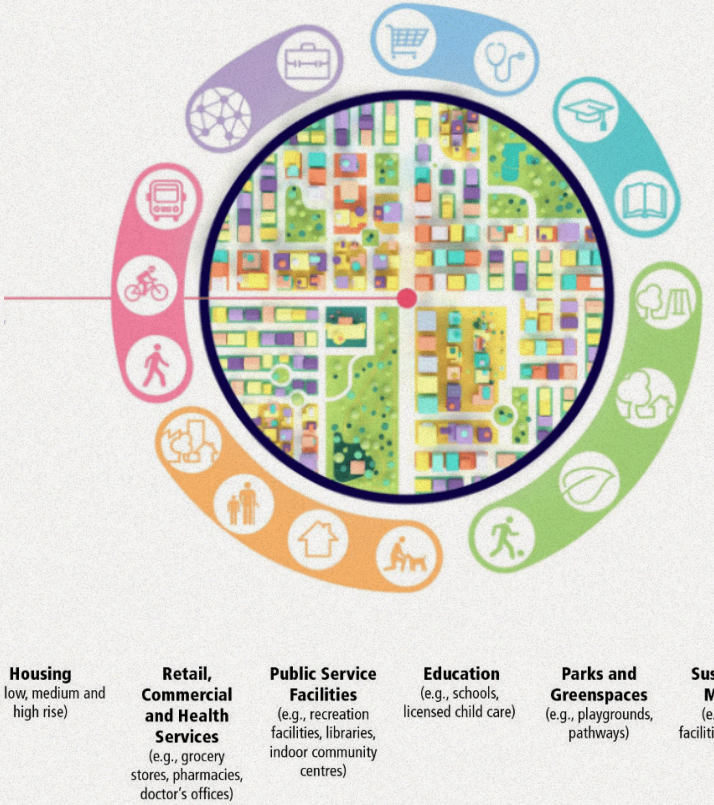
Compared to doughnut economics, the 15-minute city theory focuses more on urban functions themselves. It emphasizes that community design should be multifunctional - integrating living, working, shopping, education, healthcare, and entertainment, thus creating conditions for mixed-use spaces.I think it is precisely this high-density, compact functional structure that can optimize land use, reduce transportation needs, and improve urban efficiency.

Besides spatial planning, the 15-minute city theory believes that developing residents' awareness should also be emphasized. Green transportation systems such as walking, cycling, and public transport are encouraged to be used as priorities in this framework, as they provide possibilities for creating a more inclusive and livable urban environment.

Meanwhile, this framework also supports remote work and service access, encouraging residents to actively participate in urban planning and decision-making processes. As we can see, these practices not only meet residents' needs, but their deeper meaning is to develop community awareness and sense of belonging, as well as reduce unnecessary commuting needs.

15-Minute City Theory
Text

NEW CONCEPTS :



15-Minute City Theory
Visualization

NEW CONCEPTS :

Based on the 15-minute city theory, Duany and Steuteville (2021) further provided a specific implementation framework for its quantification. The measurement scale of this framework focuses on walking and cycling, two travel modes that are not affected by infrastructure development, reflecting the core concept of “people-oriented”.

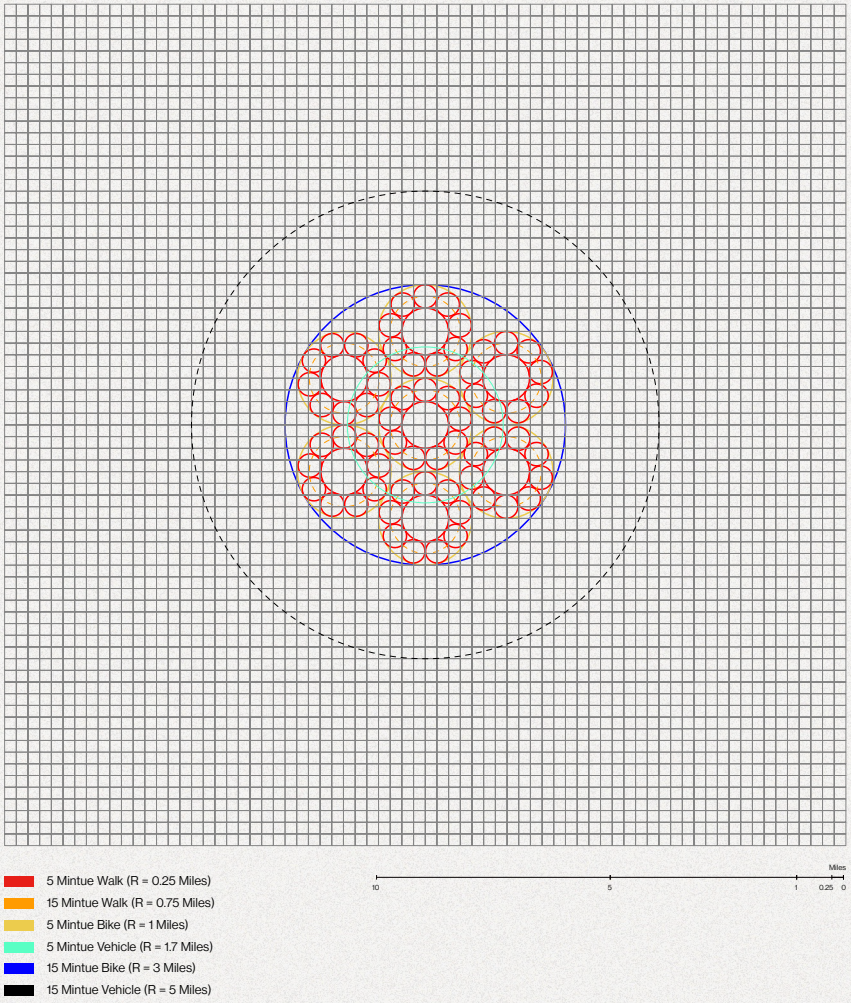
They divided the 15-minute city theory into three different hierarchical layers: the 5-minute walking layer, the 15-minute walking or 5-minute cycling layer, and the 15-minute cycling layer.

Through specific layer divisions, we can see that although 15-minute walking and 5-minute cycling are within roughly the same scale range, there is still some degree of misalignment.

Therefore, Duany and Steuteville (2021) made further subdivisions, splitting the 5-minute cycling layer into 10-minute and 5-minute walking layers, using a 9+1 concentric combination method to manage the conversion rate between different levels of urban grid layers.

Organization of Sheds
Text

NEW CONCEPTS :



Organization of Sheds
Visualization

NEW CONCEPTS :

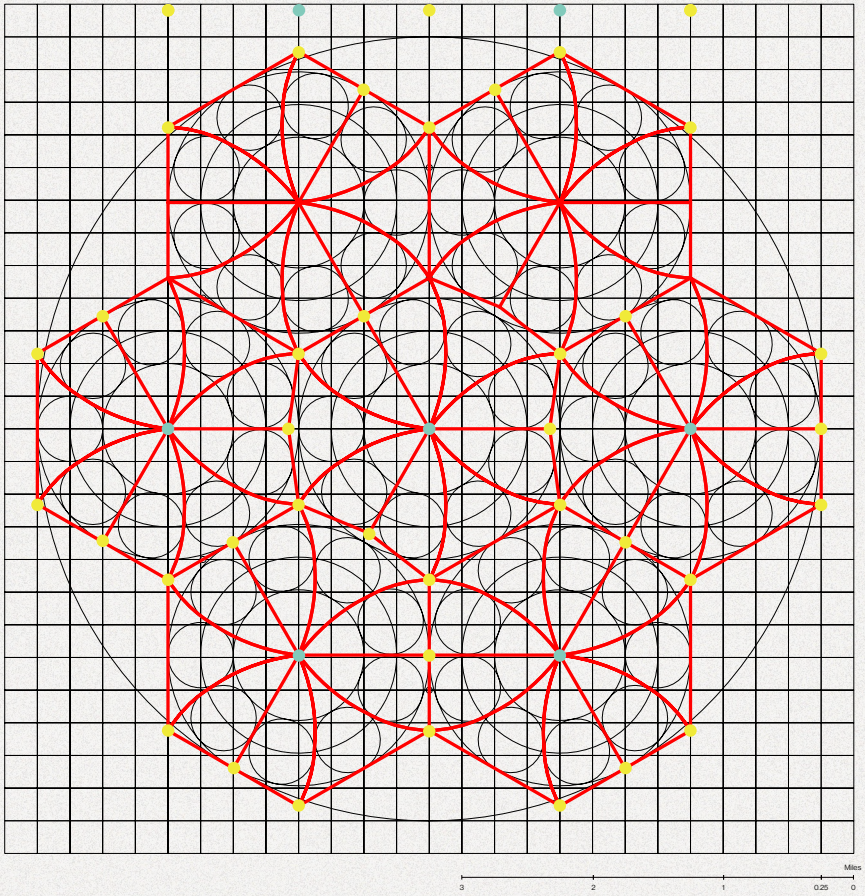
However, in reality, “border vacuums” may occur between layers, which means the interaction between adjacent blocks is hindered by obstacles such as main roads. Meanwhile, industrial facilities or large campuses may create “pedestrian shadows” with lower accessibility.

Therefore, Duany and Steuteville suggest that planners should plan traffic routes more wisely to minimize these negative effects.

They particularly emphasized the concept of “complete streets”, meaning streets should be designed for all users (pedestrians, cyclists, buses, and cars) to improve overall accessibility.

Connection
Text

NEW CONCEPTS :



Connection
Visualization

NEW CONCEPTS :

It is worth noting that this framework is not a rigid structure that cannot be changed. Instead, it leaves considerable flexibility for adjusting urban layer planning.

By only outlining the approximate range and layer functions, rather than strictly defining specific grids for each layer, this framework leaves sufficient space for both downward and upward design expansion.

This flexibility allows the framework to adapt to different cities' unique needs and geographical conditions.

Duany and Steuteville emphasize that this framework can be applied to urban environments of various scales, from villages to metropolitans, only requiring adjustments to layer sizes and function allocation according to specific situations.

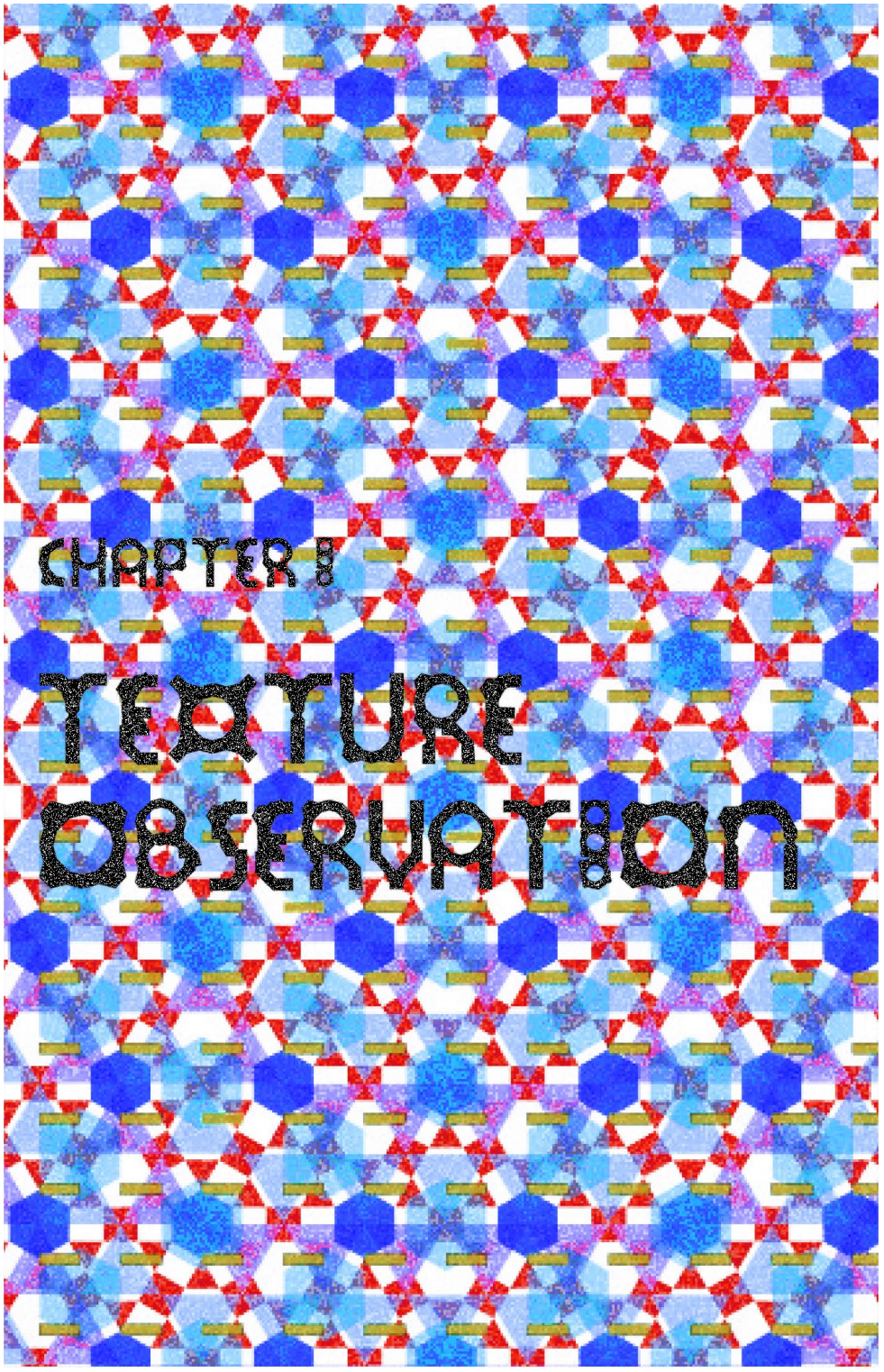
Functions of Sheds
Visualization

NEW CONCEPTS :

	Transit	Medical	Education	Public Facility	Park	Accomdation
5 Mintue Walk (R = 0.25 Miles) 2600 2.6/Unit				Small Businesses	Square Main Street	Ranges of House Typing
15 Mintue Walk (R = 0.75 Miles) 5 Mintue Bike (R = 1 Miles) 23500 2.6/Unit	Transit (≥1 Stop	Pharmacy	Public School	Larger Businesses Grocery Store General Merchandise	Larger Park	Ranges of House Typing
15 Mintue Bike (R = 3 Miles) 376500 2.6/Unit	Intercity Transit	Medical Facility	Higher Education Facility	Major Employers Major Cultural Facility	Regional Park	Ranges of House Typing

Functions of Sheds
Visualization

CRITICAL RESEARCH PAPER



1 - 3

APPLICATION CASES

:

" Embodiment of Urban Circles in Design "

APPLICATION CASES :

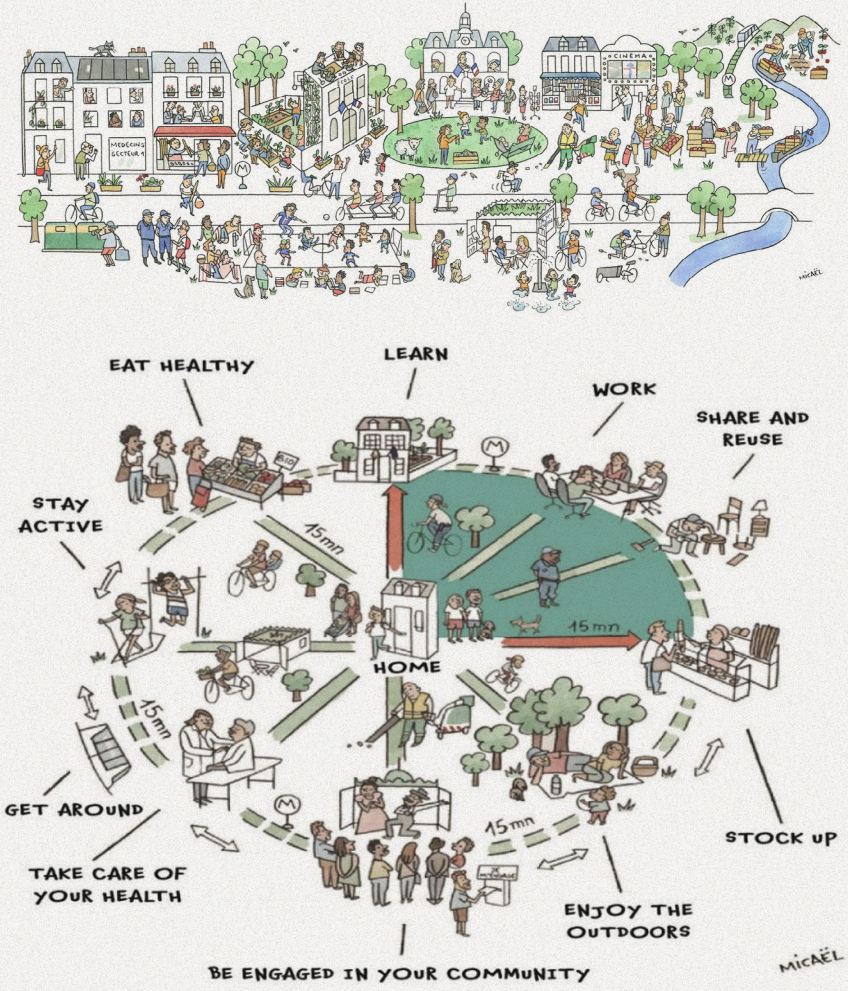
In actual urban planning and construction, the 15-minute city theory has been widely applied.

As the first city to practice the 15-minute city theory, Paris aims to transform the city into a series of self-sufficient communities and ensure 15-minute accessibility between communities.

This can actually be seen as a trend of developing functional complexity in small layers.

Application in Paris
Text

APPLICATION CASES :



Application in Paris
Visualization

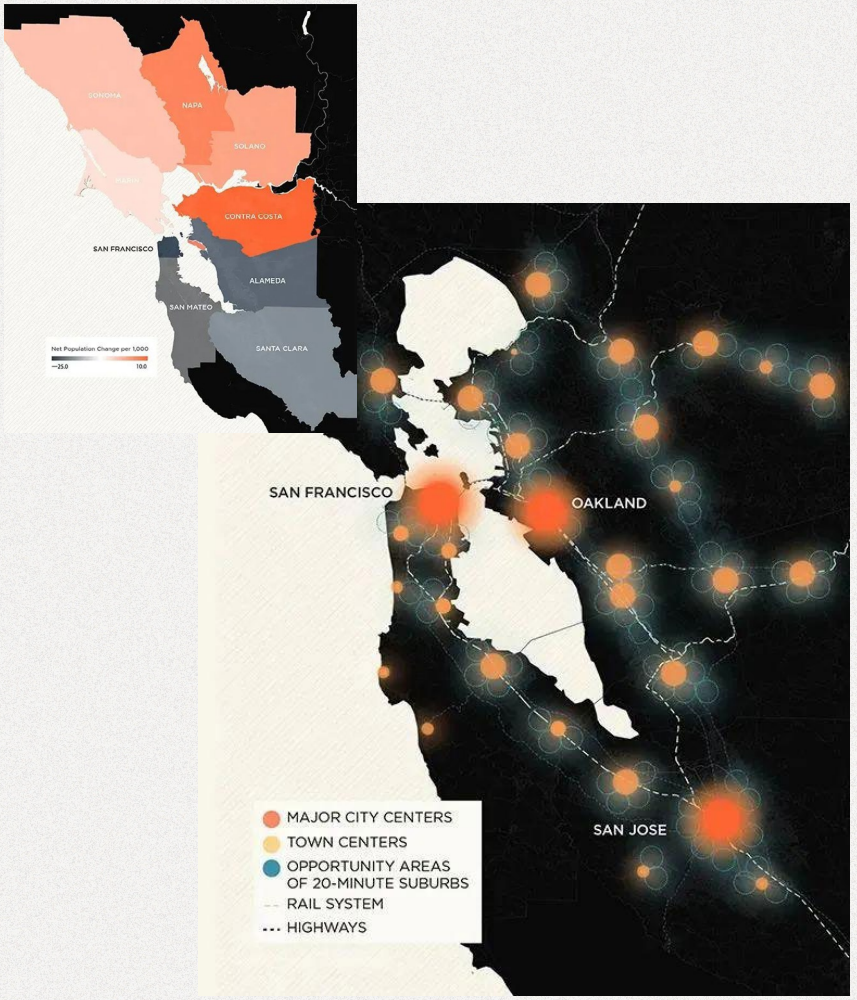
APPLICATION CASES :

The “20-minute” suburb studied by SOM is actually an extension of the 15-minute city theory. From their planning of the Bay Area, we can see that the entire plan divides the region into a series of suburbs within 20-minute driving distance, connecting city centers and town centers through transportation.

This can be seen as a demonstration of creating functional complexity and accessibility in small layers, and achieving the connection of large layers based on this foundation.

Application in CA Bay Area
Text

APPLICATION CASES :



Application in CA Bay Area
Visualization

APPLICATION CASES :

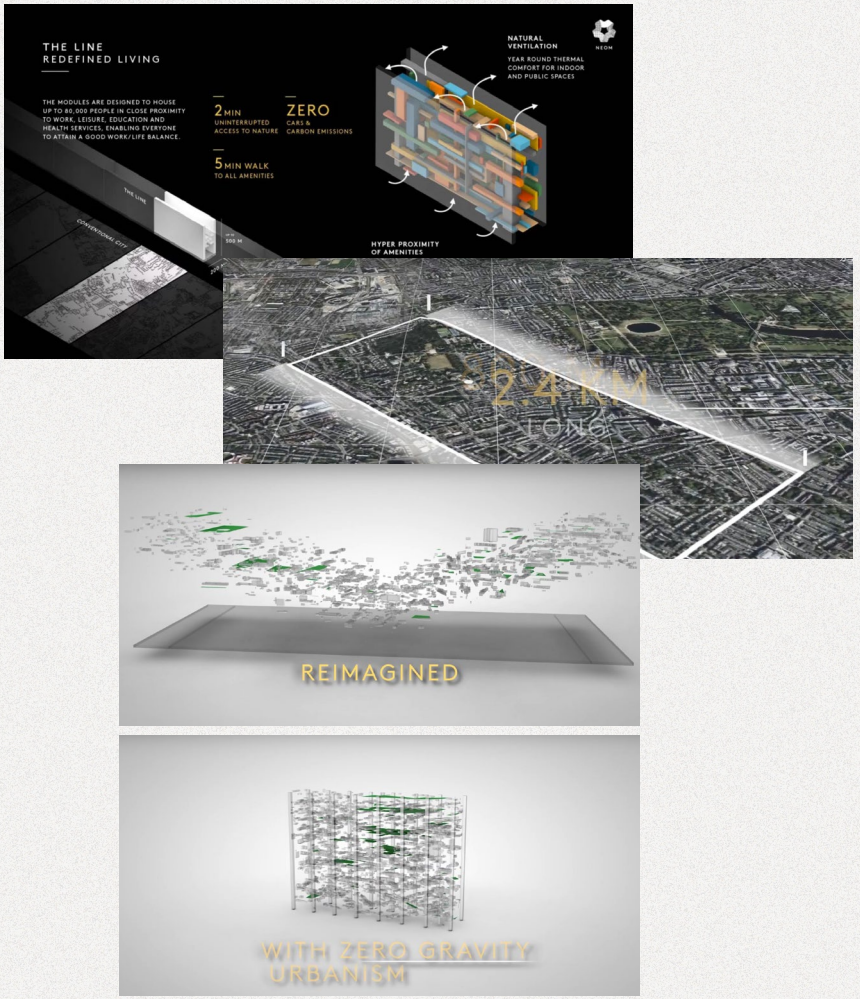
The Line project in Saudi Arabia is one of the recent designs that breaks through circular planning. It linearly connects three 5-minute layers, while adopting a stacking approach in the vertical direction to achieve high-density, multifunctional community design, thus ensuring all daily needs are within a 5-minute walking range.

From the practices of Paris to The Line project, we can see that urban layer theory is seeking a more flexible way of spatial organization.

However, to achieve this flexibility, we need a design tool that can satisfy both systematic and adaptive require-ments. This has led me to focus on another common feature in cities - fractals.

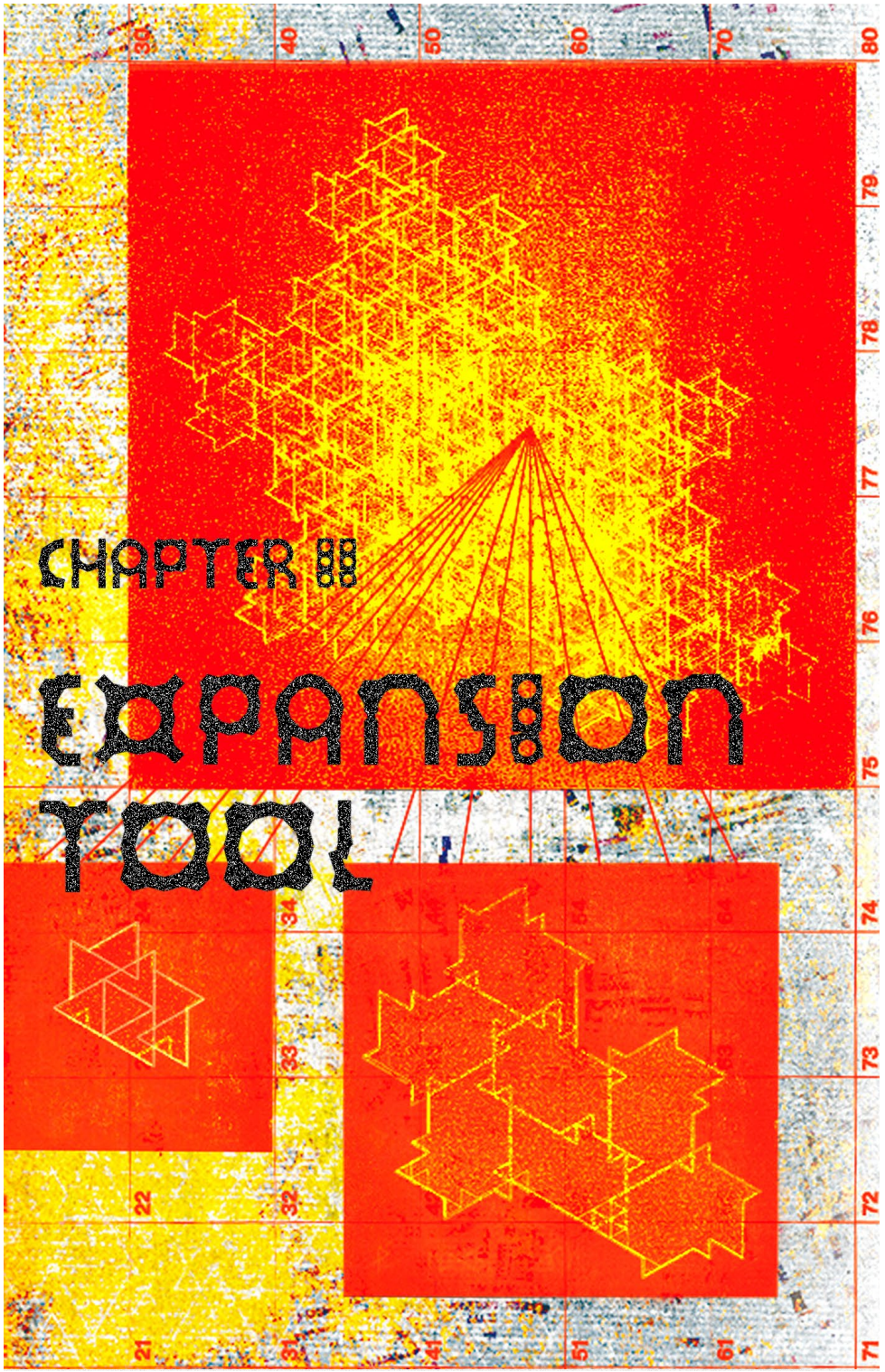
Application in "Line"
Text

APPLICATION CASES :



Application in "Line"
Visualization

CRITICAL RESEARCH PAPER



2 - 1

INTERNAL LOGIC

:

" Fractal Characteristics and Urban Development "

INTERNAL LOGIC :

During my research on urban texture, a recurring phenomenon caught my attention - whether it's Venice's water network or Tokyo's subway system, they all show certain fractal characteristics.

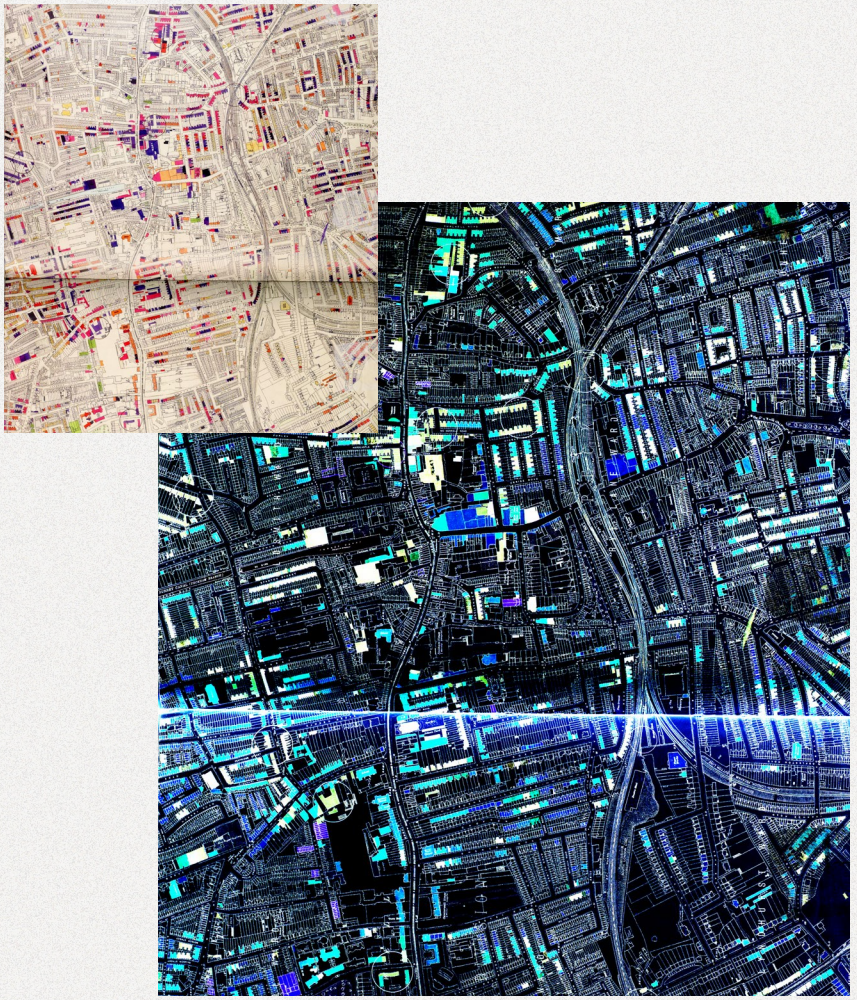
This reminds me of many images, suggesting that this phenomenon exists widely not only in human society but also in nature. I think these fractal characteristics are not just a visual phenomenon, but rather an internal logic of organic urban development.

I once lived in the Peckham area of London, where many Londoners said it was one of the most vibrant districts in London. When I investigated the urban texture of this area, I found they all showed characteristics of spontaneous growth and mutual penetration, like a huge fractal system. This observation made me think: does naturally growing urban texture have more vitality than planned grids?

Through their observations of urban forms, Batty and Longley (1994) systematically pointed out that cities show certain fractal characteristics during their development process.

Based on this, Batty (2013) further combined fractal theory with complex system theory and explained why fractal characteristics meet urban needs.

INTERNAL LOGIC :



INTERNAL LOGIC :

First, the diverse of fractal structures meet marginal concerns in urban development. Frankhauser (1998) believed that the self-similarity of fractal structures allows it to show similar structures at different scales, which can accommodate urban diversity at different levels.

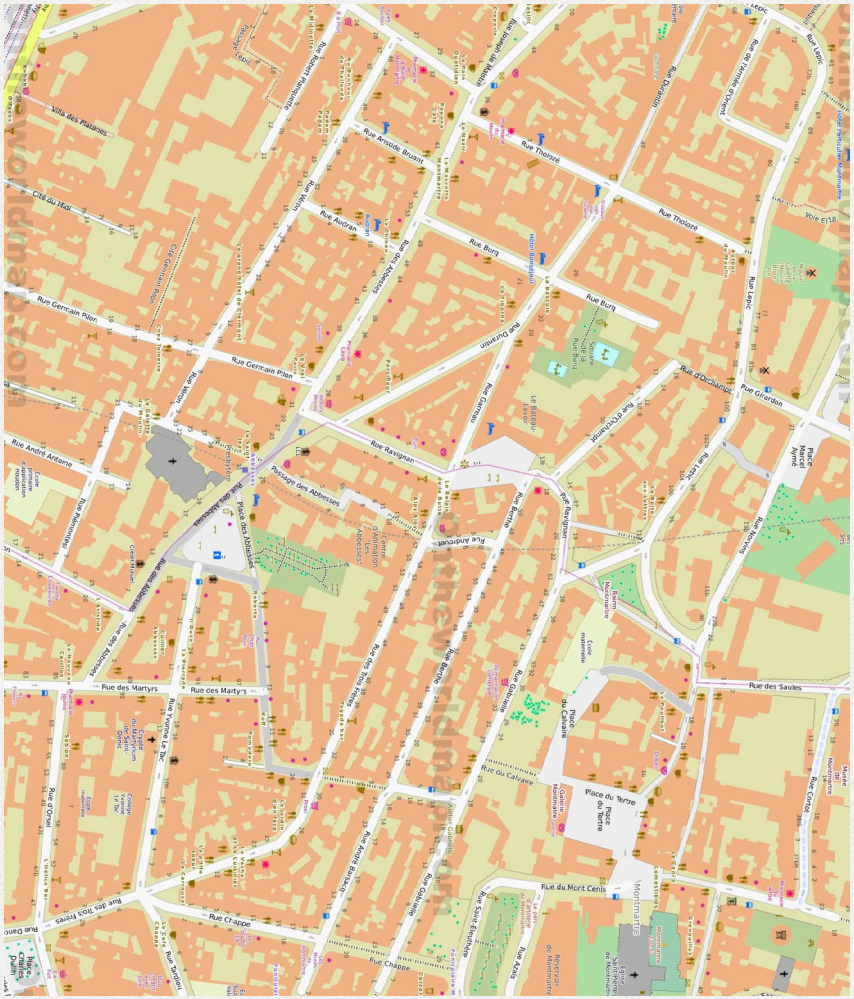
Panerai et al. (2004) also responded to this, stating that urban forms should indeed accommodate communities of different sizes to promote social diversity.

Building on this, Feliciotti et al. (2016) further emphasized that urban design should focus on the needs of marginalized groups and provide communities and facilities of different scales, which matches the adaptability of fractal structures at different levels.

These marginal concerns are fully demonstrated in the Montmartre district of Paris. The unique street network of this area has formed public spaces of different scales, from narrow alleys to squares, from cafes to theaters, with each level serving different community needs, showing how fractal structures promote the development of urban diversity.

Marginal Concerns
Text

INTERNAL LOGIC :



Marginal Concerns in Paris
Visualization

INTERNAL LOGIC :

Second, the universality of fractal structures meets the continuity needs in urban development. Alexander, Ishikawa, and Silverstein (1977) believed that the universality of design is shown in its ability to be applied and combined at different scales and contexts.

This echoes Portugali's (2000) view that the complexity and richness of fractal structures can accommodate various functions and forms, ensuring the coherence of urban structures at different levels.

Venice's urban structure perfectly demonstrates this universality, as its water and land networks form a multi-level connection system from grand canals to water alleys, from St. Mark's Square to neighborhood spaces.

This fractal-like spatial hierarchy both ensures the city's overall coherence and adapts to different areas' functional needs, enabling Venice to maintain strong adaptability throughout centuries of development.

Universality
Text

INTERNAL LOGIC :

Universality in Venice
Visualization

INTERNAL LOGIC :

Finally, the iterative characteristic of fractal structures reflects the dynamic evolution process of urban development.

Marshall (2009) pointed out that urban design should be adaptive and gradual, able to respond to urban changes through local adjustments and iterations.

This view is similar to Batty's (2013) description that cities are complex adaptive systems, with evolution processes having iterative and self-organizing features.

Additionally, Salat et al. (2014) supplemented this view - the adaptability and flexibility of fractal structures can allow local changes while maintaining overall characteristics.

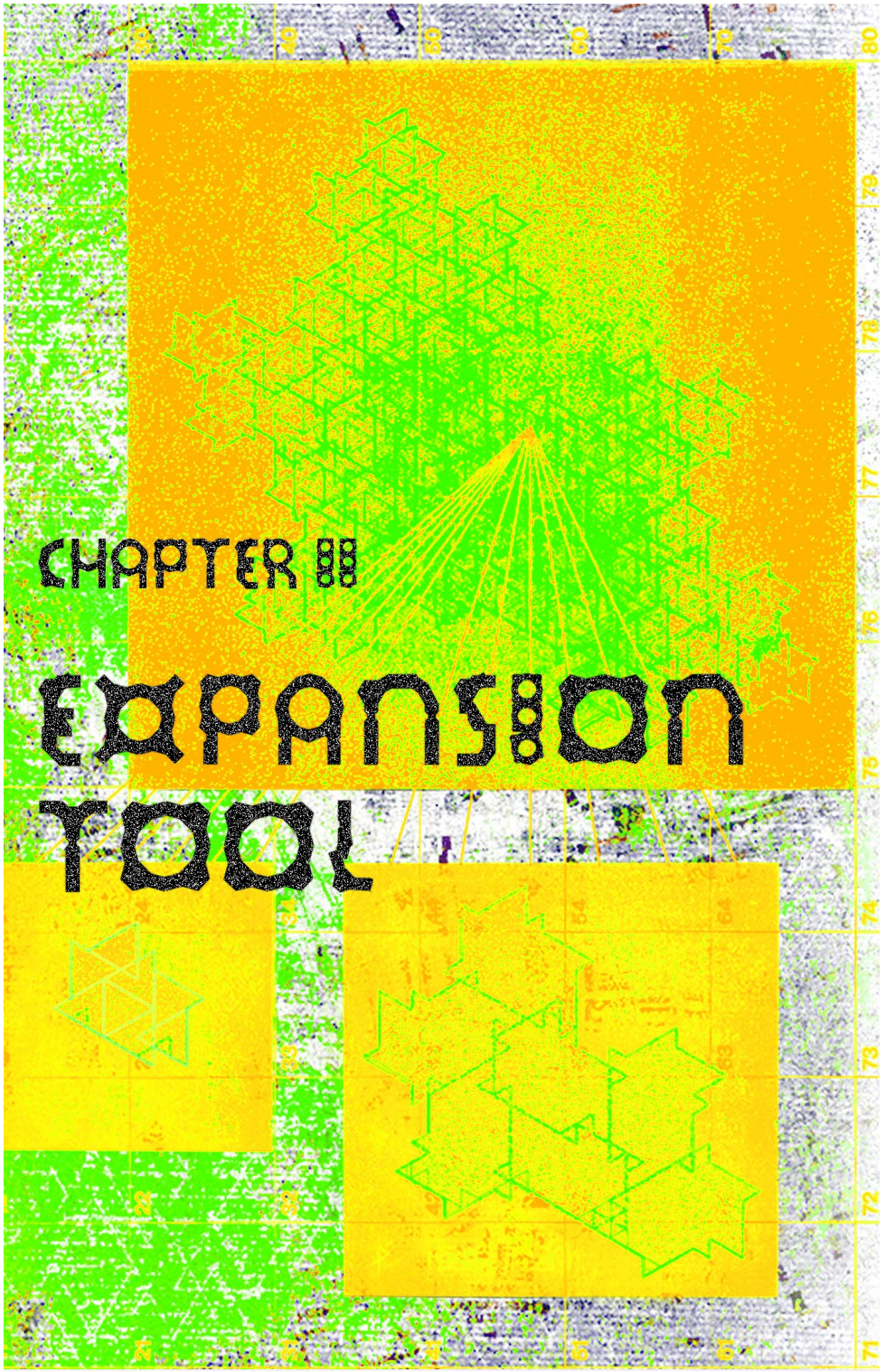
If we need a specific example, Tokyo's urban evolution best demonstrates this iterative nature. Taking Shibuya Station as an example, its surrounding district's subway network, commercial facilities, and pedestrian bridge system were actually built at different times.

Through continuous layering, they have formed today's complex yet orderly urban space. This gradual development model has both maintained the city's vitality and avoided the damage caused by large-scale reconstruction.

Iterability
Text

INTERNAL LOGIC :

Iterability in Tokyo
Visualization



2 - 2

NEW TOOL

:

“ Urban Design Application of Hat Polykite ”

NEW TOOL :

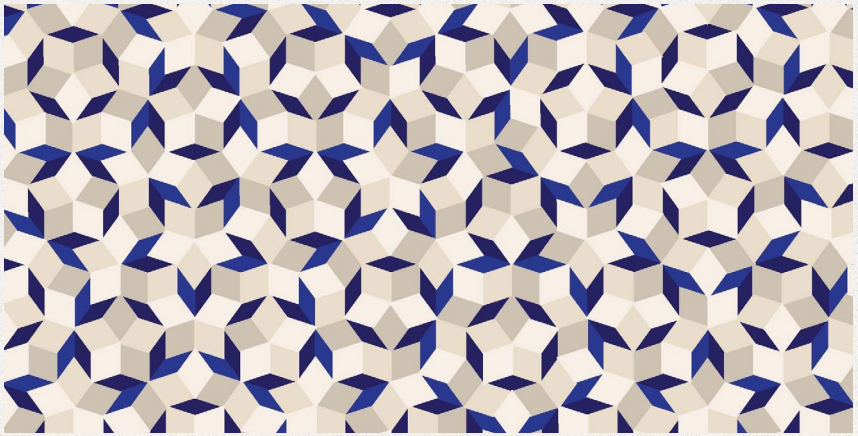
The core value of Hat Polykite as a new spatial organization tool lies in its ability to systematically apply fractal characteristics to urban design. Mandelbrot (1982) had already proposed the idea of applying fractal geometry to urban studies in “The Fractal Geometry of Nature”, laying the foundation for subsequent research.

Later, Salingaros’s (2005) study on fractal interfaces and African town network structures also helped promote the application of fractal elements in urban design.

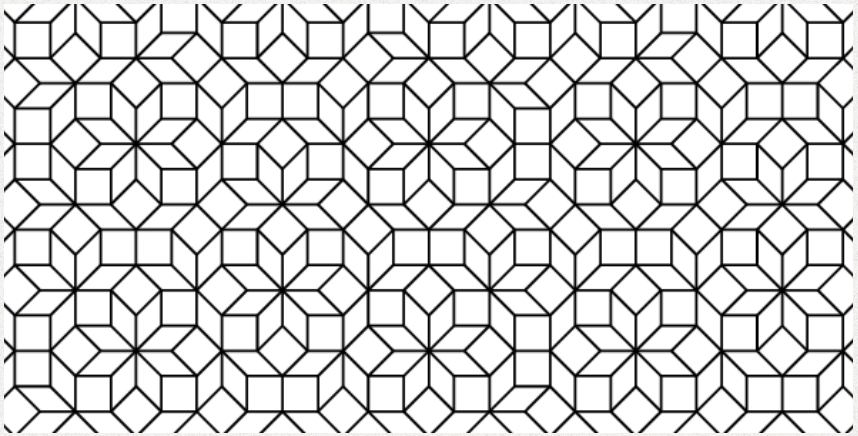
Following this line of thinking, Baake and Grimm (2013) suggested trying to use non-periodic patterns with special mathematical properties, such as Penrose tiles or Ammann-Beenker tiles, for spatial practice, adding innovation to urban texture design methods.

These studies provided important theoretical support for the application of Hat Polykite, enabling it to systematically integrate controllable fractal structures into urban design, thus providing an ideal carrier for implementing the 15-minute city theory.

NEW TOOL :



Penrose Tiles



Ammann-Beenker Tiles

NEW TOOL :

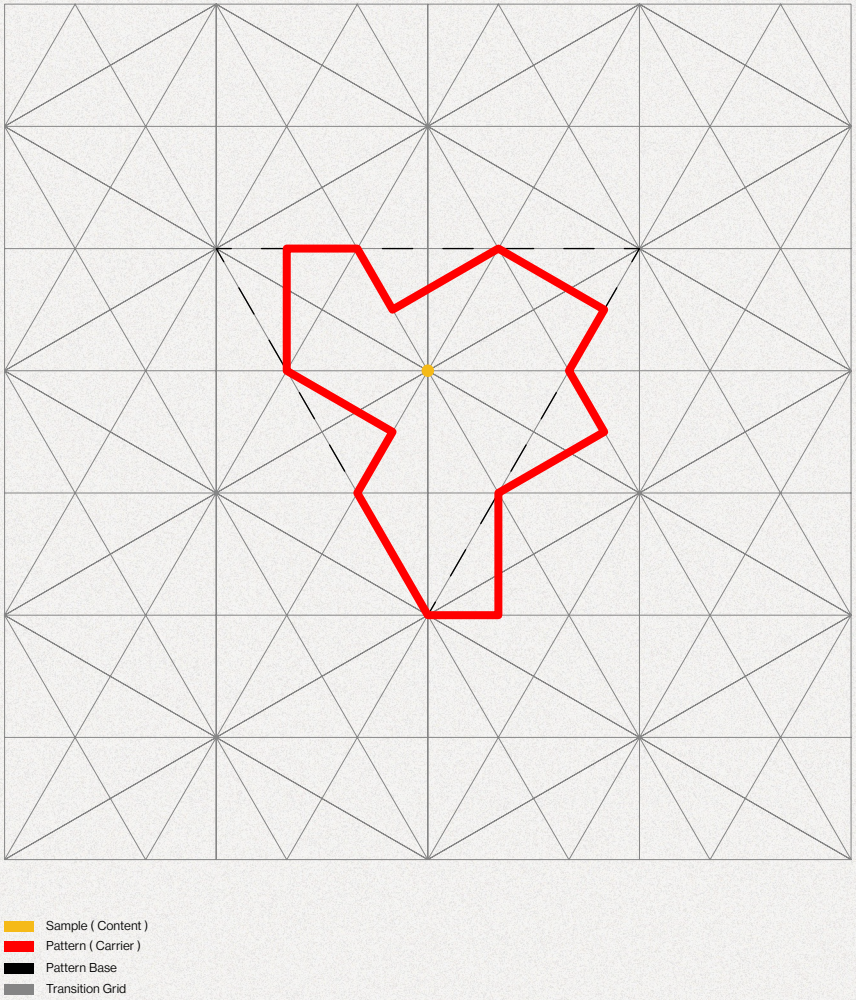
In recent years, the Hat Pattern discovered by Smith et al. (2023) has provided a breakthrough in spatial organization thinking.

The structural characteristics of Hat Polykite are reflected in its unique dual framework. First is the “carrier” part, which ensures systematic organization while introducing controllable complexity, showing typical fractal characteristics.

These fractal characteristics highly align with the inner needs of urban development, making Hat Polykite naturally suitable for urban development needs and capable of deconstructing complex functional forms.

Hat Polykite
Text

NEW TOOL :



Hat Polykite
Visualization

NEW TOOL :

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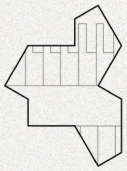
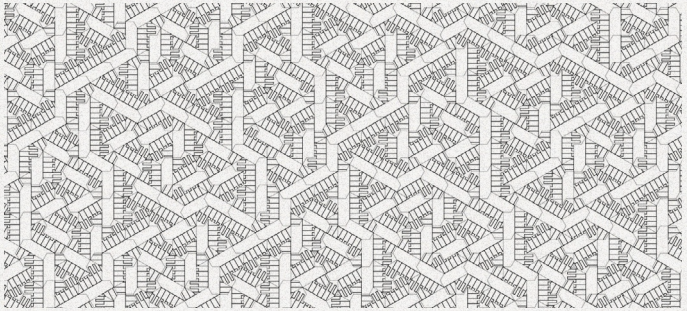
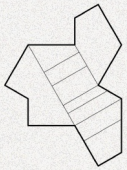
NEW TOOL :

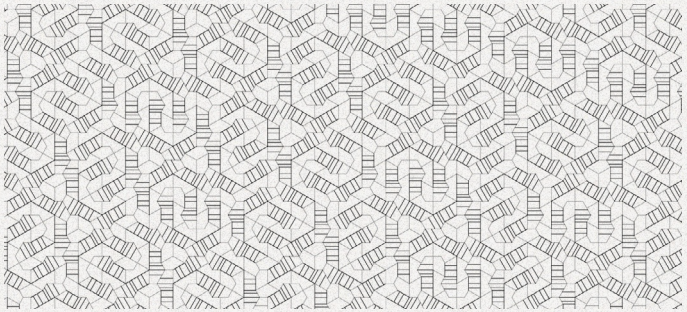


Sample 01

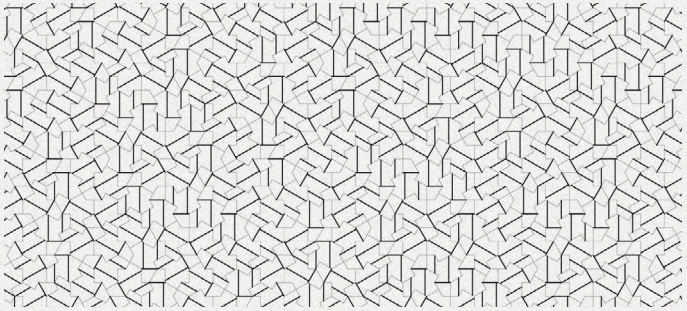




Sample 02



Sample 03



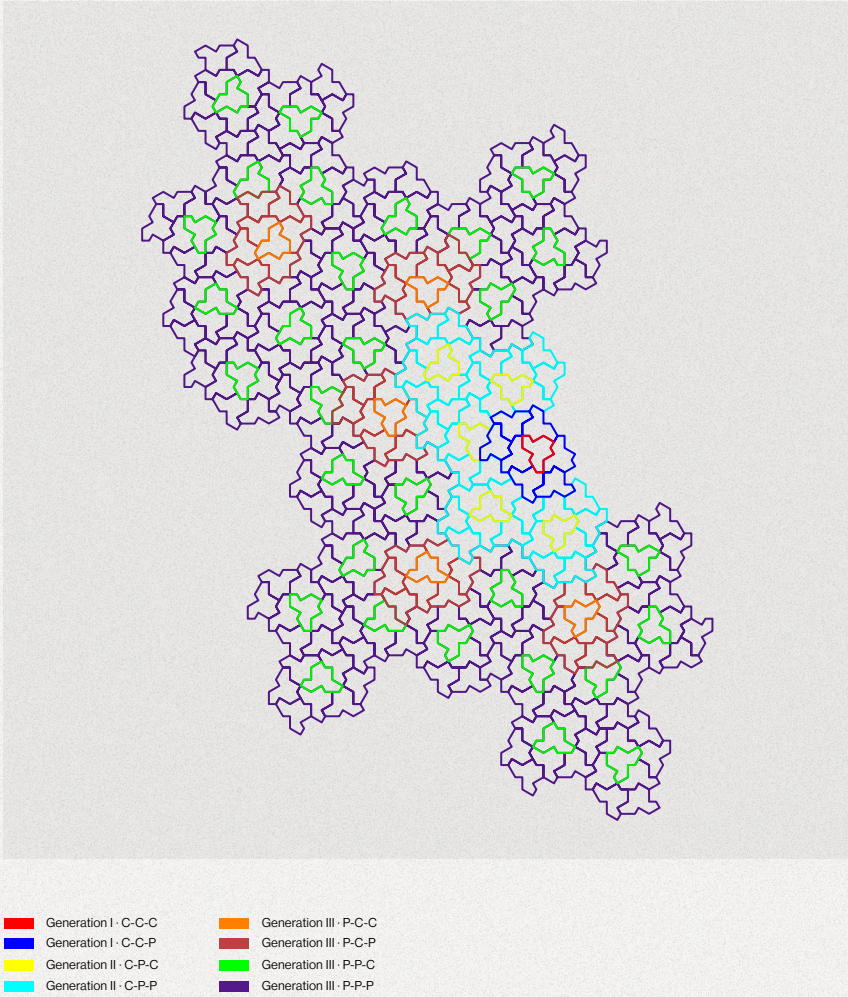
NEW TOOL :

It should be noted that the “carrier” of Hat Polykite is realized through two basic organization modes. The combination units in General Mode are divided into iterative units (composed of 7 basic units) and non-iterative units (composed of 6 basic units).

Through observation, we found that the iterative coverage area on the Y-axis is much larger than that on the X-axis, showing advantages of linear development, and the block structure maintains excellent similarity at different scales.

General Mode
Text

NEW TOOL :



General Mode
Visualization

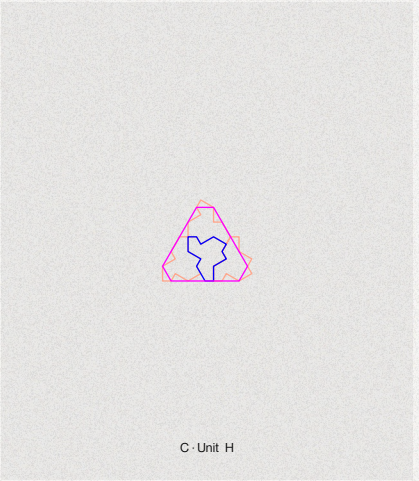
NEW TOOL :

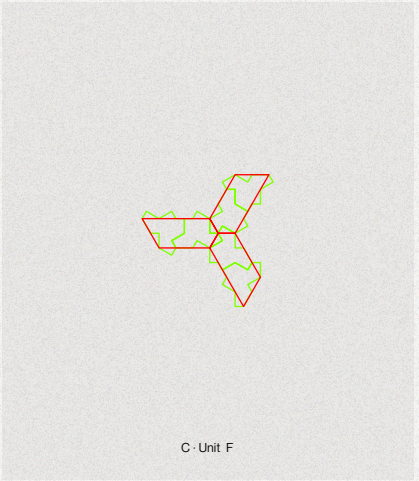
The Concentric Mode includes four basic unit types: H, T, P, and F, among which the H unit has dual functions - it can serve both as a contemporary output unit and combine with other basic units to form new combination units.

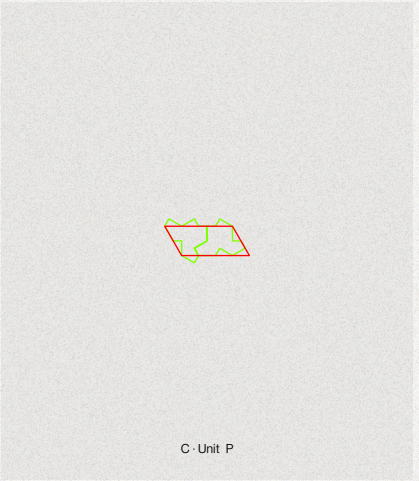
This mode shows typical fractal characteristics, with relatively uniform coverage area in all directions and a clearly identifiable “center” position. However, the block structure gradually develops differences during continuous fractal processes.

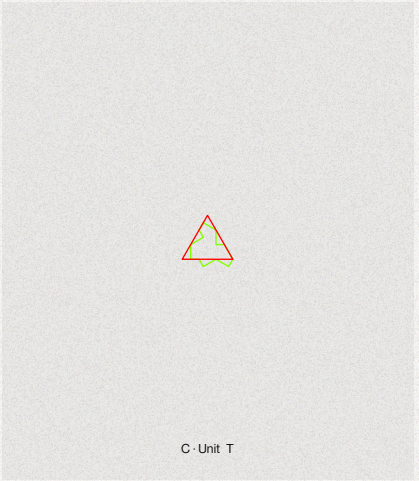
Concentric Mode
Text

NEW TOOL :



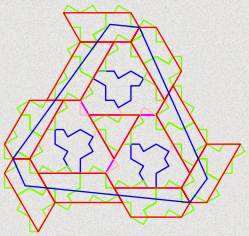




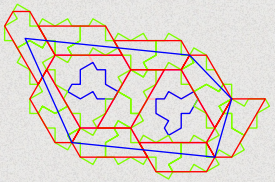


Concentric Mode · Unit
Visualization

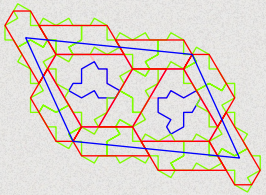
NEW TOOL :



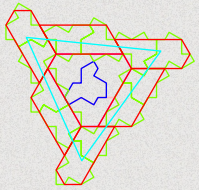
C · Genergation I · Unit H



C · Genergation I · Unit F



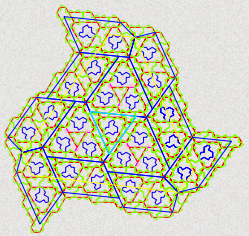
C · Genergation I · Unit P



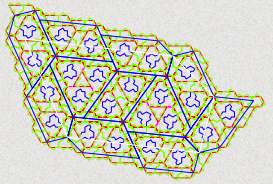
C · Genergation I · Unit T

Concentric Mode Generation I · Unit
Visualization

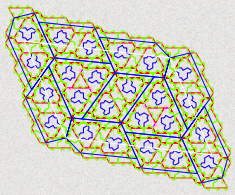
NEW TOOL :



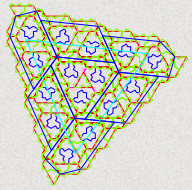
C · Genergation II · Unit H



C · Genergation II · Unit F



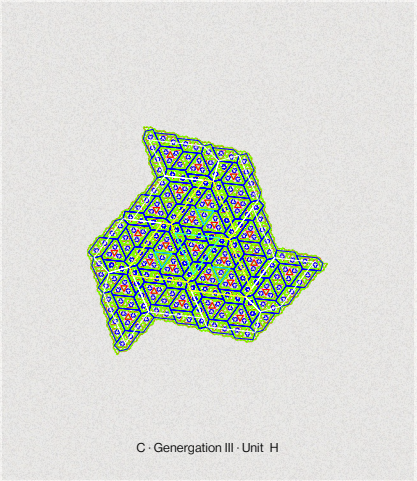
C · Genergation II · Unit P



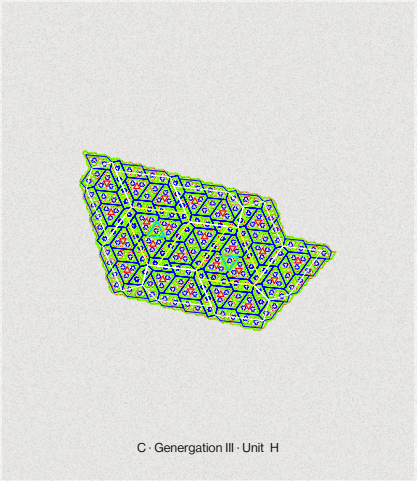
C · Genergation II · Unit T

Concentric Mode Generation II · Unit
Visualization

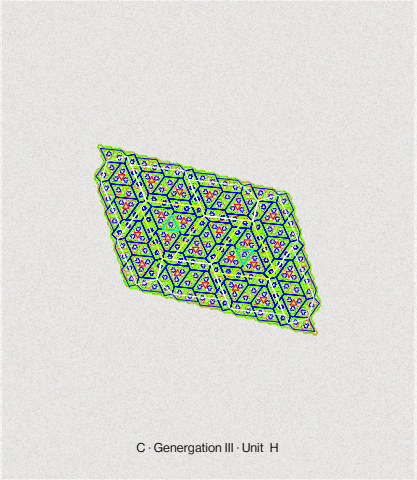
NEW TOOL :



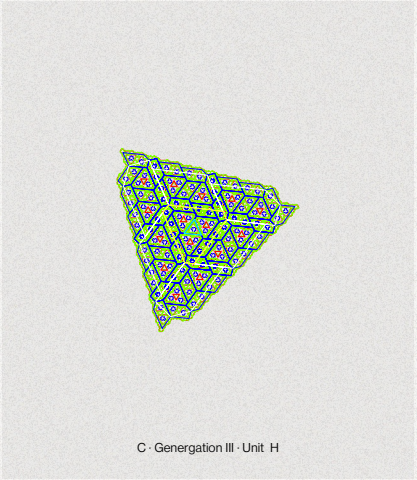
C · Genergation III · Unit H



C · Genergation III · Unit H



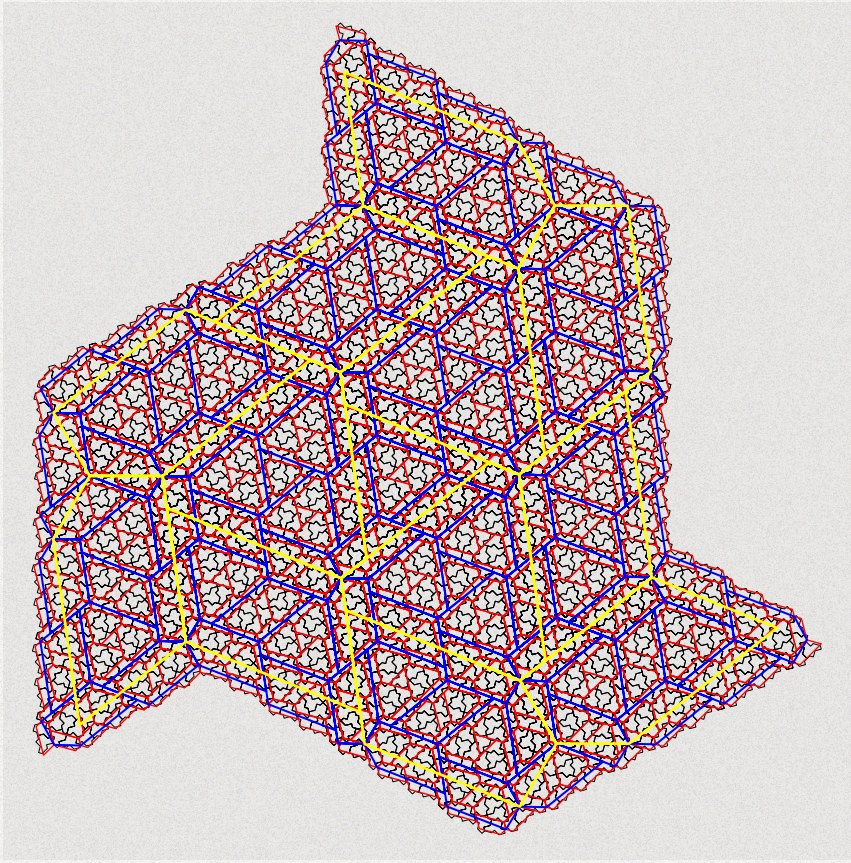
C · Genergation III · Unit H



C · Genergation III · Unit H

Concentric Mode Generation III · Unit
Visualization

NEW TOOL :



Basic Unit
Generation I
Generation II
Generation III

Concentric Mode Generation III
Visualization

NEW TOOL :

In practical applications, Hat Polykite shows significant advantages through this dual structure:

First is its multi-scale integration ability, which achieves seamless connection from block to community to city level through fractal characteristics, avoiding the common scale transition problems in traditional planning.

Second, its unique regional adaptability allows it to sample local texture characteristics, making new planning visually unified with existing urban texture.

Most importantly, Hat Polykite achieves a balance between systematic and flexible approaches - the General Mode provides a framework for linear development, while the Concentric Mode offers a center-radiating structure, and both modes can be flexibly selected and adjusted according to specific needs.

Advantages
Text

NEW TOOL :

However, to fully realize the potential of Hat Polykite, I think we need to answer three core questions to test its adaptability in different urban environments:

First, can Hat Polykite effectively adapt to urban environments of different scales and types?

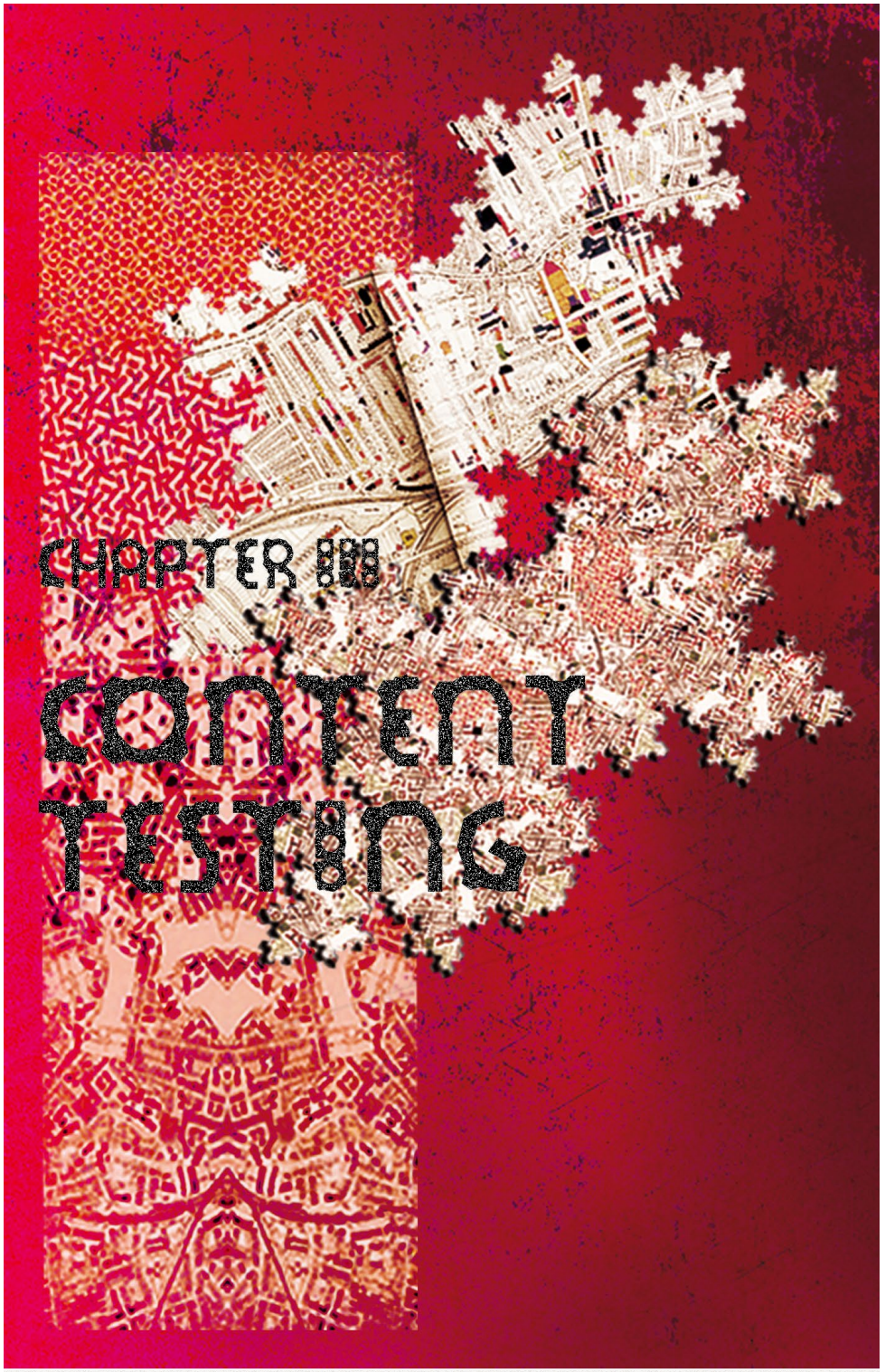
Second, can its fractal characteristics maintain continuity in practical applications?

Third, does this tool have enough flexibility to respond to dynamic urban changes?

The answers to these questions will determine whether Hat Polykite can truly become an effective tool connecting urban theory and practice.

This leads to our next chapter, where we will discuss how to scientifically validate the effectiveness of Hat Polykite in practical applications.

Tests of Hat Polykite
Text



3 - 1

CONTENT VALIDATION

:

" From Theory to Practice "

CONTENT VALIDATION :

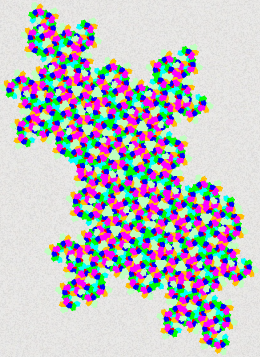
First, the maginality test evaluates the compatibility of fractal structures. I selected the Peckham area as a sampling prototype for large-scale research, following the research method of Dibble et al. (2017) to analyze the complexity of urban texture through listing multi-scale morphological measurements.

The test aim is to observe when using Hat Polykite's General Mode for organization, by establishing four different scale sampling units (B/S/M/L) in the Peckham area for multi-scale sampling, to verify whether different sampling examples under the same framework can cover communities of different scales.

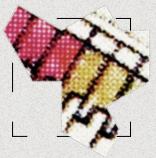
The test results show that the urban texture generated from Peckham sampling maintains original characteristics while improving regional accessibility and functional mix, confirming that Hat Polykite can effectively address marginalized groups and promote social equity.

Maginality Test
Text

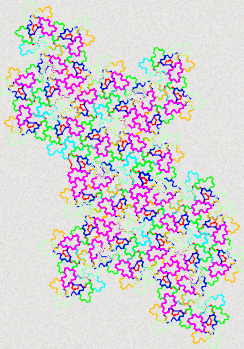
CONTENT VALIDATION :



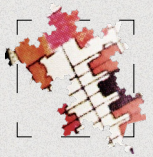
Sampling Unit - Generation I



Sampling Unit - Output 01



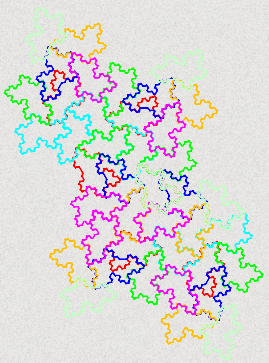
Sampling Unit - Generation II



Sampling Unit - Output 02

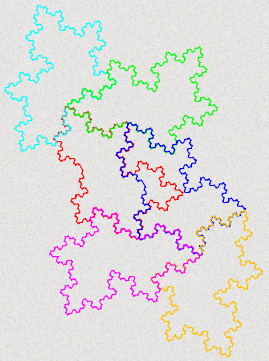
Maginality Test 01/02
Visualization

CONTENT VALIDATION :



Sampling Unit - Generation III

Sampling Unit - Output 03



Sampling Unit - Generation IV

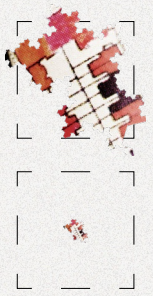
Sampling Unit - Output 04

Maginality Test 03/04
Visualization

CONTENT VALIDATION :

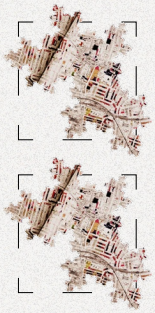
Sampling Target < Peckham>

Sampling Unit - Output 01



Sampling Unit - Output 02

Sampling Unit - Output 03



Sampling Unit - Output 04

Maginality Test
Visualization

CONTENT VALIDATION :

Second, the universality test evaluates the continuity of fractal structures. Using different urban textures generated from the edge test as a foundation, and drawing on the research of Levy (1999) and Marshall (2004), I assessed consistency by combining urban texture samples of different scales.

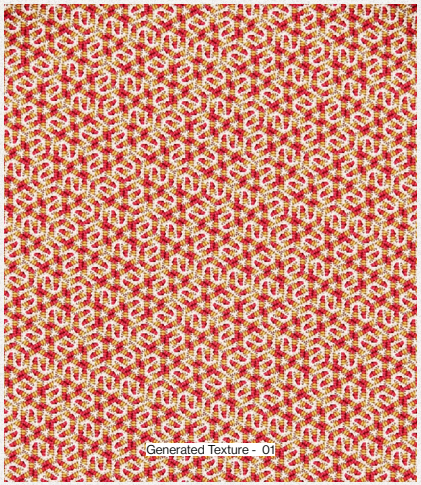
The test aim is to observe the structural continuity of urban textures generated by the unified “carrier” during combination.

The test results indicate that this tool can effectively identify and preserve the unique characteristics of each area, while optimizing spatial organization and strengthening connections between different functional areas, verifying Hat Polykite’s effective applicability in urban environments of different scales and types.

Universality Test
Text

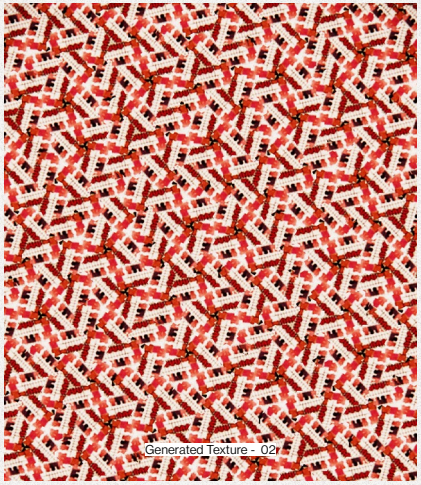
CONTENT VALIDATION :

Sampling Unit - Output 01



Generated Texture - 01

Sampling Unit - Output 02



Generated Texture - 02

Universality Test 01/02
Visualization

CONTENT VALIDATION :

Sampling Unit - Output 03

Generated Texture - 03

Sampling Unit - Output 04

Generated Texture - 04

Universality Test 03/04
Visualization

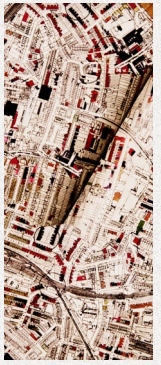
CONTENT VALIDATION :

Mix Texture < Peckham>

Generated Texture - 01

Generated Texture - 02

Generated Texture - 03



Generated Texture - 04

Universality Test
Visualization

CONTENT VALIDATION :

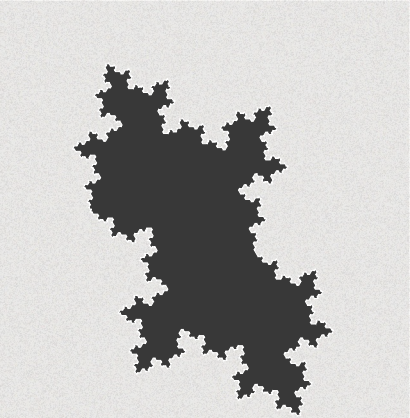
Finally, the iterativity test evaluates the flexibility of fractal structures. Continuing to use different urban textures generated from the edge test, and drawing on Tachieva's (2010) concept of gradual urban renewal and Barnett's (2016) emphasis on urban design adaptability, I replaced the original urban texture through multiple small-scale iterations.

The test aim is to disturb the texture using different levels of Hat Polykite and observe its local transformation ability during evolution.

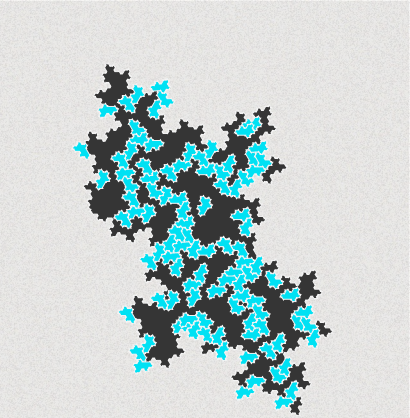
The test results show that the texture can become more complex while avoiding mechanical changes, confirming that Hat Polykite can achieve flexible local transformations and adapt to dynamic urban changes.

Iterativity Test
Text

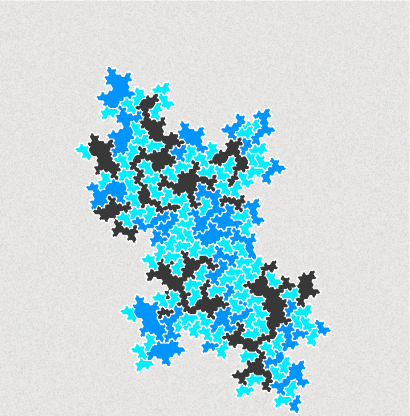
CONTENT VALIDATION :



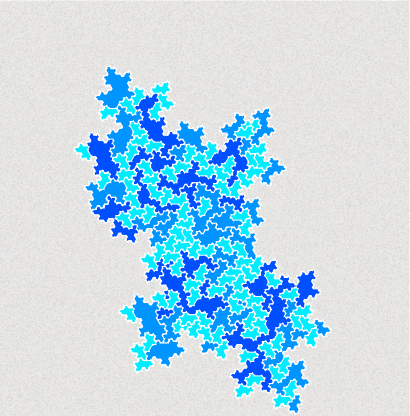
Original Texture



Iterativity Generation 01



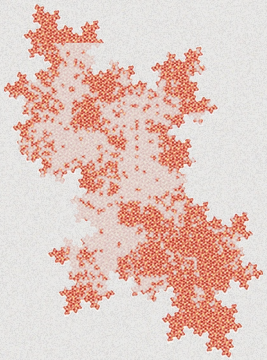
Iterativity Generation 02



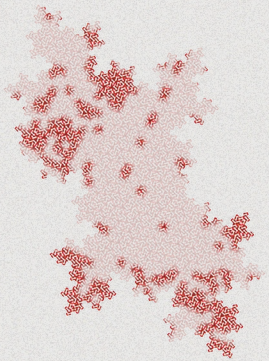
Iterativity Generation 03

Iterativity Test 01
Visualization

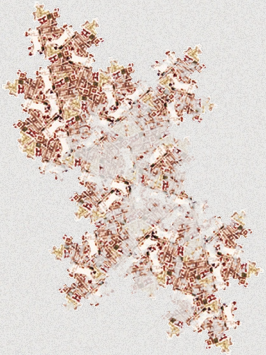
CONTENT VALIDATION :



Alternative Texture 01



Alternative Texture 02



Alternative Texture 03

Alternative Texture 04

Iterativity Test 02
Visualization

CONTENT VALIDATION :

Original Texture

Iterativity Generation 01

Iterativity Generation 02

Iterativity Generation 03

Iterativity Generation 04

Iterativity Generation 05

Iterativity Test
Visualization

3 - 2

CONTENT MAPPING

:

" Hat Polykite's Attachment to the 15-minute City Theory "

CONTENT MAPPING :

Hat Polykite can serve as a mapping object for the 15-minute city theory because they both share matching fractal characteristics and similar grid structures.

First, Hat Polykite's fractal characteristics highly align with the multi-level layer concept in the 15-minute city theory. If we consider the layers mentioned in Duany and Steuteville's (2021) quantification framework as a type of grid hierarchy, we can find that they are essentially a fractal structure - each large layer is composed of smaller layers, a characteristic that matches Hat Polykite's fractal structure.

Second, Hat Polykite and the 15-minute city theory show high similarity in grid structure. The functional distribution in 15-minute city theory needs a systematic spatial framework, and Hat Polykite's grid structure provides exactly this kind of clear spatial organization.

This similarity allows the distribution requirements for different functional facilities in 15-minute city theory to be easily converted into position arrangements in Hat Polykite's grid.

This direct mapping relationship greatly simplifies the planning process, making the transformation from theory to practice more smooth and efficient.

Grid Mapping
Text

CONTENT MAPPING :

In actual mapping operations, we need to first determine the mapping grid levels before preparing Hat Polykite's structural grid for definition. According to Duany and Steuteville's (2021) quantification framework, urban layers in 15-minute city theory are divided into three levels:

A central area plus six surrounding areas forming a 6+1 primary urban layer with uniform sizes

A central area plus nine surrounding areas forming a 9+1 secondary urban layer with a larger central area; and all components forming secondary urban circles separately constituting tertiary urban layers.

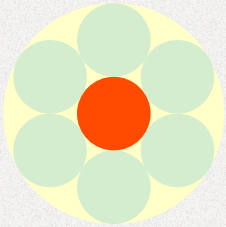
It's not difficult to observe that both Concentric Mode and General Mode can complete functional mapping for primary urban circles when serving as mapping objects.

They can serve as effective structural tools, quickly advancing mapping operations to secondary urban circles.

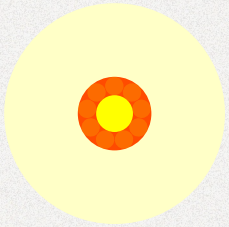
However, as mentioned before, in Concentric Mode, different areas gradually begin to show differentiation as the grid becomes finer. In fact, at this mapping stage, we can already see area differences beginning to emerge.

Grid Mapping 01
Text

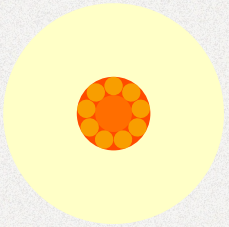
CONTENT MAPPING :



First Circle · C

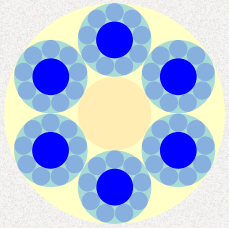


Second Circle · C-C

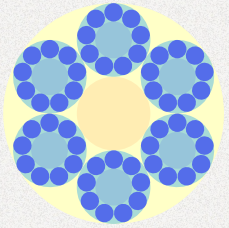


Second Circle · C-P

First Circle · P



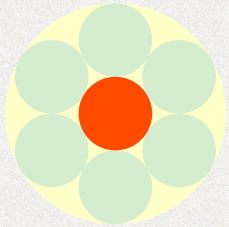
Second Circle · P-C



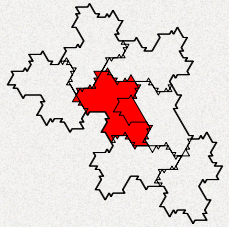
Second Circle · P-P

Grid Mapping 01
Visualization

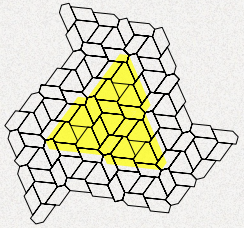
CONTENT MAPPING :



First Circle · C

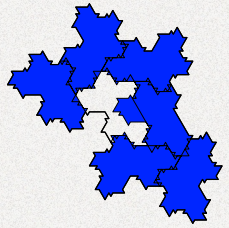


First Circle · General Mode · C

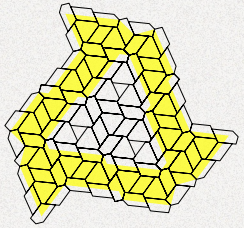


First Circle · Concentric Mode · C

First Circle · P



First Circle · General Mode · P



First Circle · Concentric Mode · P

Grid Mapping 02
Visualization

CONTENT MAPPING :

When we move to mapping the 9+1 secondary urban layer, area differentiation in Concentric Mode becomes obvious, causing differences between each area. Its performance in grid continuity begins to decline, while area diversity increases.

In contrast, General Mode can complete the 9+1 secondary layer mapping well due to its stronger structural continuity.

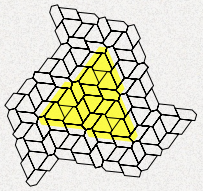
After completing the mapping of the first two grid levels, we can see that the two organization methods lead to mapping area discrepancies due to their structural differences.

So we need to consider here: what is our mapping purpose? Our goal is actually to structurally complete the 15-minute city theory, so would a more controllable system be better?

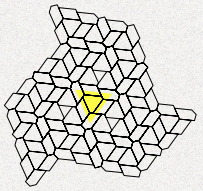
When choosing expansion, it's obvious that we should select General Mode for further exploration.

Of course, this also indirectly indicates that when our goal is to build differentiated, diverse areas, Concentric Mode has advantages.

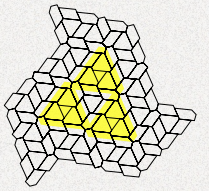
CONTENT MAPPING :



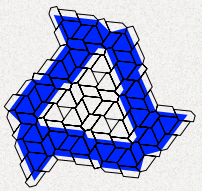
First Circle · Concentric Mode · C



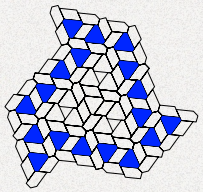
Second Circle · Concentric Mode · C-C



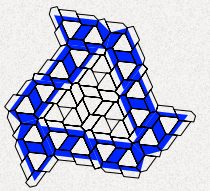
Second Circle · Concentric Mode · C-P



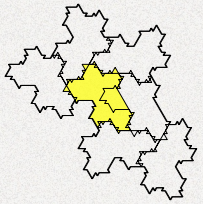
First Circle · Concentric Mode · P



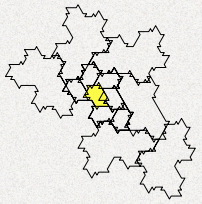
Second Circle · Concentric Mode · P-C



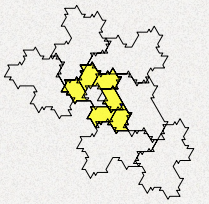
Second Circle · Concentric Mode · P-P



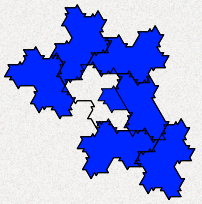
First Circle · General Mode · C



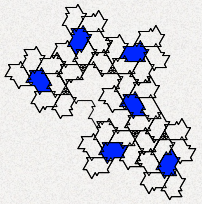
Second Circle · General Mode · C-C



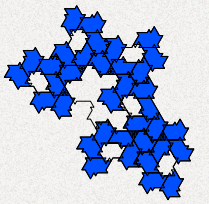
Second Circle · General Mode · C-P



First Circle · General Mode · P



Second Circle · General Mode · P-C



Second Circle · General Mode · P-P

CONTENT MAPPING :

Finally, we can further map the tertiary urban layer from Duany and Steuteville's (2021) quantification framework, which is the smallest urban layer, to the General Concentric Mode, considering a group of seven Hat Polykite units as a scale slightly larger than the 5-minute walking circle (about 0.25 miles).

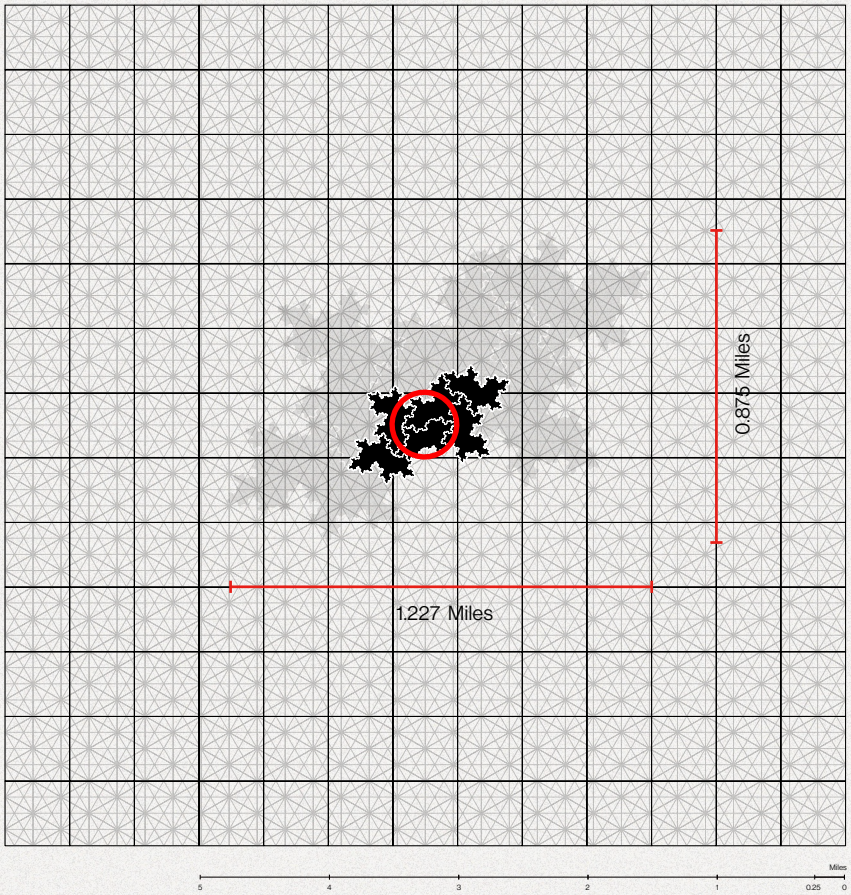
Here we should emphasize again that because Hat Polykite under General Mode can maintain structural continuity, we can use it for further subdivision, allowing structural expansion of the not-yet-clearly-defined 5-minute walking layer functions.

This explains why we can use Hat Polykite to achieve both refinement of small-scale layers and integration of large-scale layers.

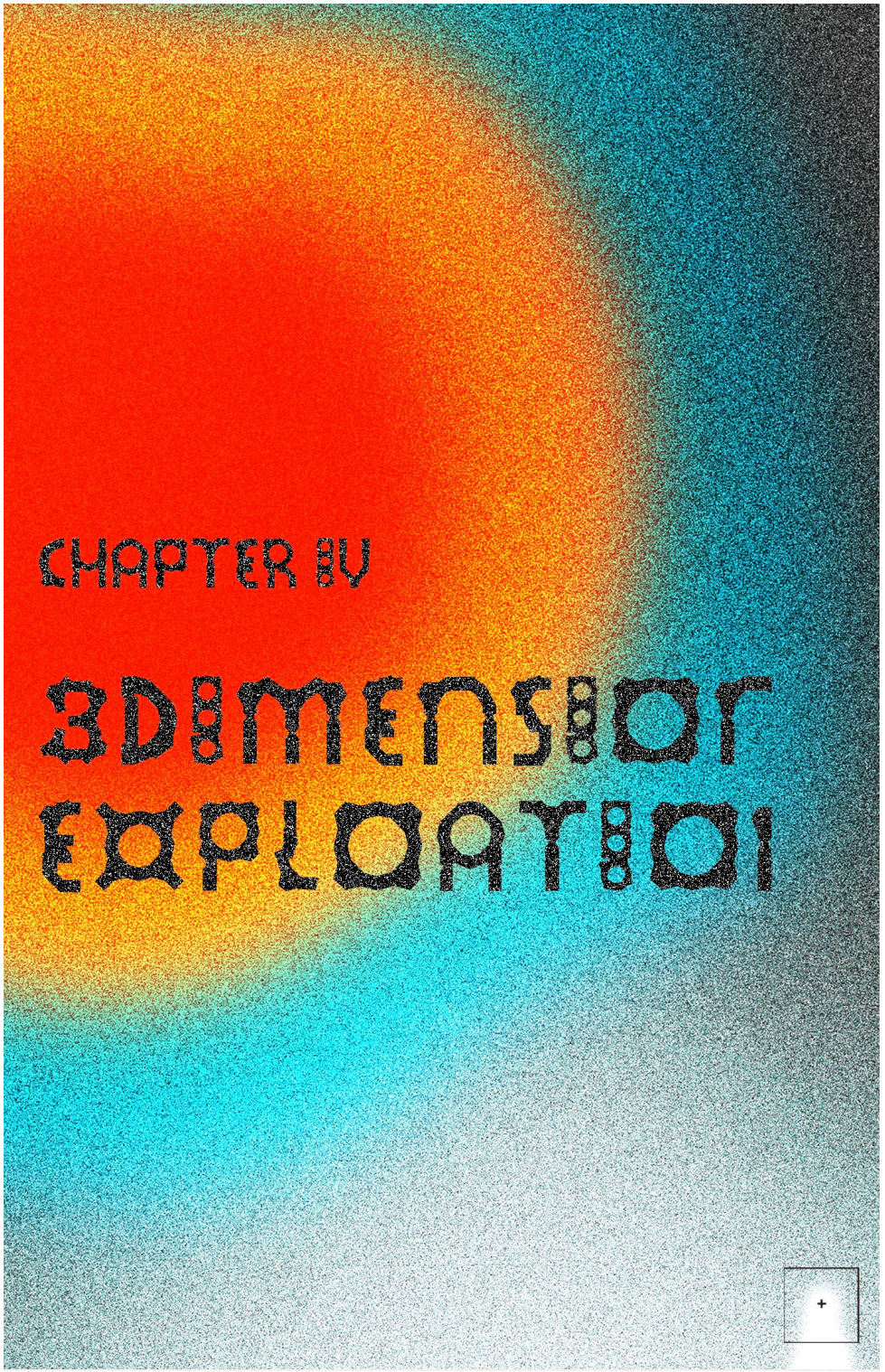
This provides a specific spatial organization tool for implementing the 15-minute city theory in practice, and also lays the foundation for future three-dimensional expansion.

Grid Mapping 04
Text

CONTENT MAPPING :



Grid Mapping 04
Visualization



4 - 1

EXPANSION METHOD

:

" Three-dimensional Exploration Based on Hat Polykite "

EXPANSION METHOD :

So how should we explore Hat Polykite's three-dimensional expansion of the 15-minute city theory to address the challenges of vertical urban design?

This exploration needs to start with its basic geometric properties, particularly the structural characteristics shown in its concentric organization pattern.

Hat Polykite's concentric organization pattern shows a balanced three-way division structure, and this geometric characteristic is similar to the design concepts of Japanese Metabolism architects.

Hat Polykite's concentric organization pattern shows a balanced three-way division structure, and this geometric characteristic is very similar to the design concepts of Japanese Metabolism architects.

As far as I know, the 'Marine City' project proposed by Kiyonori Kikutake in 1958 used complex geometric structures similar to trefoil patterns to organize vertical urban spaces.

The trefoil pattern is a complex three-dimensional structure, and Lin and Zheng (2016) discussed how this organic geometric form shows high potential in both structural stability and spatial complexity.

Based on this inspiration, I decided to try converting Hat Polykite's concentric organization pattern into a three-dimensional structure.

Grid Mapping 04
Text

EXPANSION METHOD :

Grid Mapping 04
Visualization

EXPANSION METHOD :

The specific implementation method is to reorganize basic units through trefoil patterns.

During this process, I found that using a “double-layer” Hat Polykite framework can create “folding”, which forms a three-dimensional structure with self-cycling patterns.

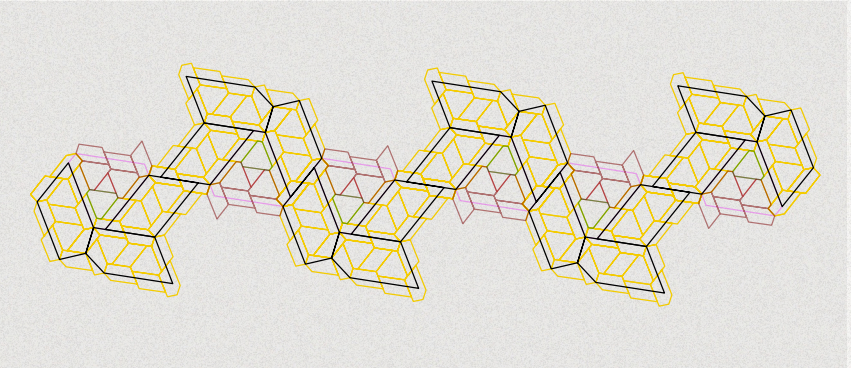
When combining three such structures with 120-degree rotations, I was surprised to discover that it could form a structural prototype that adapts to all environments - a quas!

Based on this, we can further use Hat Polykite’s inherent continuity characteristics to refine this prototype.

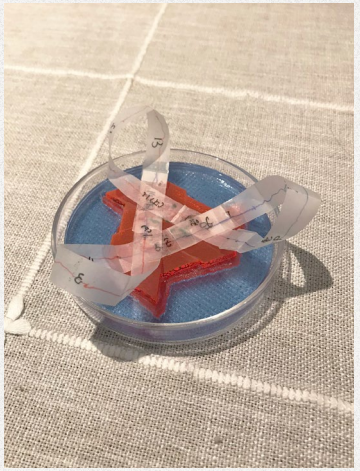
By introducing secondary and tertiary grids, we have not only achieved more detailed spatial division, but also created possibilities for functional arrangements at different scales.

3D Expansion
Text

EXPANSION METHOD :



Model - Unfold

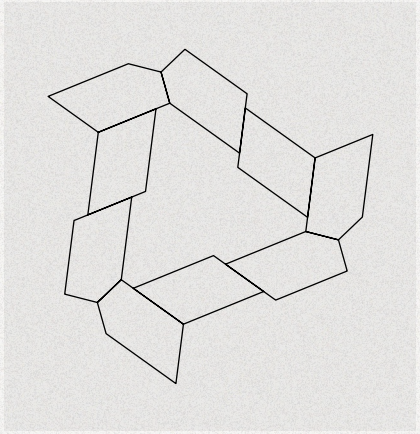


Model - Fold Up

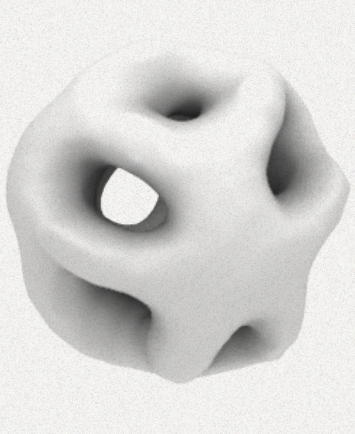
Model - Fold Up * 3

3D Expansion 01
Visualization

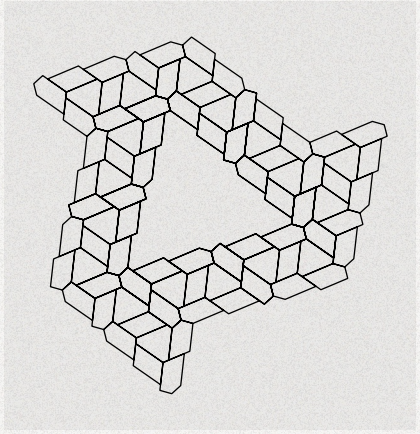
EXPANSION METHOD :



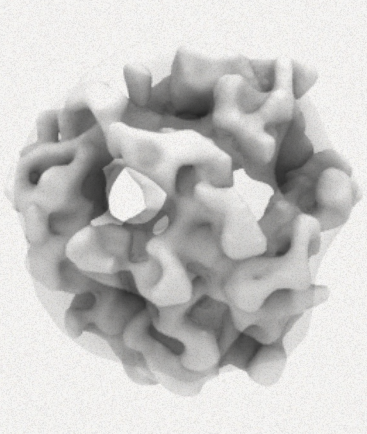
First Circle · Concentric Mode · P · Grid 01



Model - Expansion 01



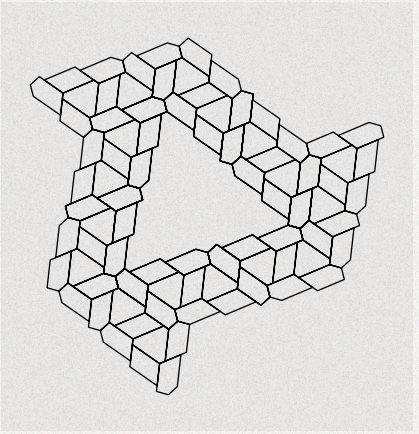
First Circle · Concentric Mode · P · Grid 02



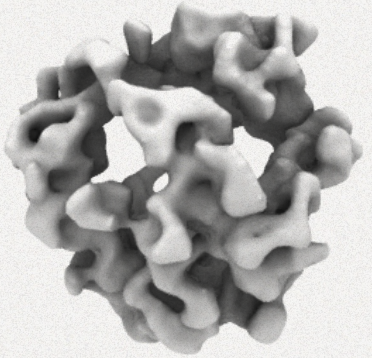
Model - Expansion 02

3D Expansion 02
Visualization

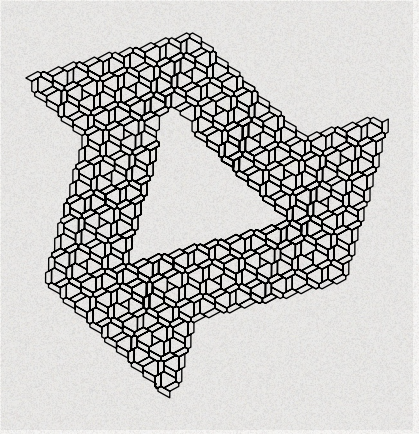
EXPANSION METHOD :



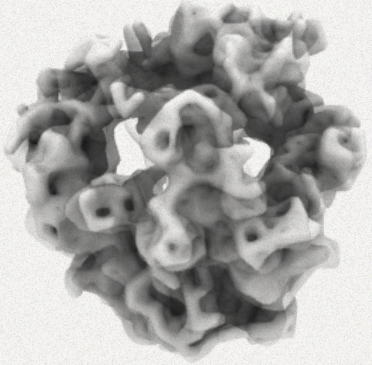
First Circle · Concentric Mode · P · Grid 02



Model - Expansion 02



First Circle · Concentric Mode · P · Grid 03



Model - Expansion 03

3D Expansion 03
Visualization