

Distinction Between “Being or Not”-The Uninhabited Space in a Super Populous Country

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Abstract

China has the largest population in the world, so it's common and reasonable to see people everywhere. However, since 1980s, places in China have been in a dynamic state switching between "with people" and "without people". "Places without people" have gradually become places that cannot be ignored. On the macro level, due to the rapid economic development in certain regions, key cities, with unique advantages, keep attracting the population from surrounding towns, resulting in the phenomenon of "empty towns", which are "places without people" in the traditional understanding. But with the development of Internet of things, 5G technology, artificial intelligence and other technologies, a series of new places without people has emerged quietly. This new type of "places without people" can be divided into two categories based on the causes of "with human involvement" and "without human involvement". This study will, focusing on the "new places without people" generated with the development of science and technology, probe into the status quo of places without people in China and the possible spatial changes they will bring to the cities in China in the future by analyzing their causes, types and morphological characteristics. On this basis, this study attempts to explore the possibilities of integration and complementarity of "traditional" and "new" types of "places without people" in the future development of cities in China.

Keywords: Uninhabited Space, Uninhabited Space for People, Uninhabited Space for Machinery, Uninhabited Space in the Future

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Introduction

With the beginning of the "Industry 4.0"¹ era and the popularization of 5G technology, mankind has entered the era of the Internet of Everything. In order to explore the impact of this phenomenon on architecture and urban development, this paper has launched research on the "no man's land".

"Uninhabited " and "No Human's Land"

Since the building was born, people have been the main body of space service. The existing theoretical systems of architecture that guide space creation revolve around how space satisfies the human experience. Therefore, the existence of people is of great significance to space. "Uninhabited" is a state of opposition to "human being", which means that human beings do not exist in space.

In this paper, "unmanned" is equal to "Uninhabited", emphasizing a process of change, which expresses the process in which the space of human existence changes from "very important" to "unimportant", and finally "completely irrelevant". "Unmanned land", the space corresponding to it, also evolved from "many people" to "few people" inside and finally formed an "unmanned" space state.

The "no man's land" that emerged in the era of the Internet of Everything has partially realized the transformation of people from "important" to "unimportant" in space. For example, the automated production line turns many workers into a "human-machine" collaborative production line with only a few workers working; automatic express sorting dramatically reduces the number of workers in the entire logistics process by replacing manual sorting. These phenomena are the changes in people's needs and the advancement of science and technology. With the further development of 5G technology, it is conceivable that in the future, "no man's land" will realize the transition from "people are not important" to "unmanned". The impetus for the change comes from two aspects: on the one hand, the needs of people; on the other hand, the needs of facilities.

The Modern Times of "No Man's Land"

The human's demand is divided into existing demand and new demand. There is existing demand, such as the demand to "protect people" from dangerous environments and "liberate people" from labor. This demand will be greatly satisfied by developing technology in the era of the Internet of Everything. Newborn demand, such as the demand for good services, will also gradually increase due to social development.

The demand for equipment can be divided into internal demand and external demand. Internal demand refers to the need for the equipment itself to operate and maintain, such as obtaining a stable and suitable power supply. External demand refers to the demand that the equipment can provide services. For example, the database station undertakes the function of information

¹ Industry 4.0 is a high-tech plan proposed by the German government, also known as the fourth industrial revolution. The Industry 4.0 working group formed by Siegfried Dais of Robert Bosch Co., Ltd. and Kong Hanning of the Leopoldina Academy of Sciences officially released the Industry 4.0 report at the Hannover Messe on April 8, 2013.

transmission.

(1) Protect People, Liberate People, Serve People: The "No Man's Land" for People

In order to protect their own lives, the high-risk working environment is a space where people are eager to transform it into a "no man's land". Although people can use existing technology to improve the environment or build shelters, it still cannot eliminate the life threats people face in high-risk environments for a long time. In the era of the Internet of Everything, with the development of intelligent control systems and The Internet of Things technology, people can completely free themselves from the high-risk environment. By transforming the high-risk environment into a "no man's land", humankind can realize the complete protection of life safety—for example, constructing unmanned mobile scientific research stations in the polar regions. Through the Internet of Things and 5G technology, observation indicators and experimental data from various places can be transmitted back in real-time, preventing scientific researchers from going into the dangerous polar regions to conduct investigations. Through the susceptible robotic arm combined with the remote-control system, in the future, researchers can be freed from various potentially dangerous laboratories such as radioactivity and toxic, and form an "unmanned laboratory".



Fig 1. Relying on Robots to Perform Aircraft Test Flight Missions to Protect Pilots.
Image Source: <https://www.wpafb.af.mil/News/Article-Display/Article/1935442/air-force-research-laboratory-successfully-conducts-first-flight-of-robopilot-u/>

People bring about the liberation of productivity by promoting the development of science and technology, which aims to realize the liberation of people while improving production efficiency. The workshop of fully automatic machine production can completely liberate workers from the production line. In this process, "no man's land" was born. At present, the development of Industry 4.0 from "few people" to "partially unmanned" under the blessing of intelligent systems has been popularized, and the state of completely "unmanned" has gradually emerged. This process of change is reflected in JD's unmanned warehouse. In 2014, JD Logistics' Shanghai "Asia One" warehouse was completed and put into production. Its warehouse management, equipment control, sorting and distribution are under the control of the information system, and more than 90% of the operations have been automated. In 2017, JD Logistics officially unveiled its full-process unmanned warehouse, becoming the first full-process unmanned logistics center that was put into use on a large scale at that time. Although industrial production's current "no man's land" has only achieved breakthroughs in some regions, it is impossible to achieve comprehensive "unmanned". However, Roland Berger pointed out that cloud-based vendors have provided open-source AI application infrastructure,

and manufacturers focusing on artificial intelligence and automation will have the ability to achieve a higher level of industrial autonomy in factories faster in the future.⁰ It is expected that the development of the manufacturing industry in the future will significantly reduce the configuration cost of high-intelligence robots, and the popularization of all-robot production lines will completely liberate people from industrial production. When people are completely evacuated from the industrial production line, a completely independent "no man's land" is born.



Fig 2. Jingdong Robot Running in an Unmanned Warehouse.

Image Source: https://www.sohu.com/a/330022183_800943

As machines free people from material production, people have a higher level of demand, that is, the demand for services. The "no man's land" created for "serving people" is divided into two categories, one is the "no man's land" that provides material services to people, and the other is the "no man's land" that provides spiritual services to people. The "Internet of Everything" provides people with material services, mainly focusing on providing more commodity information and a more comfortable way of obtaining commodities. The tremendous abundance of material has weakened the material properties of commodities themselves, and people acquire commodities more for the experience. Whether it is online shopping or physical retail, the existing new business models have optimized people's shopping experience regarding material information and access. In the new business model, the process of providing many services does not require the presence of service personnel, such as the unmanned retail store "Amazon Go". Amazon Go physical store is loaded with "just walk out technology"². A large number of cameras and sensors installed in the space can accurately capture customer behavior, thereby supporting customers to walk out of the store directly after selecting the goods. The bill will be automatically deducted by the intelligent settlement system, without manual settlement. Without monitoring employees and waiting in line for payment, Amazon Go has created a "nobody's land" while satisfying customers' needs for better material services.

² "Direct leave technology" comprises modules such as computer vision, deep learning algorithms, and sensor fusion.



Fig 3. Amazon Go Unmanned Physical Retail Store.

Image Source: <https://www.geekwire.com/2018/new-compact-amazon-go-store-opens-door-locations-office-lobbies-hospitals/>

The spiritual services that people get now mainly come from the digital cultural industry. Supported by the Internet platform, the digital culture industry has built a virtual world with abundant content for people composed of data and closely connected with reality through the screen. For example, in-network broadcast, anchors' rooms that people watch on the screen exist in a virtual form on the Internet, while anchors' rooms in real life are actual and material. If the Internet has built the skeleton of the virtual world for people, then the current breakthroughs in 3D modeling technology, the iteration of rendering engines, and the improvement of VR technology have made the image of this virtual world more and more real. The two core technologies, Nanite and Lumen³, showcased at the Unreal Engine 5 promotion in 2020, aim to give 3D modeling spaces a more realistic representation. All these are the results of people's efforts to obtain richer spiritual services. In the process of demand realization, the gap between the virtual "no man's land" and the reality is gradually narrowing.

³ The Nanite virtual micro-polygon geometry allows artists to create all the geometric details that the human eye can see without losing picture quality. Lumen is a set of fully dynamic global illumination solutions that can react to scene and lighting changes in real time without specialized ray tracing hardware. The system can render indirect specular reflections and diffuse reflections that can bounce infinitely in extensive and detailed scenes.



Fig 4. Rendering Effect of the Fourth-Generation Unreal Engine.

Image source: <https://www.artstation.com/artwork/6arYIN>



Fig 5. The Fifth-Generation Unreal Engine Rendering Effect.

Image source: <https://www.unrealengine.com/en-US/blog/a-first-look-at-unreal-engine-5>

By liberating productivity, "no man's land" enables people to divert more resources and energy to more creative and valuable work. The high-quality services provided by "no man's land" can enable people to face the challenges of the future world with a better mental state. Although the main theme of "no man's land" in the real world is still the cooperation between humans and intelligent machines in the short term. Once "no man's land" becomes a pure no man's space, its spatial attributes will undergo great changes.

(2) Providing Power and Transmitting Information: The "No Man's Land" of "Unmanned"

The normal operation of "no man's land" requires the support of data and energy. When looking for data operation and power support solutions, a series of "no man's land" will be produced.

Maintaining "unmanned" operation means huge and uninterrupted power consumption. From the miniature solar cells carried on the sensors to the unmanned wind power plants that provide power for data base stations, their stable power supply is necessary to ensure the normal operation of the "no man's land". In the future, as the number of "no man's land" increases, its need for power is bound to lead to the birth of a series of "no man's land". For example, unmanned charging stations or unmanned gas stations that provide energy support for unmanned vehicles, self-generating power packs that provide power for unmanned scientific research stations.

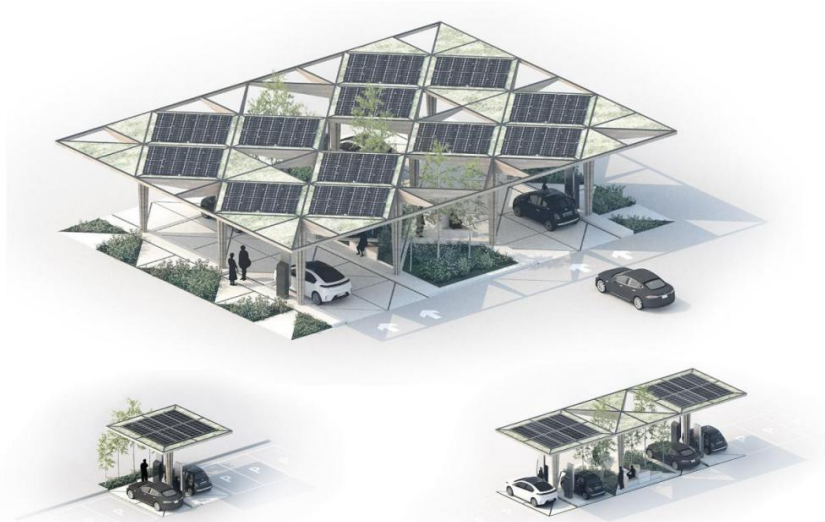


Fig 6. Electric Vehicle Charging Station Concept Designed by Danish COBE.
Image Source: <https://www.goood.cn/ultra-fast-charging-station-by-cobe.htm>

The key to "unmanned" equipment being able to perform tasks smoothly is the support of data operations and smooth data transmission. The most core of these is data computing. The "Intelligent Era" is essentially a computing era, and the explosion of calculations brought about by the "Internet of Everything" has made data centers the fastest growing infrastructure in the world. The data center focuses on not humans but interconnected computers and equipment that provide a good operating environment. Workers are often far away from the data processing site and maintain the operation of the data center through a highly integrated monitoring system. Therefore, the construction of the data center reflects a highly rational feature; that is, all designs are designed to provide a safe and efficient operating environment for the computer, and any unnecessary spatial expression is regarded as waste here. As the most important "no man's land" for maintaining the operation of the "Internet of Everything", its data center has also supported the birth of more "no man's lands" as its data center continues to expand its scale.



Fig 7. Number and Distribution of Data Base Stations that Have Been Built around the World by 2020

Image Source: <https://www.datacentermap.com/>

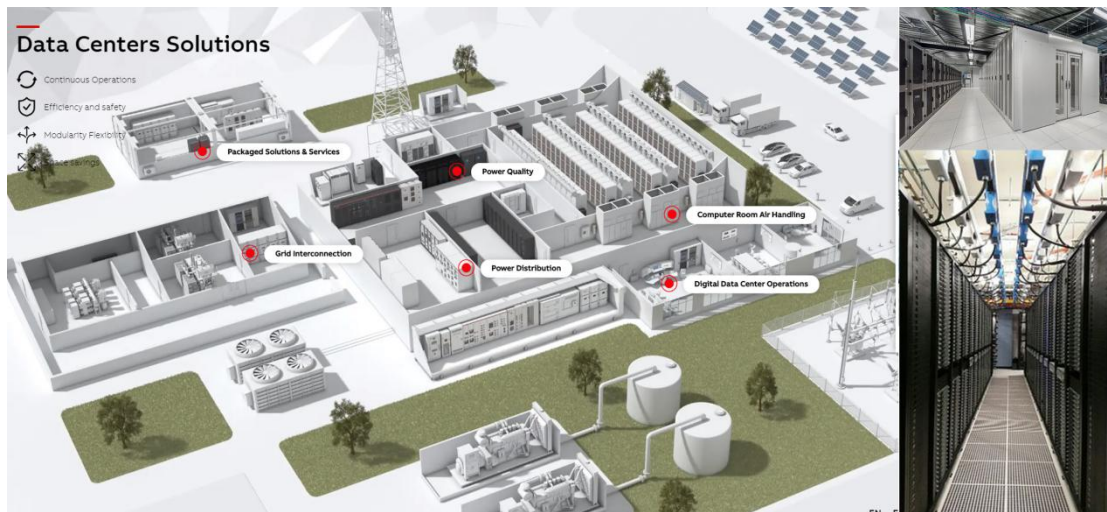


Fig 8. The Interior of the Data Center Shows a High Degree of Rationality of the Space

Image Source: <https://www.pinterest.com/yuaokun/%E6%95%B0%E6%8D%AE%E7%AB%99/>

(3) Go to the Distal End: Where Does "No Man's Land" Go from Here

The development of the "Internet of Everything" technology and the generation of new needs of people make the "no man's land" in the real world and the virtual world continue to expand, which has become an established trend. The expansion of "no man's land" refers to the increase in number and the gradual emergence of new building types in the real world. People's production and living patterns will change with this trend, but the existing urban spatial pattern will be adjusted accordingly.

Because of people's demand, the virtual world of "no man's land" will be more and more involved in people's real life. While providing more and more realistic sensory experiences, the popular virtual reality technology will inevitably lead to the blurring of the boundary between the virtual world and reality. When virtual reality technology can fully simulate the real world, the boundaries of space will be broken. Like Mel can't distinguish between reality and dreams in *Inception*, the highly simulated virtual world can bring incredible sensory experience to people, but it also hides enormous risks⁴.

The Distal End of "No Man's Land"

As mentioned above, when the "no man's land" develops to a certain scale, it will inevitably affect people's living patterns and living spaces. When the scale of "no man's land" grows from small to large, from "no man's land" to "no man's city" and then gradually develops into "no man's pole", its influence on architecture and urban spatial pattern also grows from small to large. Each time the scale of no man's land escalates, its impact leaps.

(1) No Man's Domain

No man's domain refers to a series of uninhabited spaces around people's lives, independent individuals with specific functions. No man's domain can be divided into two categories according to its intimacy with human life: one is closely related to people's daily lives and the other is not directly related to people's daily lives.

There are many no man's land closely related to human life, such as no man's restaurants that provide in-room food and complete independent food delivery service, no man's stores that are connected with logistics and can carry out automatic distribution and sales. This no man's power station automatically charges the driverless car. They act as "clients" and are distributed around people's lives. They exist under the human gaze. While they embody the value of the efficient and convenient application, they also need to consider the influence of spatial surface on people's perception and experience, although their spatial core is still highly rational.

The other is not directly related to people's daily life, such as no man's factories and unattended data centers. They can operate within a certain distance from people's life circle. They free up space resources while reducing interference to people's lives. This kind of "no man's domain" is far away from people's gaze, emphasizes the rationality of space, and abandons the influence of perception experience on space design.

(2) No Man's City

A "no man's city" occurs when a "no man's land" far from the "circle of life" gathers and develops into a "community" of considerable size. A "no man's city" does not have to be spatially close to a city to keep it going. In the "Internet of Everything" era, technology can break through space limitations and closely connect "no man's city" with urban space. A "no man's city" can be a collection of "no man's domain" with a single function, for example, "no man's industrial city", "no man's logistics city", "no man's ecological planting city", etc. "No man's city" can also be a mixed symbiotic ecosystem of "no man's domain" with multiple

⁴ In *Inception*, the protagonist's wife Mel stubbornly believes that the dream created by her and her husband is the "real" reality, while the real world is a dream. In the end, Mel chose to die in reality in order to travel to the "dream".

functions.

The spatial patterns of "no man's city" and cities can be roughly divided into two types, one is "decentralized," and the other is "centralized". The decentralized "no man's city" is similar to Howard's "garden city" spatial pattern". The city is located in the center of radiation, and the "no man's city" with single function is arranged outside the city, and the distribution is relatively loose. For example, the "unmanned industrial city" is located far downwind from the city, the "unmanned logistics city" is located near the port and transportation hub, and the "unmanned agricultural planting city" is close to the city to facilitate the travel needs of urban residents. The decentralized layout means that no man's city will have fewer restrictions on future expansion but will be less efficient because of the distance. Centralization means that all kinds of "no man's land" are built in a fixed area to form "no man's city", and the city is arranged around the "no man's city". Three neighboring cities plan a piece of land together and move the "no man's land" that is not closely related to people's daily lives to this land, arrange it centrally, and finally become a city intensively. The centralized layout means more efficient operations and space and considerable space limitations for future expansion of the "no man's city". Both models can utilize space and natural resources according to local conditions and optimize people's living space while improving economic benefits.

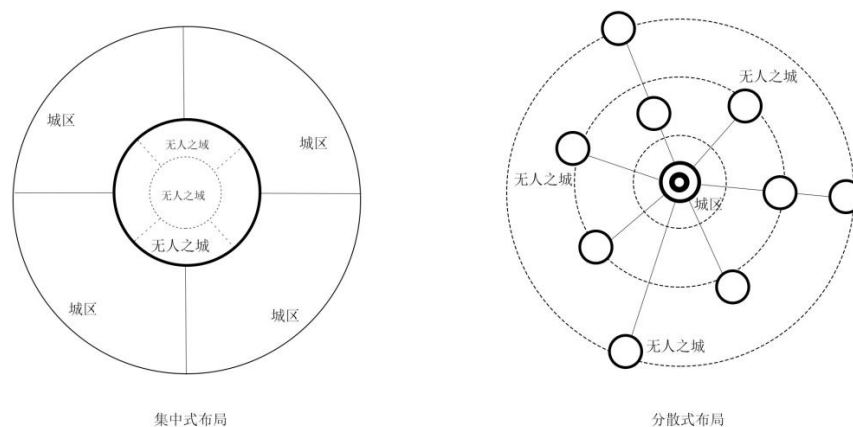


Fig 9. Centralized (Left) and Decentralized (Right) Spatial Modes of " No Man's City"
Image Source: Author self-painted

(3) No Man's Territory

When the scale of "no man's city" expands to a certain extent and changes from "no man's city" to "no man's pole", its spatial pattern and existence mode will undergo qualitative changes. There are three possible trends in the development of "no man's pole": i) When the "no man's city" is large enough and does not rely on any external support, it may form a "no man's pole" that operates independently and is not affiliated to any country or region; ii) When the scale of "no man's land" exceeds the capacity of the earth's space, it will be partially transferred to aerospace and other spaces, to establish "no man's land" far away from people's living world; iii) When the "dimensional wall" between the real world and the virtual world is broken, the virtual world will no longer be attached to the real world, but become "no man's pole" that parallel with the real world.

According to the current demand for data computing globally, "no man's data city" is the most likely existence to develop into "no man's poles". This trend has already taken shape, and

internet companies are actively looking for suitable overseas bases to build data centers while building and expanding data centers in China. Data computing has high environmental and energy requirements. When the scattered small data centers can no longer meet the demand for data computing, and only "huge" supercomputing centers can solve the problem, it will make the right construction base. In order to avoid disputes, the ideal solution is to neutralize the supercomputer center and the territory it is located in and provide services to all countries, thus forming a "no man's poles".

If "no man's land" expands out of control in the future, Earth's space will no longer accommodate it, and it will expand outward to form "no man's poles". In many science fiction that represent the future world, there are scenes of polarization and separation between the living space of humankind and the "no man's land". Specifically, humans are still living on the earth's surface, and "no man's land" is built on space stations or deep underground, forming "no man's land". In controlled circumstances, people can regain control of the planet. Once people lose the control of the "reproduction" of the "no man's land" and the "no man's pole" invades the living space, the state and pattern of the existing human living space will be broken, which will lead to highly undesirable consequences.



Fig 10. The Future "No Man's Pole" May Develop into the Air

Image Source:

https://www.artstation.com/artwork/e5kd3?utm_campaign=digest&utm_medium=email&utm_source=email_digest_mailer

The virtual world is also a kind of "no man's pole" that needs to be considered. The development of existing technology has blurred the boundary between virtual and reality. When technology has reached the point where it can deceive human senses and completely confuse reality and virtuality, the virtual world, as the "no man's pole", will present a situation opposite the real world. In the movie Ready Player One, "Oasis" has a complete world structure and an independent value judgment system, as well as a similar financial system in the real world, which has become another parallel space in people's life.

Conclusion

The characteristics of "no man's land" determine that "no man's land" has two very obvious spatial characteristics: highly autonomous and highly rational. The high degree of autonomy of "no man's land" space means that there will be specific algorithms to formulate the corresponding space rules when the space is faced with different technological conditions or

functional requirements. All behaviors in the space are strictly carried out following the rules, and this process does not require human intervention and assistance. As mentioned above, the Amazon warehouse space is a highly autonomous space to deal with the fixed-point transportation of goods in the space. "No man's land" space is highly rational. The spatial expression of "no man's land" rejects all meanings. It aims to meet the requirements of technology and function, and ignores people's spatial experience and aesthetic appreciation. All redundant expressions of craft and function are unnecessary and excluded in "no man's land". In the future, the phenomenon that "no man's land" is mainly created by "human needs" may be broken, and the demand of machines will become the main reason for the emergence of "no man's land". At present, even the "no man's land" created by technological needs is still indirectly satisfying people's demand. In the future, robots like those in *The Matrix* will be able to renew themselves and iterate. "No man's land" may also be self-escalating and create new demands, creating a steady stream of new "no man's land".

"No man's land" will have a huge number and rich space types in the future. Current scientific and technological means are the main factor restricting the development of "no man's land", and whenever a breakthrough occurs in the "Internet of Everything" technology, more "no man's land" will be produced. Even if people's needs for "no man" are fully satisfied in the future, the number and types of no man's land will continue to grow. This means that "no man's land" includes a series of no man's spaces, which will bring significant opportunities and challenges for architectural design and urban planning.

In the future, the boundary between the virtual world and the real world will become increasingly blurred. In the long-term home isolation caused by COVID-19, software such as "Tencent Conference" and "Ding Talk" broke through the limitations of space distance on people's work and study, and demonstrated the mutual influence of the virtual world and the real world. Inspired by this, the real life of mankind in the future may more and more migrate to the virtual world. When the virtual world uses technical means to mixed the spurious with the genuine, do we want to preserve the difference between the virtual world and the real world? When the virtual world becomes a "no man's land that full of "people", and the real world "no man's land" simultaneously exist, which is "no man's land"? The possible negative impact of the virtual world in the future is a question we should think carefully about now.

The development trend of "no man's land" will make "unmanned space" an important direction of architecture research. Whether it is to study the "no man's land" in the real world, or to build a virtual "no man's land" like a "dream builder"⁵, it will improve the architecture discipline. Perhaps in the near future, "no man's land" will become an important object of architecture research, and "no man's architecture" will be born.

⁵ The words come from the movie *Inception*. The dream architect is responsible for the general environmental framework and environmental details of the dreams at all levels of the building so that the target person will believe that it is in his dream after entering this dream.

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