Research on the Design of Modern Aged Residential Buildings Based on the Intelligent Home Elderly Care Model

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Abstract: In recent years, China's population aging problem is serious, and the aging work has become an important content to be solved urgently in social development. It is a common way to provide for the aged at home, which adapts to the basic conditions of our country. However, most of the technology and equipment of home care services lack advanced nature, and the service quality and efficiency are low. With the rapid development of information technology, the application of intelligent technology in the elderly is more and more extensive, and has achieved good results. In view of this, based on the characteristics of intelligent home care mode, this paper analyzes the design of modern age-appropriate residential buildings from the perspectives of internal environment and external environment.

Keywords: Intelligent Home Care Model; Modern; Suitable for Aging; Residential Buildings; Design

1. Introduction

In the new era of increasing population aging problem, it is particularly important to do a good job in elderly care services.With the intelligent home care model as the background, from the perspective of the elderly, scientific design of modern age-appropriate residential buildings can not only provide a comfortable and healthy environment for the elderly, but also improve the quality of life of the elderly, so that the elderly can enjoy their later life.Therefore, relevant personnel should take a scientific way to integrate intelligence with modern age-appropriate residential building design to improve the effect and level of architectural design.

2. Characteristics of the Smart Home Care Model

Smart home elderly care refers to the electronic information technology as the basis, through the cloud technology, sensors and other advanced technical means, the government, medical community and community closely together, to provide various services for the daily life of the elderly, including entertainment, travel safety, medical security and so on [1].At this stage, the main application modes in China's smart home elderly care are shown in Table 1.

Table 1. Intelligent Home Care Model

mode	content
Comprehensive intelligent elderly community	At present, the newly built facilities related to the elderly include intelligent housing, apartments for the elderly, life services, etc
Intelligent and livable community for the elderly	Based on the existing urban communities, the intelligent pension service platform will be built with the help of intelligent technology to improve the pension service system
Intelligent service agencies for the elderly	In the structure related to the elderly, such as nursing homes and universities for the elderly, etc., focus on the application and promotion of intelligent facilities and equipment, pay attention to the training of relevant personnel, and build a sound intelligent service system

Different from other pension methods, the smart home pension model shows more characteristics, mainly reflected in the following aspects.

(1) To meet the diversified needs of the elderly.Compared with ordinary elderly care, the application of smart home elderly care mode can satisfy the physiological and psychological needs of the elderly, provide assistance for the elderly's self-care and physical health care through barrier-free and intelligent design, and also provide daily medical care for the elderly outside the elderly care service institutions [2].In

addition, the smart home pension model can connect the Internet, big data and other technologies, dynamic and all-round monitoring of the daily activities of the elderly, and maintain the life safety of the elderly.In addition, with the support of the smart home pension model, it can also achieve deep exchanges and communication between the elderly and the outside world, so that the elderly have the opportunity to return and participate in society, while providing convenience for the care of their children.

(2) To create a healthy and high-quality living environment for the elderly.Through the scientific application of the smart home pension model, with the help of advanced technologies and products, it can create a green, environmentally friendly, comfortable and healthy living environment to ensure that the elderly interact and communicate with each other.

(3) Realize the full utilization and sharing of resources.The application of smart home elderly care model can build an information resource integration platform, effectively integrate nursing and rehabilitation, Internet, architectural design, etc., and incorporate rehabilitation management, life care and other aspects into the platform, so as to realize the work that is insufficient or cannot be done in a rapid and reasonable way, and promote the improvement of the level of elderly care [3].

3. Theoretical Support for Modern Age-Appropriate Residential Building Design

3.1 Hierarchy of Needs Theory

The theory is divided into five levels: physiological need, safety need, social need, self-esteem need and self-actualization need.In the design process of modern age-appropriate residential buildings based on the smart home care model, designers need to follow the theory, analyze and think from the perspective of the elderly, and pay attention to all aspects of the elderly, including diet, medical care, living, clothing, etc., to meet the needs of the elderly as much as possible [4].

3.2 TRIZ Theory

TRIZ is a knowledge-based, people-oriented, systematic approach.In modern age-appropriate residential building design, with intelligence as the background and TRIZ theory as the basis, we can use the knowledge of the problem field, apply heuristic methods, pay attention to the designer's thinking, and take intelligent system as the aid and support to build a detailed design model and improve the feasibility of the design.At the same time, TRIZ is the invention of problem solving theory, which solves problem conflicts in the process of obtaining innovative solutions, as shown in Figure 1.

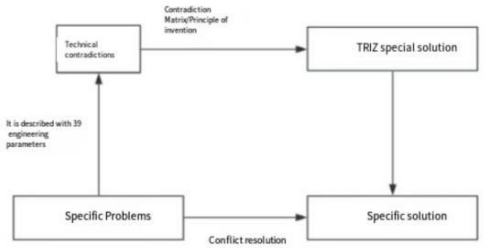

Figure 1. Technical Conflict Resolution Process

3.3 Universal Housing

Universal housing follows the design principle of "people-oriented", starting from ordinary housing, will meet the living needs of most people as the benchmark.In the design of modern aging residential buildings, designers should not only focus on the needs of users, but also provide convenience for users as much as possible.Housing is not only for vulnerable groups, in different cases, ordinary people should also enjoy the convenience brought by accessibility, emphasizing the complete life cycle of users.Therefore, the universal house design can meet the living requirements of modern age-appropriate houses.

4. Design Analysis of Modern Age-Appropriate Residential Buildings Based on Intelligent Home Care Model

Based on the smart home care model, during the design of modern age-appropriate residential buildings, it is necessary to follow the people-oriented design principle, rationally design residential public Spaces, bedrooms, etc., and clarify the design points of each link, as shown in Table 2.

4.1 Interior Environment Design

In the design of modern age-appropriate residential buildings, it is mainly divided into indoor and outdoor environment design.For the interior environment design, designers need to

pay attention to the design of public entrances and exits, horizontal and vertical traffic, indoor space forms, etc. The specific analysis is as follows.

Table 2. Key Points of Architectural Design (Part)

Space division	Design points	Level I	Level II	Level III
Residential public space	Directly into, no vertical height difference	★	▲	▲
	The wind and rain corridor covers the whole residential area		★	★
	Large-scale channels and platforms		▲	▲
bedroom	800mm pass width	▲	▲	▲
	Large lighting surface	▲	▲	▲
	Corner Yang surface circular arc treatment		★	▲
sitting room	800mm pass width	▲	▲	▲
	Combine with the dining room kitchen layout	▲	▲	▲
	Large lighting surface		★	▲
toilet	Dry and wet separation arrangement form	★	▲	▲
	Insertable washing table		▲	▲
	Toilet classification receives a space	▲	▲	▲

(Note: ▲ is a necessary item; ★ is a non-essential item at this level)

(1) Design of public entrances and exits.In the process of the elderly going out, the entrance and exit are used more frequently, and they are also the main transportation link of the semi-private and open space. In this aspect, the design process needs to pay attention to intelligence and suitable aging.For the aging design, the relevant personnel should start from the perspective of the elderly, reasonable control of the height difference between the platform in front of the building and the outdoor ground, and the slope slope and tread width should be designed according to the actual situation to ensure that the wheelchair can pass smoothly, but also for the ordinary hand to push the stroller, shopping cart, etc.In terms of anti-slip treatment, make sure that the flatness is high, use materials with strong water permeability, and try not to use stone with high hardness [5].Due to the older age of the elderly, there is a phenomenon of memory decline, in the daily travel, the probability of getting lost is high, so in the design process, the entrance location can be designed with color identification markers, and ensure that the color is bright, especially the unit house number, to be set in a prominent place, so that the elderly can clarify the location of the home.When the doorbell is designed, it depends on the height of the elderly.In terms of intelligent design, visitor intercom facilities are installed to ensure that the building can always maintain a safe state.Or the design of automatic induction door, the elderly swipe card or ID card to enter, to achieve the purpose of external personnel isolation.

(2) Horizontal and vertical traffic design.In the process of horizontal traffic design, based on the actual situation of the elderly, the height difference between the corridor ground and the inner surface should be reasonably controlled, and handrails should be set in the corridor, as shown in Figure 2.Conversation Spaces can be designed to meet the individual needs of the elderly.For example, the traditional commercial street is taken as the theme, and the characteristic elements of the city are interspersed in the space to ensure that the elderly can feel the vitality of the city in the apartment.In the intelligent design process, the installation of a monitoring system, if the elderly in the corridor walking during the emergency situation, including falling, fainting, etc., the system will send an early warning signal in a short time to ensure that the staff can quickly deal with.

In the vertical traffic design, the design of the stairs should avoid the arc or rotation type as far as possible, and the actual situation of the elderly needs to be fully considered, such as emergency assistance, to provide convenience for the passage of rescue equipment.In the design of stairs, the width and step height should be reasonably designed, and the rest platform of the stairs should be scientifically designed.The stairwell should be as large as possible to open the window, so that the elderly can obtain good illumination and achieve the natural circulation

of indoor and outdoor air.In the intelligent design, an elevator is added for the old residence to ensure the convenience of the elderly.Or choose a dedicated elevator to ensure that wheelchairs and stretchers can pass through.

Figure 2. Corridor Handrail

(3) Interior space form design.During the interior space design, different family structures are used as the basis to plan and design the space in a differentiated way.Family population and pattern will have a direct impact on the structure of the family. In the specific design period, it is necessary to combine the degree of separation between the elderly and their children to design the space form reasonably.Such as co-living type, the specific relationship is shown in Table 1.Or the space form is designed as a neighborhood type, that is, different households live on the same floor or live on different floors of the same building, which can provide convenience for the independent life of the two generations, and also keep the two generations to realize mutual communication, care and help in daily life.In intelligent design, designers should ensure the humanization and flexibility of indoor space separation.For example: in the kitchen design, you can extend the entrance and exit of the corner of the house, connect the kitchen and living room, or make an open kitchen.In addition, when the elderly are alone at home, the sense of security will decline in the case of a large room, at this time, an intelligent way can be used to let the elderly use the remote control to create a private space on the active wall in the home.

Table 3. Space Relationship between the Elderly and Their Children

Living relationship		account for
The bedroom is separated type, namely each has an independent bedroom, the remaining space is a public space	Family members share toilets	64.57%
	Special toilet for the elderly	
Bedroom and bedroom are separated, that is, each have independent bedroom and bedroom, the remaining space is public space	Bathroom sharing	30.11%
	Bathroom separation	
Living space separation type, namely the main living space separation, including bedroom, bedroom, kitchen, unimportant space sharing	The foyer shared	5.32%
	The entrance hall separation	

(4) Hall entrance design.The entrance hall is an important place to greet guests, but also the main space connecting the interior and exterior.In the specific design, the designer should reflect the living taste and furniture design style of the occupants, not only to ensure the safety of use, but also to consider the convenience of the elderly's life.At the same time, the location should meet the needs of the smooth passage of the local ambulance stretcher, and ensure that the situation that the stretcher cannot be applied because of the narrow channel can be effectively avoided.In the inner position of the entrance hall, reserve some space for the elderly to sit down and change shoes, and install armrests and grippers next to the seats.In the intelligent design link, the installation of intelligent systems, including cameras, visual intercom, etc., the elderly can use the visual intercom function to communicate quickly with visitors in the bedroom, kitchen, etc.Alternatively, install the contact scene panel and set the welcome and leave mode.

(5) Living room design.In the design process of the living room, it is necessary to ensure that the orientation is good and the area is suitable, which can provide sufficient space for the activities of the elderly, and the armrest is set around the wall so that the elderly can walk easily.For the small apartment type of one room or one room, the living room can use a dual-purpose way to integrate the living room, bedroom and dining room to realize the flexibility of the space.In the intelligent design, combined with the overall style of the design, the installation of home intelligent systems,

including lighting, sound, air conditioning and other systems, to enrich the daily life of the elderly.

(6) Bedroom design.In the process of designing the bedroom, the psychological characteristics of the elderly are fully considered.Because the elderly sleep is shallow, so in the design, you can design their own bedrooms and sleep in different rooms.Furniture such as bedroom beds, wardrobes and dressers should be consistent with the living habits of the elderly.The net width of the main passage in the bedroom should exceed 900mm.During the intelligent design period, the scenario model is designed, including home mode, warm mode, reading mode, etc., to meet the diversified needs of the elderly.At the same time, the emergency call system is installed to ensure that the elderly can alarm the system in the first time when an emergency occurs.

(7) Bathroom design.When designing the bathroom, ensure that the height design of the sink and toilet is consistent with the use requirements of the elderly. Handrails and emergency callers should be set next to the toilet, as shown in Figure 3.At the same time, the bathroom should be set up in the bathroom walkie-talkie, smart toilet and other facilities, with the help of intelligent control system, so that the bathtub automatically water.In addition, smart faucets are installed to save manual operation time for the elderly.

4.2 Outdoor environment design

In the process of indoor environment design, it is necessary to pay attention to the design of outdoor communication space and indoor fitness space, and pay attention to the intelligent design.

(1) Design of outdoor communication space.Elderly people have a high demand for social interaction, so during the design of outdoor space, it is necessary to design outdoor communication space from the perspective of elderly people, such as the entrance location of the unit.At the same time, make full use of buildings and seats, so that the psychological needs of the elderly can be met.

(2) The design of outdoor fitness space.In recent years, the elderly's demand for exercise facilities has gradually increased, and walking and free exercise have become more common activities for the elderly.In this regard, in the design of outdoor fitness space, it should be combined with the exercise needs of the elderly, set up different exercise facilities or exercise methods, and ensure safety.For example, the road is designed with red paving to prohibit vehicles from passing, providing convenience and safety for the elderly.Or provide flower beds where the elderly can grow flowers and plants.

Figure 3. Toilet Armrest

(3) Outdoor recreation space design.Good rest space can provide basic protection for the outdoor activities of the elderly, so during the design period, designers can design rest facilities next to the building wall, under the eaves and other locations, and ensure good ventilation and lighting, so as to provide convenience for the elderly to enjoy and rest.For the design of rest seats, it is necessary to ensure that they can be moved and adjusted, and try to use wooden seats.

(4) Intelligent design.In the process of outdoor environment design, intelligent design can provide convenience for the travel and life of the elderly.In this regard, the designer should design the security system, including automatic cruise system, perimeter alarm system and so on.It is also possible to install communication automation systems, such as community communication network systems, to monitor the life dynamics of the elderly at any time.It can also install a management automation system to intelligently manage the water consumption,

electricity consumption, vehicle access and so on in the community to ensure the convenience and safety of the elderly.

5. Conclusion

In summary, intelligent home care as a new model of care for the elderly is still in the initial stage of development in our country.Taking this model as the basis, reasonable design of modern age-appropriate residential buildings can not only meet the functional needs and characteristics of ordinary residential buildings, but also enhance the comfort level of buildings and improve the hardware conditions of buildings.Therefore, in order to improve the design level of modern age-appropriate residential buildings, relevant personnel should take the initiative to integrate with intelligence, apply big data, cloud computing and other technologies, and achieve comprehensive innovation in old-age care methods.

References

[1] Xiao Guilan, Guo Benyu.Design of age-appropriate housing under home care model [J]. Urban Housing, 201, 28(02):199-200.

[2] Zhang Xiaojun. Design analysis of age-appropriate housing under home-based care model. China Construction, 2020, (03):74-75.]

[3] Wang Hua. A humble opinion on the design of age-appropriate housing under the home-based care model [J]. Ju She, 2019, (34):23.

[4] Sun Fangyuan. Residential aging design under home care model [J]. Housing and Real Estate, 2019, (27):47.

[5] Wang Peiyu. Age-appropriate design of high-rise residential buildings under the home-based care model -- humanized living space [J].Jiangsu Architecture and Architecture, 2019, (01):28-29+42.

