Research on the Space Design Strategy of Pension Buildings Based on the Internet of Things Technology

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Abstract: With the advent of population aging, the demand for space of old-age buildings is increasing. Compared with other developed countries, the current situation of aging buildings in China is in urgent need of improvement. Facing the rapid development of emerging technologies such as the Internet of Things and big data, it also brings new opportunities to the space design of old-age buildings. This paper explores the new directions and new means of the space design strategy of pension buildings with the support of the Internet of Things technology, and creates intelligent space in the interior, so that the elderly can also experience the life happiness brought by intelligent design.

1. The Internet of Things technology

The Internet of Things (IoT) technology is a technology that connects various physical devices through the network, enabling them to conduct data exchange and interconnection. Internet of Things technology can realize information transmission and sharing between different devices, so as to realize intelligent, automation and remote control functions.

The core of the Internet of Things technology includes three aspects: sensor, network, and data processing and application. Sensors are the foundation of the Internet of Things, which can collect and sense all kinds of data in the environment and convert them into digital signals. A network is an infrastructure that connects a variety of devices and sensors and can transmit data either wired or wirelessly. Data processing and application is to process, analyze and apply the collected data, so as to realize various intelligent applications.

The Internet of Things technology is widely used in various fields. In the field of home furnishing, the Internet of Things technology can realize intelligent home control, intelligent security, intelligent health monitoring and other applications, providing a more convenient and intelligent life experience.

2. Problems existing in the space design of pension buildings

China has entered the stage of population aging, and higher requirements are put forward for the space design of old-age buildings. These spatial characteristics aim to provide a comfortable, safe, social, healthy and pleasant living environment and help the elderly live a positive and meaningful

life. At the same time, old-age care buildings also need to consider barrier-free design and intelligent facilities to meet the special needs of the elderly[1] .

2.1 The application scope of the Internet of Things technology is limited

With the development of the Internet of things technology, people can try to use new technology to detect the behavior of the elderly, so as to improve the humanized design of endowment building space, but the lack of professional and technical personnel, and engineering operation experience is not mature, in the elderly physiological needs and psychological needs and lack of understanding, with the Internet of things technology to perfect the space design also need process.

2.2 The space design of old-age buildings lacks consideration for the psychological needs of the elderly

At present, the living space of pension facilities lacks detailed design, the space form is single, and did not create a good space feeling. Relatively speaking, the design of the bedroom space for the elderly is still designed to meet the physiological needs of the elderly, without considering the space feeling stage of the elderly.

2.3 The space design of old-age care buildings needs to build a systematic design concept

Current stage of pension space design is often focused on a space facilities, which can help and improve the elderly life. This way of design to improve the elderly life is limited. If space design wants to better meet the needs of the elderly, space design usually need to involve interior hardcover level details, barrier-free facilities, environment, renovation, etc. Pension space design need to build systematic design concept.

2.4 Lack of more adaptive methods in the space design of pension buildings to ensure the safety of the elderly

The physical function of the elderly is often inferior to that of the young, so the safety of the elderly need to focus on in the space design. At present, there is often no focus on the physical conditions and psychological characteristics of the elderly in the design of the old-age space. The design of the old-age space does not strengthen the safety of the building space, so special attention should be paid to preventing the elderly from falling and protecting the elderly from moving easily.

3. Key points to be considered in the space design of pension buildings

3.1 Indoor intelligence

Using the Internet of Things technology, various devices and systems are connected to realize remote control and management. Through the smart home system, the elderly can control the lighting, temperature, curtains and so on through voice or mobile phone operation, to increase the comfort and convenience of living.

3.2 Humanized layout

Design must consider the physical characteristics and mobility of the elderly. For example, set up barrier-free access, reduce the use of stairs, increase handrails and anti-skid ground, etc. At the same time, multiple rest areas are set up inside the residence to facilitate the rest and communication of

the elderly[2] .

3.3 Safety monitoring

The Internet of Things sensors and monitoring devices are used to monitor the living conditions of the elderly in real time, such as heart rate, blood pressure, body temperature, etc. When an abnormal situation occurs, the system will automatically issue an alarm and timely notify the relevant personnel or medical institutions to provide emergency assistance.

3.4 Medical assistance

Medical auxiliary facilities, such as intelligent medicine box and call nurse system, are set up inside the pension building. The elderly can easily access medical services through the Internet of Things technology, and improve the accuracy and timeliness of medication.

3.5 Social interaction

The design of old-age space should consider the social needs of the elderly and provide them with places for various social activities, thus promoting the interaction and communication between the elderly. For example, we should set up recreation areas, libraries, gyms, etc.

3.6 Environmental adaptability

The comfort of the elderly should be considered in the indoor space, and the lighting, ventilation, temperature and humidity control should be reasonably arranged. At the same time, choosing pollution-free, easy-to-clean and non-slip materials in interior design can improve the indoor environment quality.

4. Space design strategy of pension buildings based on Internet of Things technology

4.1 Use the new intelligent monitoring and sensing equipment to improve the living environment.

Intelligent monitoring system. The family monitoring system is installed in the space of the pension building, which combines the intelligent elements with the space design, which is not only beautiful and convenient, but also rich in a sense of science and technology, and makes an aging design for the residential space.

Cameras usually have wide-angle lenses, which can shoot high-definition videos, and have built-in advanced functions such as motion sensors and night vision devices. If the elderly fall or have an emergency, they can trigger the alarm device at any time. Other family members can also check the real-time status of the room through the mobile phone application at any place and time.

Emergency call system for home care rooms. At the head of a bed, toilet, corridor and the elderly often activity set a fixed point for help system, in the head of a bed and sofa hold the form of alarm equipment, toilet and corridor set in the form of pull rope alarm equipment, even if the old man on the ground, after the alarm sounded, the family will immediately receive the alarm prompt.

Human body sensing detector is set in the public corridor of the living room, bedroom and toilet. When the elderly do not pass the detector for a long time, the system is judged to be a dangerous situation and then alarm. The time period can be set freely.

Smart sofa sensor. When the elderly are alone at home, they may fall asleep while watching TV on the sofa, which is not conducive to the spine. The living room will be equipped with voice

sensors. When the pressure value of the sofa reaches a certain extent, the voice broadcast will be opened to remind the elderly to return to bed to rest.

Also considering the elderly mostly disabled, can also be equipped with other smart home facilities, such as automatic induction curtain, automatic induction switch, etc.In the era of modern science and technology developed, smart home is no longer groundless, more and more convenient products can be choosed according to the different needs of the old man.

4.2 Real-time monitoring of room space data, and improvement of environmental indicators.

Environmental quality monitoring system. The sensor can collect, process and analyze data in real time, and can also monitor various environmental quality indicators in the environment in real time, such as air quality, particulate matter 10, temperature, humidity, ultraviolet intensity and other indicators. The elderly often have poor physical function and higher requirements for environmental quality. In addition, people's concept of green, environmental protection and health is gradually enhanced, and the application scope of environmental quality monitoring system is becoming more and more wide.

The adjustment of the indoor environment can be strategically controlled and distributed through the fresh air, air conditioning, floor heating, doors and Windows and other facilities in the home, so as to achieve the effect of intelligent control and ensure the excellent air environment in real time. The integration of these functions and the family environment space will not produce any conflict, and can make the traditional space environment originally individual facilities, no longer simply play the function of a single, but through the intelligent home system put them together, make them organized, strategic formation of a smart whole, in order to provide family space with convenient, fast, efficient, safe and beautiful living environment[3] .

4.3 Add the intelligent home theater system to improve the entertainment attributes of the bedroom space.

Smart home theater system. In the building space for the aged, the leisure and entertainment needs of the elderly in the bedroom space should be taken into account, such as watching movies, watching news, listening to music, intelligent sound reduction and lighting functions. Smart home technology of digital home theater, as long as the touch screen, the lights will automatically adjust to the theater mode, the curtain automatically closed, automatically open the screen, temperature automatic adjustment, all kinds of audio and video equipment automatically open, optional video source, the volume automatically adjusted to the appropriate position...... The smart home system allows the elderly to fully control household appliances anywhere, and also facilitates other family members to make audio and video calls, understand the mental status of the elderly in real time and conduct daily communication.

The Internet of Things is realized in the space of pension buildings, and the smart TV system is combined with smart window, smart bed, lighting system and monitoring system to realize data interconnection, multi-point positioning, and optimal sharing. While facilitating the daily use of the elderly, the space design of the old-age building should take into account the leisure and entertainment needs of the elderly.

4.4 Add barrier-free design and humanized the space.

The application of "barrier-free" design in the old-age building space can on the one hand reduce the risk of falling for the healthy elderly, and on the other hand, the disabled elderly can have a safe and barrier-free living environment. The following is the use of common accessible designs:

Living room:

The net width of the door should be at least above 85cm, and the position of the threshold is not high and low difference.

The switch should be in a palpable position in the dark, and its height should be determined according to the height of the resident and whether the wheelchair is used. It is recommended to increase the nighttime induction lighting.

The height of the bed surface is about 55cm away from the ground to avoid too high or too low. The folding handrail can be added at the bed to facilitate the elderly to get on and off the bed.

Toilet:

In the toilet, shower and bathtub should be installed beside the handrails fixed on the wall.

The lighting brightness of the toilet needs to be moderately enhanced, and has a clear contrast between light and shade.

The periphery of the toilet should be at least 150*150cm of free space, and the side of the toilet should be at least 75cm of the space, convenient for wheelchair access.

For the disabled elderly, the targeted design suitable for their own needs is more important, such as furniture height, lighting assistance, and intelligent electrical appliances that can make them have a better living experience.

4.5 Human-computer interaction to enhance the social attribute of the living space.

With the support of the Internet of Things technology, the smart home chat bot is a kind of chat software with artificial intelligence technology. It can master home intelligence through voice interaction, and provide home management, emotional comfort, intelligent control and other services. The functions of chatbot include family management, emotional comfort and intelligent control, which are convenient for the elderly to set reminders, record schedules, make plans, provide psychological counseling, chat, emotional emotions, and control home devices, smart home and music playback.

The living room should also create a social interaction space in the appropriate location, such as the living room or leisure room. Provide comfortable sofas and chairs for the elderly to communicate and gather with their family and friends. At the same time, some board games, chess and cards and other activities are provided to promote the interaction and social interaction among the elderly.

Choose ergonomic comfortable furniture such as soft seats and mattresses for the elderly to rest and relax. In addition, bright, warm colors and decorations can be used to create a warm and pleasant atmosphere[4] .

4.6 Create a medical help system and add medical aid facilities.

The community can cooperate with some local clinics and invite them to set up resident doctor rooms in different areas of the community and establish a medical help system for the elderly. The elderly can seek help from the doctor through the phone at home, or go downstairs to find the doctor's resident room for face-to-face consultation. In an emergency, nurses and doctors in the resident room can also go to the old man's home for treatment.

The elderly can also use the Internet + smart medical care to realize the synchronous treatment of community medical care and third-class A hospitals, and realize medical informatization. Smart medical treatment is a cloud treatment developed for the elderly. Doctors provide diagnosis and treatment services to patients through the Internet, Doctors ask the patient's medical history in detail, check the necessary examination report, and give a diagnosis and treatment plan. The elderly only need to complete the treatment through the Internet.

5. Conclusion

The emergence of the Internet of Things era has brought great convenience to modern life.For pension building space, the Internet of things and the development of information technology changed the way of the elderly. The living room can better improve the life experience of the elderly through new intelligent equipment and more humanized design strategy. Intelligent monitoring facilities can also improve the safety and comfort of living room.

Acknowledgements

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