

# Design of Nursing Home based on IoT and Blockchain Technology

Ying Lin

Jinan University, Guangzhou, China

kieralinny@gmail.com

**Abstract.** The aging society is an increasingly common problem facing the world. In the process of supporting the operation of my country's pension model, the existing professional pension institutions, family pensions and community pensions have shown shortcomings such as scale limitations, selection preferences, lack of standards, and efficiency constraints. This paper attempts to summarize the current management design of nursing homes based on IoT communication technology and blockchain thinking, and then study how to realize real-time positioning and monitoring services for the elderly in nursing homes. To create a high-quality nursing environment for the elderly, or to effectively improve the monitoring level of nursing homes and the work efficiency of staff.

**Keywords:** IoT; Blockchain; Nursing Home.

## 1. Introduction

At present, the continuous development of new technologies has played a role in promoting various industries. Especially in recent years, the development momentum of the Internet of Things and blockchain has been continuously enhanced, and the development speed has been accelerated, realizing the complementary interests from the enterprise side to the user value as the core. With the transformation of the Internet, an interconnection model based on user needs has begun to emerge and develop rapidly, making the traditional pension model continue to integrate new technologies, and smart pension is an inevitable trend.

According to the characteristics of technological development and business construction focus on different periods, smart old-age care is mainly divided into three modes: traditional old-age care model [1], medical care and old-age care combined with old-age care model [2], and smart old-age care model. These three modes are a process of mutual promotion and continuous improvement, rather than simple iteration and addition [3].

Based on the development data of the aging population, huge development opportunities can also be seen. It is estimated that by 2030, the space of China's pension market will reach 22.3 trillion yuan. At the same time, with the improvement of the social security system and the improvement of the ability of the elderly to pay, the elderly care market space of over 20 trillion yuan needs to be tapped.

At present, the pressure of supporting the only child is prominent, the institutional pension beds are in short supply, and the pension industry is not perfect [4]. It is impossible to fully protect the health and safety of the elderly in real time, and sometimes it is impossible to provide timely help in dangerous or emergency situations. These problems need to be solved by providing more high-quality and humanized services. The relevant demands also provide more possibilities for the development of the smart elderly care market [5]. With the empowerment and integration of government, community, medical institutions and other resources by emerging technologies such as the Internet of Things and blockchain, smart wearable devices will help the elderly to fully enjoy the convenience and comfort brought by the Internet of Things and blockchain technology.

## 2. The Development of Smart Elderly Care Empowered by the IoT

The development of the Internet of Things brings more possibilities for smart elderly care, and the following smart pension models combined with the Internet of Things and blockchain technology.

## 2.1 The First is the Smart Home Care Model

It is an extension of the traditional home care model. It generally refers to the return of the elderly to the family, relying on the Internet of Things technology to provide intelligent services such as intelligent protection, remote or door-to-door solutions to daily problems, so that the elderly can enjoy professional elderly care services at home, etc. social services [6]. This model mainly solves the pain points such as the lack of nursing and monitoring of the elderly at home, and no one knows when an abnormal situation occurs, and no one helps to solve or rescue them.

Safety protection is the core need in elderly life, and "smart protection" can play a big role in emergency rescue. Relying on technologies such as the Internet of Things, through intelligent perception, voice and image recognition technology and ubiquitous computing, it breaks traditional thinking and maximizes access to various sensors and computing networks to remotely monitor the dangerous situations that may occur in the daily life of the elderly. For example, the first smart "embedded" home care service center in Taizhou City, Zhejiang Province introduced new IoT sensing technologies such as "SOS push-to-talk" emergency call device, activity track sensing, automatic fall alarm, to fully meet the needs of the elderly class requirements [7].

## 2.2 Smart Nursing Home

It is developed on the basis of nursing homes, also known as institutional elderly care and institutional care. This model refers to various welfare institutions or charging institutions that provide nursing care, accommodation and care for the elderly, and use the Internet of Things technology to provide the elderly with various specialized and professional services required [8].

Different from home-based care, nursing homes involve many people and places and the situation is complicated. The staff cannot provide "7×24" care, care or monitoring for the elderly, especially some elderly people who need physical monitoring. "Smart medical care" is the core function of smart nursing homes and an extension of the combination of medical care and elderly care. Through more in-depth intelligence, more comprehensive interconnection, and more thorough perception, the elderly can enjoy medical services in nursing homes, interact with medical equipment, and provide more professional and better medical resources based on the needs of the elderly for medical resources. Comprehensive daily simple health care, professional care and other services [9]. To a certain extent, this reduces the burden of children taking care of the elderly, diversifies the risk of family pensions, and satisfies the needs of the elderly for basic medical resources.

## 2.3 Smart Community Pension

Smart community elderly care is a model between home-based elderly care and smart nursing home elderly care. With the help of IoT technology, wearable devices can be used to monitor the conditions of the elderly in the community in an all-round way, and an elderly platform covering the whole community can be built [10]. Embedded call system to provide consulting and other services. In communities with relatively complete facilities, it is also possible to follow the model of smart nursing homes, carry out services such as smart medical care, and expand the scope of services for the elderly in smart communities.

The rapid development of Internet of Things technology and the continuous opening of the smart elderly care market have driven the development of hardware and software services around smart elderly care and have also empowered various models of smart elderly care [11]. Smart elderly care solutions are the main focus, which promotes the integrated development of the upstream and downstream industry chains of elderly care.

Hardware mainly refers to wearable devices such as smart bracelets, covering functions such as positioning, heart rate monitoring, sleep monitoring, exercise, reminders, and one-key calling. It mainly solves the health problems of the elderly, relieves children's daily care anxiety, and provides daily health care and other health services.

Smart home mainly refers to security terminals, such as smoke detectors, gas alarms, water leakage alarms, anti-theft alarms, remote cameras, which are interconnected through the Internet of Things to provide corresponding services while ensuring a safe home environment.

Smart elderly care promotes the coordinated development of software and hardware, which is conducive to ensuring the real-time, safe, agile, and cost-effective smart elderly care, and effectively promotes the intelligent upgrade of health and elderly care services.

## 2.4 Smart Contract Equipment

smart contract equipment using blockchain technology is also a core of the current smart pension. It mainly refers to the deployment of devices that support blockchain smart contracts on the Internet. When the instructions (voice, mobile APP, etc.) issued by the elderly smart hut or the elderly at home are received by the merchant, the smart contract will be automatically activated. A shared distributed ledger can be formed between them.

The blockchain-based virtual nursing home ecosystem can improve the service quality of the health care industry and make the virtual elderly care community more intelligent and human; it can realize the efficient operation of the virtual elderly care community; support the win-win, ecology and development of the ecological chain of the elderly care industry; At the same time, it adopts cutting-edge technology to consolidate the technical foundation of the information platform. This ecosystem uses blockchain technology to solve credit problems such as decentralization, peer-to-peer transactions, coordination and collaboration in the virtual nursing home ecosystem. Smart contracts are the core components of the blockchain. The blockchain-based virtual nursing home ecosystem can provide a more open and transparent nursing environment for the elderly.

In addition, with the gradual popularization and application of multi-dimensional pilot technology supported by blockchain distributed technology, the virtual nursing home system that integrates various traditional pension modes is also being practiced and explored. The elderly living in their own physical families is connected with the government, community, hospital, supermarket, logistics and elderly associations in the real world through the technical network, and enjoy home, medical, health care, logistics, social, entertainment and other elderly services, and the virtual nursing home system is connected by the value chain. Explored such pension services based on the new technology paradigm of new supply mode, in the big data integration based on the analysis of the storage and intelligent computing, using smart triggered digital endowment contract operations, at the same time avoid data redundancy, and personal privacy, helps to precise and specification to improve service quality and efficiency of pension, Gradually covering more and more extensive elderly groups, it provides a new practice and technical design for the exploration of China's pension mode.

## 3. Conclusion

As an important starting point for "implementing the national strategy to actively respond to population aging", smart old-age care will help to achieve "support for the elderly", resolve the increasingly acute old-age problems of my country's aging society, ease the pressure of the only child to support the elderly, and effectively Improve the quality of life of the elderly. In addition, smart old-age care is also of positive significance for stimulating the "silver economy" and driving the development of the smart old-age care industry.

The latest technologies such as smart pension and the Internet of Things promote each other and can provide intelligent services for the elderly from multiple perspectives such as IoT pension platforms, remote monitoring, intelligent positioning, and wearable devices, while driving the development of related industries.

Smart old-age care is conducive to the aggregation of social resources, fully integrating government, community and social forces under the guidance of national policies, and earnestly paying attention to the quality of life of the elderly.

All in all, the future of smart old-age care empowered by the Internet of Things is promising, and it is expected to further improve the quality of smart old-age care by meeting the needs of the elderly in their future daily life, health monitoring, smart medical care, positioning, and companionship.

## References

- [1] Foley D J, Ostfeld A M, Branch L G, et al. (1992). The risk of nursing home admission in three communities. *J Aging Health*. 4(2):155-173.
- [2] Fry D E. (1993). ORIENTATION AND IN-SERVICE EDUCATION. *Modern Nursing Home*. *American Journal of Surgery*. 165(2ASuppl):26S-33S.
- [3] Al-Sinaidi A A. (2012). Periodontal health and oral hygiene practice of elderly Saudis living at Riyadh Nursing Home. *King Saud University Journal of Dental Sciences*. 3(1):1-5.
- [4] Steiner H. (2005). Modern equipment for better safety of nursing home residents.
- [5] Zhu R, Zhou R, Wenjing M I, et al. (2015). Dynamic Integration of Modern Sightseeing Agriculture and Nursing Home--Taking Nursing Home Tourism Park of Xinxiang County as an Example. *Forest Inventory and Planning*.
- [6] Gubbi J, Buyya R, Marusic S, et al. (2013). Internet of Things (IoT): A Vision, Architectural Elements, and Future Directions. *Future Generation Computer Systems*. 29(7):1645-1660.
- [7] Miorandi D, Sicari S, Pellegrini F D, et al. (2012). Internet of things: Vision, applications and research challenges. *Ad Hoc Networks*. 10(7):1497-1516.
- [8] Perera C, Zaslavsky A, Christen P, et al. (2014). Context Aware Computing for The Internet of Things: A Survey. *IEEE Communications Surveys & Tutorials*. 16(1):414-454.
- [9] Evans D. (2011). The Internet of Things: How the Next Evolution of the Internet is Changing Everything.
- [10] Sundmaeker H, Guillemin P, Friess P, et al. (2010). Vision and challenges for realizing the Internet of things. *Microbiology Society*.
- [11] Kortuem, G. (2010). Smart Objects as Building Blocks for the Internet of Thing. *IEEE internet computing*.