Research on Intelligent Community Based on Multi-living Agent Theory

Bin Li

College of Automation, Northwestern Polytechnical University, Xi'an 710072,China

zjlhm@189.cn

Chao Liu

The ministry of industry and information technology software and integrated circuit promotion center, Beijing 100038,China

zjxulhm@163.com

Abstract—The purpose of this paper is improving the integration of smart community system, decreasing the redundancy of data fusion for smart community system in order to integrate information and resources effectively. According to the complex information system of multi-living agent theory and method, this paper presents a new method for intelligent community research that based on multi-living agent. The new research method analyzes smart community system and smart home care application that optimize smart community construction effectively. It is obvious that the connection of agents in the smart community system is a good solution to handle information silos, forming data sharing system and improving smart community performance. The new research method in this thesis provides solutions to resolve data fusion problem of information silos, which is a general problem in complex information system. The smart community development should be in a better way through this method.In this paper, the intelligent community system architecture and the application specific intellectual endowment are analyzed. The prevalence of islands of information on data integration solution is given. This method can improve the integration of intelligent community and accelerate the development speed of the intelligent community.

Keywords- multi-living agent; complex information systems; intelligent community; wisdom endowment; data integration

I. INTRODUCTION

With the Internet of things, cloud computing and mobile Internet and other next-generation applications of information technology in the community continue to develop and more intelligent in community management, community was brought in the concept of wisdom. Smart community is a new concept of community management and a new model of social management innovation under the new situation. Intelligent community regards the happiness of community residents as a starting point. By creating a smart community service to facilitate community residents, thus speeding up the construction of harmonious community and promoting regional social progress.

The main object of community constitution is the residential and family, so application of the intelligent community will permeate into every aspect of residents' life. The goal of intelligent community is to form a complete set of data-sharing system, so as to provide residents with complete, comprehensive and convenient base services. It is a high degree of autonomy, distributed collaborative complex system, facing a variety of challenges such as huge amounts of data, large user, complex application environments and different audiences. But in the actual construction process, the intelligent community systems formed a plurality of information islands, due to different departments are independent with each other and decentralized management. Scattered data caused by this reason, has seriously hindered the development of intelligent community.

In this paper, multi-living agent theory-- that aims at dealing with complex information system-- is introduced into the field of intelligent community. Intelligent community system architecture and application specific intellectual endowment are analyzed. Widespread information on islands of data integration solution is given, which improves the possibilities of integration of intelligent Community system, provides good research direction to optimize the intelligent community systems in the future.

II. SUMMARIZE OF INTELLIGENT COMMUNITY

Traditional city has been replaced by smart city. Because community construction is the foundation of wisdom urban construction, intelligent community is inevitably an important support and indispensable component of the smart city. Wisdom community building aims through the use of intelligent technology and methods to integrate various existing community resources and services, so as to innovate community management. By meeting the needs of community service management and other demands, intelligent community provides a wide range of social management services for different types of community groups, such as modern governments, commercial, entertainment, distance education, home health care, and mutual aid and so on. Intelligent community can also promote community development and improve life quality of residents. In wisdom urban construction, community services management will be regard as a guide about how to develop. Resources will be comprehensive utilization and short-term behavior will be prohibited. Furthermore, community services management

should be supported in many aspects. Looking at the above factors, community services management will achieve remarkable results.

Currently, Shanghai, Beijing, Shenzhen, Ningbo, Hangzhou, Wuhan, and Wuxi, over 100 cities proposed the target to create wisdom city, related planning and implementation project and activities will be gradually launched. As an important part of wisdom city, wisdom community will make full use of Internet and the Internet of things, which involves smart buildings, smart home, network monitoring, smart hospital, city lifeline management, food and drug management, ticket management, family nursing, personal health, digital life and many other areas. Creating wisdom community should seize the great opportunities in the new round of technological revolution and the information industry innovation wave, make full use of developed information communications (ICT) industry, related technology about RFID, telecommunications business and the excellent based facilities information. Building community development of wisdom environment should form new modes, for example: life base on mass information and smart filter processing, industry development, social management, etc. It is new form of community building for future.

Take a look at about technology, wisdom community refers to through the use of intelligent technology and methods, integrate existing services community resources, provide communities member with a variety of convenient services, such as government, business, entertainment, education, health care and life mutual and so on. From the application of directions, intelligent community should realize the objectives of "use intelligent chief to raise efficiency, use wisdom to improve people's livelihood, use wisdom home to create intelligent life, use wisdom community enhance the quality of community".

III. BASIC THEORIES OF MULTI-LIVING AGENT

The complex information system of multi-living agent theory (MLA) put forward in recent years is one of the main theories of complex information systems, which designed for artificial systems that can be used to analyze complex information architecture. "multi" mapping has complex information systems of nature property, such as multi-profile, multi-levels, multi-subsystem interwoven, and multifunction, , "multi" and "agent" collection, further reflect above property features, and "activity" is gives system activity, characterize complex information systems survival development, hire in movement process, contain with "process" are is has limits of, complex information systems although features advanced complete, but as the evolution of "environment" , it also has decline and fall(activity recession), "activity" Characterizes of normal play and the existence of systems of systems.

Method based on the analysis of active agents in complex information systems can decompose complex information system functionality from the system level into sub-agent in different levels and the agent activity can be expressed function from the system profile. Active agents in a complex information system characterize self-organization mechanism in high level by consultation, self-organization mechanism of abnormal results is on behalf of system exception occurred. The research method of using "Activity" embedded in the characterization of complex multi-agent information system, is very important for the role of information system function. In short, active agent theory is an effective study method to complex information systems research, which can provide effective solutions to solve real-world problems, and improve the performance of complex information systems.

IV. OVERVIEW OF INTELLIGENT COMMUNITY BASED ON MULTI-LIVING AGENT

Wisdom community is a complex of information systems, which make full of next-generation emerging technology such as cloud computing and property networking, involve many area like wisdom home, wisdom property, wisdom Chief, personal health and digital life, etc. With excellent advantage as developed of information communications industry, advanced of RFID related technology, telecommunications business and the information based facilities, built community development of wisdom environment, formed based on mass information and smart filter processing of new form. Intelligent Community system generally consists of five areas: infrastructure, cloud, database group platform, application and service system and support system, in a service-oriented light top design, is committed to providing comprehensive and efficient public services to residents of security and orderly living in urban environment and harmony facilities.
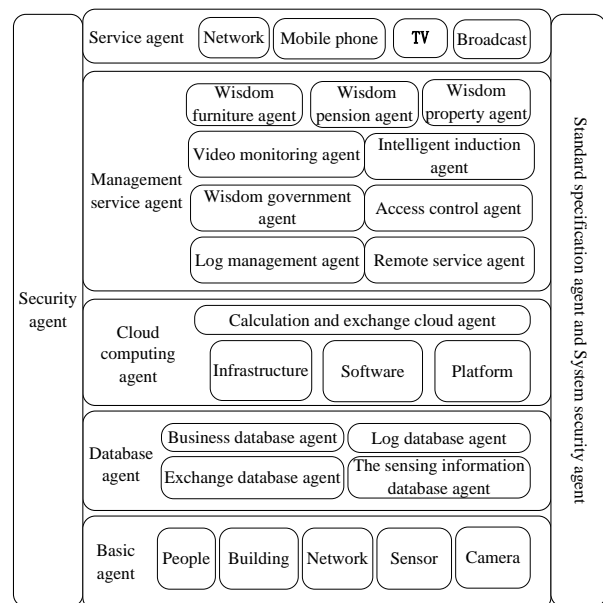

Figure 1.   The structure of intelligent community system based on the multi-living agent

For intelligent community system, we can using the theory of multi-living agent to analyze, which is equivalent to using the theory of multi-living agent to analyze a complex information system. From a point of systems, smart community is a complex information system which

contains decision support capabilities and associated with further smart city decision-making problems. In this complex information system, the "active" means that the protection of residents ' services at the top level effectiveness while "active" also represent a proxy function properly and try to prolong its functioning cycle. "multi-active" represent a system of coordination between the various agents and try best to prolong the functionality of the system formation. At the same time, various agents may be further subdivided into smaller, layer-by-layer decomposition community until the concrete realization of active agent units. Based on the above analysis, Figure 1 shows the structure of intelligent community system based on the multi-living active agents.

The intelligent community based on the multi-living agent is made up by the summary of huge amount of data, which provides a powerful data services, such as: deep integration, analysis, mining, and the development, so the most convenient service for residents can be provided. The system mainly includes five layers and three security agents. The basis agent of the first layer mainly provides the fundamental environment for data acquisition, including all hardware environments. The second layer database agent mainly includes four big database sub-agents, such as: business database agent, log database agent, database exchange agents and the sensing information database agent. The third layer cloud computing agent mainly implements various heterogeneous network data exchange and computing. The fourth layer management service agent mainly provides direct service for the community residents by multiple sub-agents, such as wisdom furniture agent, wisdom pension agent and remote service agent. The fifth layer service agent mainly displays form of residents get access to services. At the same time, the security system (includes security agent, standard specification agent and system security agent) ensures the security and integrity of each agent through three ways of technology security, safety operation and safety management. Thus, the intelligent community system based on multi-living agent is a complex information system of multi-level and multi-profile.

In a word, the complex information system of the intelligent community based on multi-living agent negotiates together with the overall function through the five agents, and controlled by security agent, standard specification agent and system security agent. By connecting all the agents together, solving the island problem of information and integrating the information resources, we can complete data sharing system and improve the overall performance of the intelligent community system.

V. APPLIED ANALYSIS OF THE INTELLIGENT COMMUNITY BASED ON THE MULTI-LIVING AGENT

The application of intelligent community works with the residents' daily life, which has a strong demand for special people's life safeguard service. Under the busy and fast-paced circumstance of today we don't have enough time to take care of the family. As the reason of body and age, disabled people, especially lonely elderly, urgently need advanced technical means to help them solve the practical problems encountered in the daily life.

In order to meet the modernized life for the old man to live in, wisdom pension agent as a fourth layer management service sub-agent of intelligent community, mainly includes four functional sub-agents: activity for aged management agent, service for aged management agent, home-based care for the aged agent and institutional pension agency. The agent is built with family, community and professional services, which can provide the socialized services to solve the problem in daily life for home-based elders. The frame is shown in Figure.2.
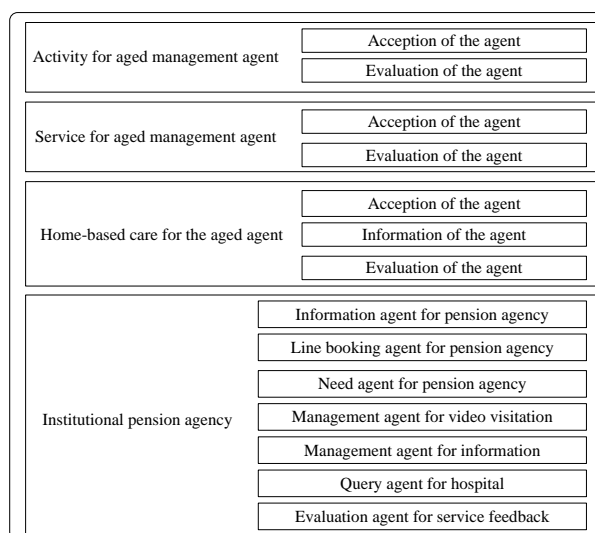

Figure 2.   The frame of wisdom pension agency

Now as an actual application for example, we analyze the application of wisdom pension in intelligent community with the theory of complex information system using multi-living agent. The frame is shown in Figure.3.
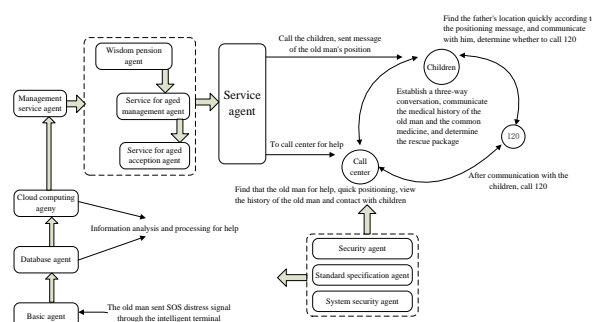

Figure 3.   The application frame of wisdom pension based on the multi-living agent

We can see from the above analysis, the system is divided into 5 layers according to the function, as the basis of the level 1 agent collected the SOS distress signal through the intelligent terminal from the elders, the database agent of layer 2 and layer 3 do cloud computing to analyze for information processing, and then the relevant data is send to the output in layer 4 management service agent, then through the sub-agent wisdom pension agent, the data continue to decompose into its sub-agents which will analyze the result and bring it to the fifth floor

service agent to make corresponding decision, at the same time by the regulation of 3 agents(security agent, standard specification agent and management security agent), the whole activity can be guaranteed. Thus it can be seen that using the theory of multi-living agent is of great significance to the analysis of complex information system.

VI. CONCLUSION

The research on complex information system of multi-living agent is shown in this paper. The structure of intelligent community system and the specific application of the wisdom pension are analyzed. The method of enhancing the integration from intelligent community system is also studied. Finally a good research direction is provided to optimize intelligent community system and improve the overall performance of the intelligent community system.

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