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Application of Artificial Intelligence Technology in Forestry Electronic Information System

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Abstract:

In recent years, the development of forest industry has increased the power consumption in forest areas year by year. The problem of power supply has become increasingly prominent. In order to monitor the power supply status of forest power system and predict the power consumption in a certain time in the future, this paper designs a power monitoring and prediction system. The development of national economy promotes the development of artificial intelligence technology. Artificial intelligence promotes the development of electronic information technology, and the development of electronic information technology promotes the progress of artificial intelligence. Artificial intelligence is to imitate people's behavior, develop according to people's way of thinking, and improve by using electronic information system. This paper studies the application of artificial intelligence technology in electronic information system. This paper expounds the characteristics of artificial intelligence, analyzes the advantages of artificial intelligence technology in electronic information technology. Based on the basic structure of artificial intelligence, this paper discusses the specific application of artificial intelligence in electronic information technology. The experimental results show that artificial intelligence can promote the development of electronic information technology.

Keywords: *Artificial intelligence, forestry electronic information technology, data fusion, telecommunication channel.*

I. INTRODUCTION

Since the reform and opening up, especially in the past 10 years, China's telecommunications industry has developed rapidly [1]. Compared with the telecommunication industry of developed countries in the world, there is not a big gap between Chinese telecommunication operators in terms of "hardware" such as technical equipment and network

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infrastructure, but there is still a big gap in terms of "software" such as business process, enterprise management and labor productivity [2-3].

Under the guidance of the strategic policy of "using informatization to drive industrialization and using industrialization to promote informatization", the informatization of telecom enterprises has multiple meanings: it can not only improve the management level and comprehensive competitiveness of enterprises, but also play a demonstration and leading role in informatization, and also develop new informatization business for enterprises [4]. The main goal of NGOSS is to use Moore's law in the operation system software to become a reality, that is, to halve the time to market and double the expansion of software functions.

The application systems in use and under construction of telecommunication companies mainly include integrated management of telecommunication business, customer service, billing account, inter network settlement, key customer management, resource management, fault management, network management, office automation, financial management, human resource management, engineering management, operation analysis, etc. According to its function, it can be divided into business support, operation support and management support.

II. AGENT TECHNOLOGY

2.1 Basic concepts of Agent

What is Agent? How to define Agent? What kind of structure should Agent have? Up to now, there is still no uniform and definite definition of Agent in academic circles. Generally speaking, Agent can be understood as Agent, but academic circles tend to understand agent as agent, agent or intelligent agent. Broadly speaking, Agent can refer to any entity with intelligence, including hardware and software, such as human, robot, intelligent software and so on [5-7].

At present, there are two typical definitions of Agent: (1)Agent is an entity residing in the environment, which can interpret the data of events occurring in the environment and execute actions that have an impact on the environment. This is the definition of Agent by FIPA (Foundation for Intelligent Physical Agent). (2)Agent is a software program that can perform specific tasks for users, has a certain degree of intelligence, can perform tasks autonomously, and can interact with the environment. This is the definition of Agent by software Agent researchers. However, Wooldridge and Jennings put forward the definition of Agent, which is widely accepted. They think that Agent can be understood from both narrow and broad aspects, and put forward the weak and strong concepts of Agent.

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2.2 Classification of Agent

1. According to the degree of intelligence

We can divide agents into five types according to their intelligence [8]: (1) Passive agents. It is the least intelligent Agent among all kinds of agents, and only when other objects call them by means of communication can they perform necessary actions. It is similar to a function call in a program. (2) reactive Agent. It has one more function than passive Agent: the ability to actively monitor the environment. Once the state parameters of the environment change, it can make necessary response. (3) Knowledge Agent. Its main characteristic is that it has strong knowledge expression ability. As an imitation of domain experts, knowledge-based Agent have two kinds of knowledge: belief and strategy, which respectively represent static knowledge and dynamic knowledge, or basic knowledge and meta-knowledge. (4) Autonomous Agent. This is the most typical intelligent Agent in the research of Agent at present. They have Belief, that is, knowledge: Desire, that is, task, and Intention, that is, planning for realizing desire. (5) Social Agent. It lives in a society composed of many Agent, whose functions include cooperation and competition.

2. According to the organizational hierarchy

The organization structure of Agent adopts a tree-like hierarchical structure, which can be divided into three categories: management Agent, auxiliary Agent and functional Agent according to the different functions and levels of each Agent in the system. (1) management agents are mainly responsible for management functions, such as problem receiving agents, task planning agents and task management agents. Its functions mainly include problem receiving, analysis and decision-making, task planning and management, monitoring and grasping of overall task flow, management, control and communication coordination of functional Agent, etc. (2) The undertakers of some general functional tasks of auxiliary agents, which face functional agents and management agents and provide them with required services, but generally do not undertake specific application tasks. Examples of such Agents are registration Agent, system monitoring Agent and auxiliary communication agent. (3) The functional Agent is the implementer of the specific functions of the system, which is designed for functions. A functional Agent is generally the finisher of a specific subtask in the process of problem solving. Generally, different functional Agents do not communicate directly. They face and are responsible for the management Agent, communicate directly with the management agent and accept its management and scheduling.

2.3 Theoretical model of Agent

(1) Cohen and Levesque's BDI model

Cohen and Levesque's BDI model is based on linear temporal logic, and gives a formal model, which introduces and represents the concepts of time, event, behavior goal and idea

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respectively. Finally, the relationship between these concepts is formally expressed. However, Cohen and Levesque's BDI model can't completely reflect Bratman's philosophy. It doesn't solve the relationship between intention and goal. It's very abstract and difficult to realize.

(2) The BDI model of rational Agent of 2)Rao and Georgeff

Rao and Georgeff's BDI model of rational Agent adopts nonlinear branching temporal logic, and uses three basic modal operators: belief (BEL), intention (INTEND) and GOAL, which are defined accordingly. Compared with Cohen's BDI model and Levesque's BDI model, Rao's and Georgeff's rational Agent's BDI model describes the relationship between intention and goal, and its semantics are clear, but it is still too abstract to be realized.

(3)Brooks' behavior based agent theory in America

Different from the above two abstract and difficult theoretical models, Brooks thinks that behavior can produce intelligence, and the real intelligence is the result of the interaction between agent and environment, without complex logic and philosophy. Brooks advocates ① going to the scene, ② physical implementation, ③primary functions, ④ behavior generates intelligence. Based on these, Brooks studies a kind of robot worm, which uses relatively simple functional units to achieve the functions of avoiding, advancing, balancing, etc. to form a hierarchical asynchronous network, and achieves a certain degree of success.

2.4 The structure model of Agent

(1) Think carefully about agent structure model. Deliberative agent, also known as cognitive agent, is an explicit symbolic model. It is a knowledge-based system, which includes the logical reasoning ability of environment and intelligent behavior. It has active software of internal state, knowledge representation, environment representation, problem solving, concrete communication protocol and so on. This architecture is dominant in Dai.

(2) Reaction agent structure model. Reactive agent is a model that does not include symbolic representation. Its characteristic is that the reactive agent includes a perceptron that perceives internal and external state changes, a group of processes that respond to related events, and a control system that is activated according to the perceptron information. The system plays a leading role in the distributed system.

(3) Hybrid agent structure model. The feature of hybrid agent structure model is that there are two or more subsystems in an agent, one is thinking subsystem, the other is reaction subsystem. The former is based on the latter [9-10]. The hybrid agent structure model overcomes the shortcomings of the former two models, which are not comprehensive in

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function and flexible in structure. An agent model with the comprehensive ability of autonomous action and cooperation under the guidance of real-time response target is given (see Figure 1).

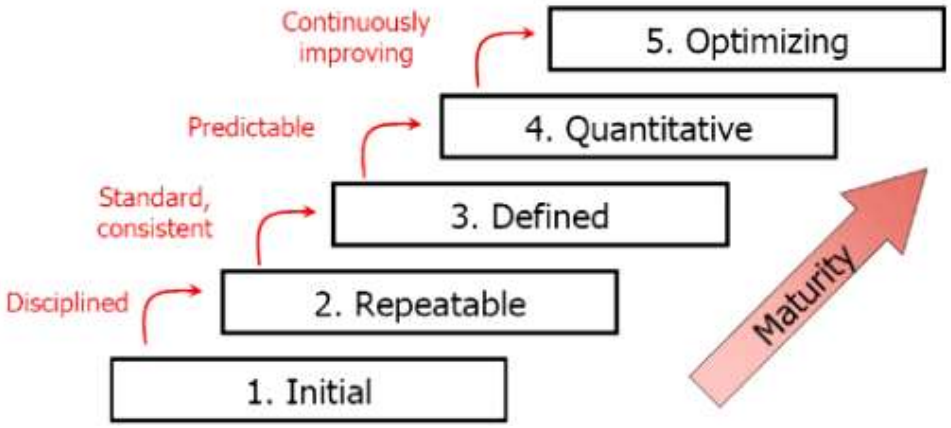

Fig 1: Agent structure model

III. SUPPLY CHAIN MODEL OF TELECOM ENTERPRISE BASED ON AGENT

3.1 Analysis of Telecom supply chain

The model shown in Figure 2 is the basic structure of the current telecom operation supply chain. The direction of arrow indicates the flow direction of products and services, and the relationship between entities in the supply chain, which belong to the entities in the above-mentioned telecommunication value network.

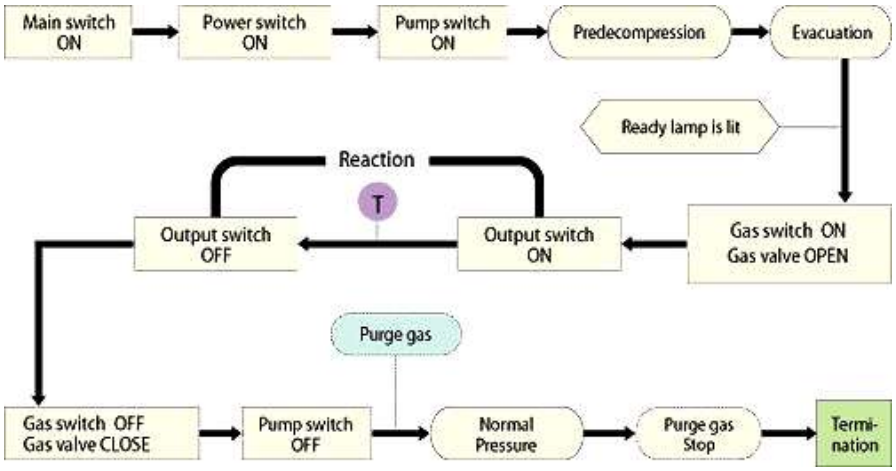

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Fig 2: Product and service flow model of telecom operation supply chain

Due to the particularity of Telecom production, the supply chain is mainly divided into two parts. The first part: the upstream of the telecom supply chain, mainly producing and developing telecom business infrastructure (including hardware and software). The value network entities involved in this part include: suppliers (hardware and software, system integrators, etc.) and telecom operators. The products are all kinds of network equipment and supporting systems (including software and hardware) provided by upstream suppliers. The second part: the downstream of the telecom supply chain. These suppliers mainly deliver telecom services and some matching Telecom terminals to users. The value network entities involved include affiliated service providers, telecom operators and intermediary service providers. The services provided usually include access services and content services.

3.2 Agent model

Similarly, we give a running interpreter of the agent model, which aims to explain the running mechanism of the agent model at an abstract level and reduce the distance from the real system. This abstract runtime interpreter includes belief B, desire D and intention I of agent in literature. It also introduces capability component Ca, communication component Co, trigger tr, Perceptor re, evaluator EV, processor PR and implementation related components.

According to the running interpreter, in the agent model, the agent perceives the external environment through the perceptron re and the communication component Co, and updates the belief B; Through the trigger to monitor the change of belief, and according to the mental state (B, D, I) at that time and the ability component Ca, form a new desire D; then the evaluator EV evaluates whether these wishes are worth executing according to B, D, I, ca, Evaluated wish formation plan I: processor PR is responsible for allocating and scheduling capability components to complete these plans: during the execution of the plan by processor, the perceiver continues to accept external events using communication components. Agent updates mental state and capability components: according to the different commitment strategies of agent to intention and the existing capabilities of agent, remove the satisfied wishes and successfully implemented plans, remove unrealistic wishes and unrealistic plans, and remove unnecessary capability components.

3.3 ASCM architecture

ASCM system architecture adopts hierarchical structure (Figure 3), which is divided into system layer, domain independent component layer and application component layer. The system layer is composed of Java virtual machine. ASCM system is based on Java language and is built on Java virtual machine, so ASCM system can run on different operating systems and

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hardware platforms, which is platform independent. Domain independent component layer consists of some components and infrastructure unrelated to specific application fields, providing basic services such as data connection, component communication, component search, etc. application component layer includes supply chain management logic, providing entity library which forms all parts of supply chain, and different enterprises initialize their own roles according to their different positions in the supply chain. As a result, ASCM has the independence of platform and database, and the three-tier architecture ensures that system developers can only care about the supply chain management logic of application domain layer, which meets the actual application needs of enterprises and adapts to the future software development trend.

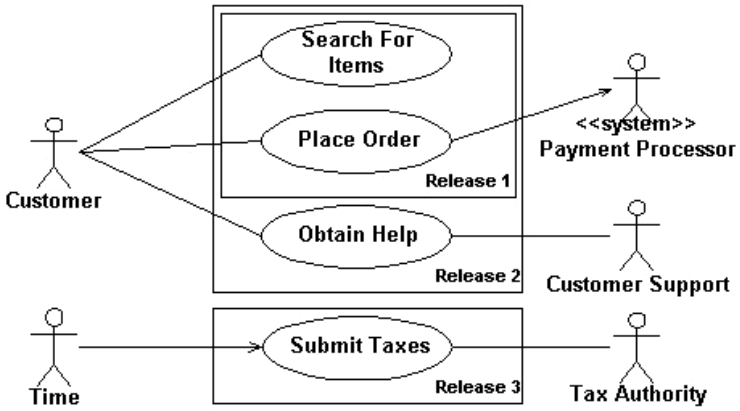

Fig 3: ASCM logical architecture

The entity agents in ASCM system form a local regional alliance according to different physical locations. Each local regional alliance has the following four servers. It is responsible for the registration, communication and management coordination of agents in the region. Each agent in the system first submits its own information to the registration server when it is initialized. The communication between agents in the same local region adopts point-to-point communication, and agents in different regions forward it through relay server. If an agent wants to query an agent with a certain function, it submits a request to the query server, and the agent obeys the management of the regional coordination server during its whole running period.

The application layer components of ASCM are composed of agents with different capability components. according to the different capability components, the agents in the

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system are divided into three categories: (1) structural agents are entities that describe products and transportation in the supply chain, such as suppliers, manufacturing enterprises, distribution centers, retailers and transporters, which are represented by SAgent. (2) Control Agent is used to define various control strategies for managing product flow in supply chain, such as demand, supply, information and material flow, which are expressed by CAgent. (3) Interface Agent provides interfaces and methods for agents in the system to interact with the outside world, which is represented by IAgent.

IV. IMPLEMENTATION OF E-COMMERCE BASED ON AGENT

4.1 The feasibility of collaborative e-commerce system

With the explosive growth of the amount of information on the Internet, the network environment is becoming more and more complex, and each subject participating in e-commerce and their relationship are becoming more and more uncertain. Enterprises hope to establish closer ties on the Internet to improve the delay of traditional e-commerce online transactions. Individuals are eager to get more active and intelligent personalized services. All of these challenges the traditional e-commerce. It is an effective way to solve the problem to deeply study the collaborative information technology and the new generation of distributed computing mode. This research will promote the development of collaborative e-commerce system, the third generation e-commerce system, and realize efficient information exchange and business cooperation among enterprises through the Internet.

4.2 Collaboration among mobile agents

Mobile agent technology is a new technology, which can effectively simplify the design, implementation and maintenance of distributed system. Mobile agent computing mode can effectively reduce the network load in distributed computing and improve the communication efficiency. MAS (multi agent system) is a computing system in which autonomous agents complete certain tasks or achieve certain goals through cooperation, and solve the contradictions and conflicts between the goals and behaviors of each agent member through competition or negotiation.

4.3 Cooperative agent group model

As shown in Figure 4, an agent group is formed around the tasks it undertakes.

User agent (UA) is an interface, which is responsible for the interaction between system and user. Management agent (MA) is responsible for agent organization, management and coordination. Application agent (abbreviated as MA) is responsible for completing the tasks related to specific applications. Multiple application agents undertake different parts of the task,

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and complete the tasks entrusted by users under the management and coordination of the management agent.

The name server provides name services related to host name, user name and agent name and maintains the above relationships. The resource management server is responsible for managing local resources and accessing resources.

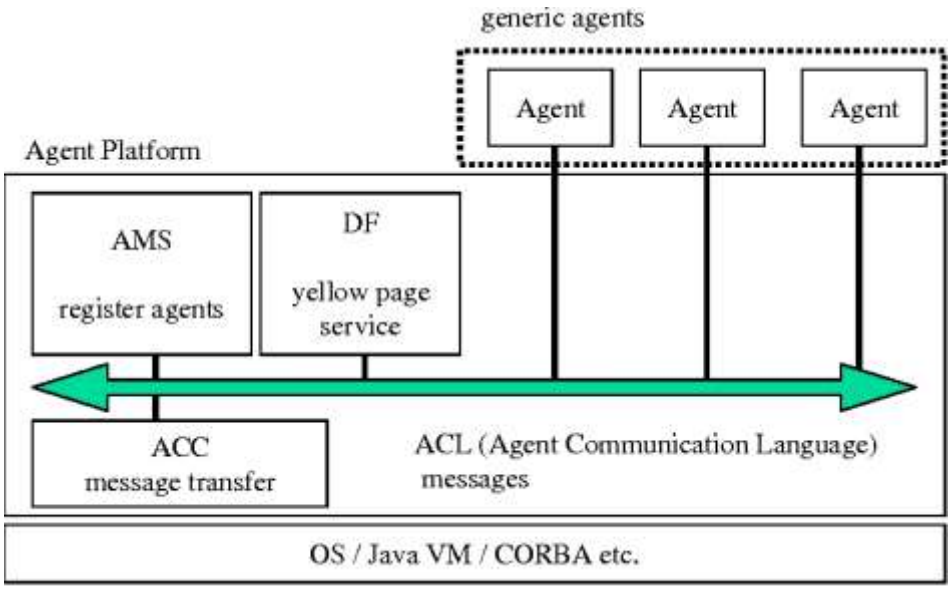

Fig 4: Agent group model

4.4 Collaborative e-commerce model based on Java

The workflow of the whole system is as follows:

(1) Customers visit a site in the system through the browser and make information access request.

(2) The front-end server is equipped with a web server and an agent system. The web server accepts the client's request and starts the user agent (based on security considerations). Agent provides corresponding interface to communicate with the outside world through one agent, which can also make the location of agen 7 transparent. When agent wants to communicate with remote agent, it only generates the agent corresponding to remote agent in the context of local host and communicates with this agent. It does not need to deal with the problem of network connection and communication directly) to judge whether it is local operation.

(3) If it is a local operation, it directly starts the local information query agent to make a

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service request. After getting the response, the result is returned to the front-end server.

(4) If it is not a local operation, create a collaborative information query agent, dispatch it to the management agent server, and request attribute information about other agent systems from the management agent system. After obtaining the context information of other agent systems, the cooperative information query agent can send the mobile agent carrying the relevant operation request to other information nodes, request the local information query agent to complete the relevant operation in the context environment representing these agent systems, and then return the result to the front-end server after the operation is completed.

(5) After the front-end server gets the information service result, it returns or transmits the result to the user through the web server.

V. CONCLUSION

Agent technology is a powerful tool for telecom operation process reengineering. Finally, the agent-based telecom enterprise supply chain model and dynamic enterprise model are designed and implemented. The application of agent in telecom enterprises gives full play to the characteristics of agent autonomy, intelligence, coordination and easy implementation, and better supports the dynamic reorganization of business and organization of telecom enterprises. It is a new idea to increase the flexibility of enterprise business process. But many aspects are still in the conceptual research stage, and there is no accurate physical model and mathematical model. I believe that with the more mature agent technology, agent technology will be more applied to the construction of telecom enterprises and other enterprises.

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