Journal of Theoretical and Applied Information Technology
10th February 2013. Vol. 48 No.1

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

RESEARCH OF SERVICE ORIENTED FITNESS BASED ON MULTI AGENT

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ABSTRACT

With the development of modern fitness, people pay more attention to customized sport fitness. This paper puts forward a service oriented fitness framework based on multi agent technology. Firstly, a service strategy for fitness was constructed through portals. Fitness resource nodes were distributed and organized in an internet or intranet. Secondly, with the help of agents of fitness demands and service, a customized fitness service process based on fitness database was built for specific person according to his physical condition and fitness domain. Thirdly, the whole service process of this intelligent fitness system for lower limb was illustrated as a case to show the effects. The agents collected exercisers' physiological information and provided an appropriate advice on customized fitness.

Keywords: *Multi Agent, Service Oriented Fitness, Intelligent Portal, Low Limb Exercise*

1. INTRODUCTION

With the development of modern fitness, people pay more attention to sport fitness. In order to gain the effect of fitness, it is important to exercise appropriately according to personal physical condition. However, professional fitness trainers are rare and expensive for common people. A fitness mode with the characteristic of safe and cheap for an individual person is in great need recently.

The Chinese government put forward an outline for national fitness [1], but it was not concerned with the implement of technology. A traditional domestic fitness model in China emphasized on guild lines and organization of the government. It lacked a scientific and quantitative customized fitness strategy.

The concept of agents which could be regarded as a computer system with the characteristic of activeness and reactivity originated from the domain of distributed artificial intelligence [2] -[3]. Nowadays on one hand, the application of agent technology becomes more widely used and gradually adopted in the field of computer aided training for athletes [4]. On the other hand, pure world wide web (WWW) can not provide customized and intelligent service to potential customers. On account of the similarity between the agents and WWW [5]-[6], it is a tendency to combine the technology of agents and WWW to provide a new type of service system model [7]. This model may help to build an open and dynamical fitness service for common people with scientific guide.

The paper is organized as follows. Section 2 describes the service strategy on fitness. Fitness resource was designed as nodes in a distributed environment. Section 3 presents a multi agent based customized fitness service process, it was built for specific person according to his physical condition, fitness domain and fitness database. Section 4 illustrates a whole service process of this intelligent fitness system for lower limb. The agents collected exercisers' physiological information and provided an appropriate advice on customized fitness. In the end section 5 presents the conclusions.

2. SERVICE ORIENTED STRATEGY ON FITNESS

The structure of multi agents based service is a complicated net structure compared with the traditional hierarchical forms. The modern fitness

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under such circumstance is available with various resources. The exerciser has no need to understand the detailed structure of fitness services. What he should do is to apply for a schedule of fitness. As the Fig. 1 shown, fitness resources compete in the whole net. These resource nodes are combined and optimized according to the exerciser's requirement. The resources in the background provide a uniform portal to the common exerciser.

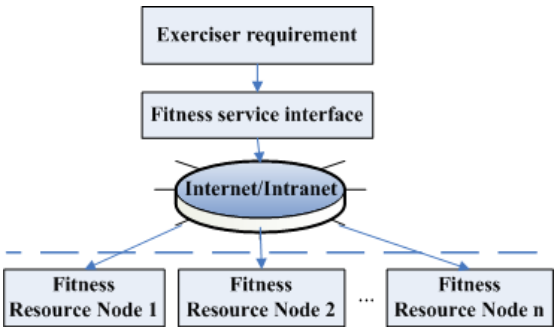

Fig. 1. The Service Oriented Strategy On Fitness

Service Oriented Fitness (SOF) not only provides the common population with various kinds of fitness but also provides scientific reuse and service combination in Internet. All available fitness resources can be modeled, stored and registered in a Unified User Interface (UUI). Hence all the fitness services may be classified to determine the logic relations among them. These fitness resources are packaged with uniform interface and documents. So when the exerciser applies for a specific fitness, the container of fitness service will choose and match his requirement and organize these contents into the customized fitness.

3. MULTI AGENT BASED CUSTOMIZED FITNESS SERVICE PROCESS

Every exerciser has his own physical condition. On account of the great population of exercisers, it is a hug work to customize a fitness plan for everyone. Here the concept of ontology and ontology modeling [8] are introduced to describe the information. The relationship between the exerciser and the fitness can be described on computers with ontology methodology. We designed three main kinds of ontology, one is the ontology of the specific fitness domain, the other two are ontology of interaction. As shown in Figure 2, the functions are as follows.

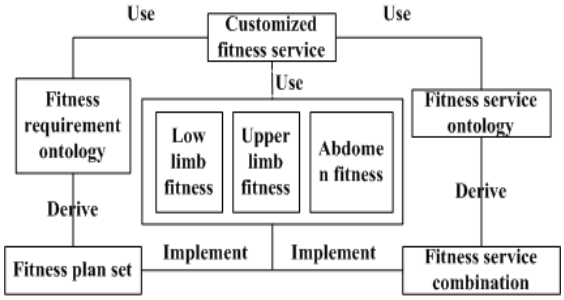

Fig. 2. Functions Of The Three Ontologies In Fitness Service

(1) Ontology of specific fitness domain

According to different fitness programs, ontology of specific fitness domain is constructed to describe its conception and relation set in the computer.

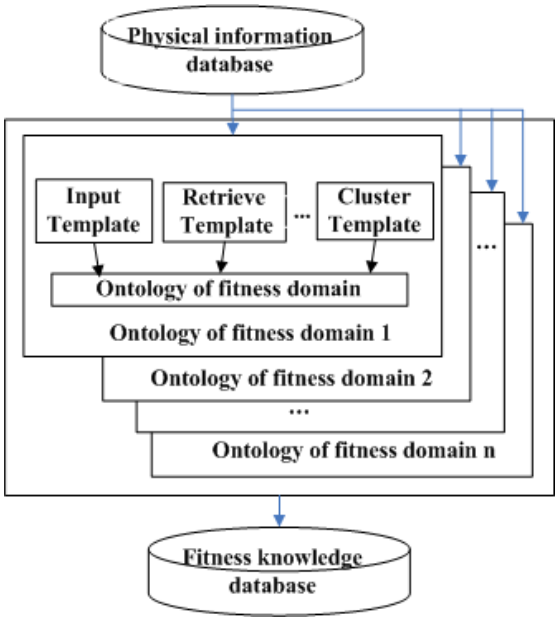

Fig. 3. Constitute Of Customized Fitness Service

The ontology of fitness domain can be customized according to the objection. We design ontology for lower limb fitness, upper limb fitness, abdomen fitness and so on. As shown in Fig. 3, every ontology of fitness domain is expressed normally with input template and all the domain knowledge are stored into the fitness knowledge database. When an exerciser asks for a fitness plan, the system searches his information according to his physical condition from the retrieve template. If there was the same customized requirement, the fitness ordered is output quickly. If there was

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nothing to match, the system provides a fitness template form the cluster template. A new ontology of fitness is constructed based on this template quickly. The cluster template here is important because the data on every exerciser's physical condition vary greatly. It needs to analyze the data cluster in finding the same factors, which will reduce the work of customized fitness.

(2) Ontology of fitness requirement

The ontology of fitness requirement can be described from objection, method and quality. Objection is the ontology of specific fitness. Method is a tool to coordinate these objections. They are often described as a set of parameters. Quality is used to measure the satisfaction degree of objects.

(3) Ontology of fitness service

The ontology of fitness service describe various information concerned with fitness service including both software and hardware. Software is the definition of interaction of ontology, such as interface parameters and semantic information. Hardware is the fitness resource available.

The ontology of fitness requirement and the ontology of fitness service are constructed with the common agent technology. The implement of fitness service combination and fitness task can be realized by the process of customized fitness service.

Now the three ontologies are packaged as agent components, their contents and inter-operation are described by Web Services Description Language (WSDL). Then the fitness service can be transferred via Hyper Text Transport Protocol (HTTP) or Simple Object Access Protocol (SOAP). The fitness resources coordinate together to response the requirement from the exercisers.

4. A CASE OF LOW LIMB FITNESS

We designed a fitness service system for lower limb. The fitness service process is shown in Fig. 4.

(1) An exerciser applies for a fitness requirement from the portal. This application will result in building a customized fitness task for his own in the fitness service system.

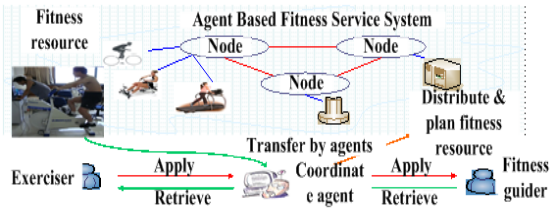

Fig. 4. The Process Of Multi Agent Based Fitness Service

(2) Once the coordinate agents on the server side receives the application, the fitness service system plans and assigns fitness resource in the whole system to find suitable resource nodes to provide services.

(3) The service system computes and suggests exercise intensity according to the exerciser's physical information. This is a process of task decomposition. The application form the exerciser is analyzed and decomposed into several sub tasks.

(4) The agents on the server side retrieve the fitness prescription to the exerciser via HTTP. If the system cannot provide suitable plan, the coordinate agents will contact professional exercise guider to tackle it manually.

The coordinate agents in this new fitness service on the server side play an important role in this system, they are the ties between the exerciser, exercise guider and fitness resources.

5. CONCLUSIONS

Sport fitness is an important way for people to relieve pressure and improve the physical quality in modern society. However, excessive fitness will do harm to exercisers' bodies. This paper puts forward a strategy of fitness service based on multi agent, fitness resource nodes were distributed and organized according to the exerciser's physical condition and fitness requirement. The customized fitness service process based on fitness database was built to guide the whole process of fitness. This paper provides an effective way for people to find scientific health sports fitness method.

ACKNOWLEDGMENTS

This work was supported by High-Tech Research and Development Program of China (973 Program Grant No. 2002CB312106), National Natural Science Foundation of China (Grant No. 61003122), the priming scientific research foundation for the junior teachers in University of Electronic Science and Technology of China and the Fundamental

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

Research Funds for the Central Universities in University of Electronic Science and Technology of China (Grant No. ZYGX2010J096 and ZYGX2009J076).

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