

JADE AGENT IS INTERMEDIATION SYSTEM (JAIS) FOR KNOWLEDGE EMERGENCE IN COMMUNITY OF PRACTICES

Intelligent Information Systems, Best Practices & Communities of Practice, Cooperation, Communication, Collaboration and Knowledge Sharing

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Abstract: This paper presents an intermediation agents system to manage the distributed collaborative design environment like CoPs. The JADE Intermediation System (JAIS) uses community enactment mechanism and agent integration mechanism. The community enactment mechanism is the system kernel and follows the specifications of the CoPs reference model. The system kernel supports two types of agents (human agent and artificial agents) that help to manage the activity into the community, whereas the integration mechanism supports an intermediation agent to interact, coordinate and monitor the activities between agents. JAIS facilitates the team interaction in a collaborative and distributed environment.

1 INTRODUCTION

We describe an intermediation system able to design distributed and collaborative environment in a CoPs.

JADE (2006) is used as the agent platform for linking the heterogeneous system in a distributed environment like CoPs. Gaia methodology is used in our work to describe a part of MAS model and MAS-CommonKADS to represent the knowledge model. Agent is able to acting autonomously, cooperatively, and collectively. Hammond (Hammond and al, 2004) proposed an approach agent to model knowledge virtual communities implanted on JADE. The information increasing across businesses involves a need to exchange and share information from various distributed and heterogeneous sources, (Boulanger, Dubois,). These exchanges include the concepts of knowledge acquisition, sharing and emergence, and require the development of negotiation and interaction protocols. According to Wenger (Wenger, 1998), CoPs are "resources in the most versatile and dynamic enterprises and (CoPs) form the basis of cognitive ability and learning organizations". Some authors such as Brown and Duguid (Brown and Duguid, 1998) see in these communities a place for knowledge creation, maintenance and reproduction. In this context, we propose to design a system

composed of several layers: the first contains the description of the organization (organizational model), the second layer represents a "agentification" of the previous level with a modeling agent. The last level is the level of implementation, will be processed using the JADE platform. Before presenting our work, we give the definition of the used concepts.

2 COPS AND KNOWLEDGE EMERGENCE

This concept is often used in order to create knowledge (experience, knowledge internalized, tacit knowledge (Nonaka, 1991)), (Cohendet et al, 2003). Zacklad (Zacklad, 2003) argued that knowledge is still a large part tacit and contextualized. So we define CoPs as "a creative community of knowledge formed a group of human agents with a common interest in a given subject and exchanging knowledge in connection with his problem" (Kenfack, 2007). CoPs can be treated as an intelligent system in which players do not work alone but in an environment that contains other intelligent entities. Therefore agent technology is a good candidate to model CoPs because he offers a

great flexibility concerning development of complex and distributed systems. An agent is a software entity that can autonomously perform routine tasks with a level of intelligence (Boudriga 2004) Wooldridge (Wooldridge and Jennings, 1999). During the problem solving, the capacity of all individuals are used to act together. In the case of CoPs, the collective knowledge available in the community is much more than the sum of knowledge of all members (Brown and Duguid, 1991). CoPs have a particular method of problem solving; members of the community put existing knowledge into new contexts and create new knowledge. Therefore knowledge emerges through communication and interaction between members of the CoPs. The common enterprise emerges from a permanent collective process during negotiation that reflects the complexity of the dynamics of the mutual commitment of community members. The phenomena of knowledge creation emerge at the macro level (the community as a whole) from an interaction between the members of the CoPs (micro level). Another aspect of the knowledge emergence in CoPs can be realized through the techniques of storytelling (Soulier, 2004).

Another concept that we use is the concept of intermediation, we define our intermediation system as "a system that allows all members of the CoPs to create interactions between them, even in geographically dispersed locations. To promote the co-construction of meaning, to enrich their knowledge base; to improve their skills, to share, exchange and acquire knowledge. To do this, the system must be able to provide the mechanisms to manage constraints that could impose the functioning of the community. These constraints can be tasks allocation, management profiles, authorization of access to the knowledge base, process requests etc". (Kenfack, 2007). Our aim is to reproduce some process to support human intelligence by building intelligent intermediation agents to perform members' tasks in the CoPs. Our proposal. This specification has identified and defines the system models. The organizational model defines knowledge and role models, the MAS model defined communication and agent models. In this figure we identified three phase of development of our system.

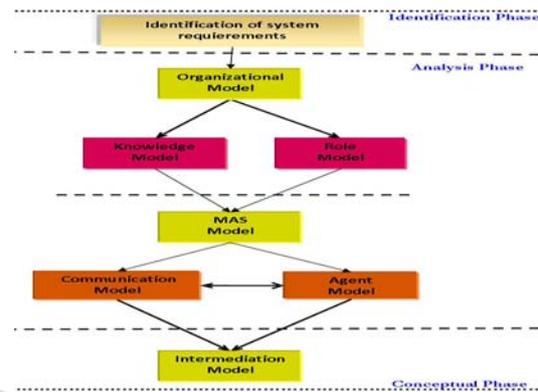


Figure 1: JAIS Model.

3 JAIS PHASE

3.1 Identification Phase

In this phase we identified some components which included some technical features to allow information exchange, mutual support and mutual point of view between the members of CoPs to achieve and create the emergence of new knowledge. These components are: component-based resources used to save the formalized part of the shared directory. It is important that the link between the actor and the resource recorded or published is maintained and easy to follow. The system must encourage and store all information produced by the community, whether a result of interactions between peers, or individual contributions.

The activities domain component: This component allows the community to select its members, organize the implementation of its activities in a field, search for information resources related to their activity domain.

The role component: This feature allows members to define and identify the roles may be held within the community or other communities. In these roles a set of activities to achieve is assigned. Each role includes objectives to be achieved by the member who play this role. To these objectives rights are assigned.

The basic Protocols / Collaborative Activities / cooperatives Tasks: The protocol defines the steps by which the activities must be performed by community members, how the activity is done, what kind of knowledge or skill is necessary to carry out the activity. Cooperative activities represent concrete actions that are undertaken in the community. The authentication database: this

database contains the identifiers of each member in connection with their profile and management rules of each right.

User profile base component: This component contains a list of all CoPs members that are registered as users. Especially, in virtual CoPs face-to-face contacts is not present, the design of profiles user base allow building trust among members. We propose to define the profiles in two areas: static area, which include information background and dynamic area which enable dynamic evolution their profiles based on interventions in the community

Exchange component: This component allows members to communicate between them and the system through various channels (direct asynchronous communication between members who send messages directly to another members they wish to contact or indirect asynchronous communication between geographically dispersed members).

Tool/collaborative platform: the collaborative platforms like (SweetWiki, CommKnowledge) are mostly equipped with one or more forums, more or less formal in which members of the CoPs can discuss various topics. Especially in this context people can exchange experiences (through narratives (storytelling) or by sending request for information or assistance).

Analyse phase

The Organizational model

The organizational model represents the core framework of a CoPs. The system specification relies on the functioning of the community especially on the relevant aspects of what constitutes the community (activMember), the objectives, policies put in place to support the community.

The knowledge model describes the knowledge required for workers to perform activities. It also helps to define the process to resolve activities within the CoPs, to describe the activities and tasks and their distributions, the inputs and outputs, the preconditions and the performance criteria. So the knowledge model is composed of:

The organizational structure: includes the Organizational Context (background activity) corresponds to the organizational environment in which the community is involved; this allows targeting the utility and function of the tool and its suitability to the needs of users. The user profile: A profile is define as including knowledge necessary for effective evaluation of applications and production of relevant information distributed to each user. The goals are used to model the system through the missions and goals of a community. The

members. Members can be defined as having strategic and intentional goals. A member may be a physical agent or a software agent.

The Activities domain: refers to topics related to the environment in which the community is immersed, this structure allows to identifying some concepts.

The activities structure includes: The activity context corresponds to the organizational environment in which the community evolves; the activity Protocol, the tasks, the cooperative activities: a description of a cooperative activity is independent of the entities that perform. The cooperative tasks, represent the work being done by members of CoPs, solving tasks contributes to community resources.

Resources base: represent all library resources and the knowledge exchanged and used the mails, the group summaries and other information that may help in solving a problem in the community. The resource base is used to perform a cooperative activity.

The role model identifies the key roles of the system (Wooldridge et al. 2000). A role is defined as an abstract entity which describes the functions in the organizations; role describes an organizational structure according to a type of activity (Gasser, 2001). In a role-model, role descriptions define or identify activities or services required to achieve the community goals. Indeed, a set of roles is attached to each community and a member can play several roles resulting in a set of actions necessary to accomplish a task (the principle of agent-group-role) (m association -> n) (Gutkchnet, 2001).

In the system, several types of roles can be identified: an organizational role describes all the roles that constitute the computational organization (in a CoPs, and resulted in the intermediation system) and an intermediation role. Each role includes objectives to be achieved by the Member who will play this role. The roles in our system are characterized by two types of attributes according to GAIA (Wooldridge et al, 2000) method: the permissions represent the rights associated with the role and on the type and number of resources to exploit to achieve its objectives.

Responsibilities represent the goals, objectives of a role defined by various features. The protocols are activities which involve interactions with other agents.

MAS model (Intermediation)

This model helps to reproduce the process able to support human intelligence. The use of intelligent agent helps to perform CoPs tasks. The following

model covers all the models needed to develop our intermediation system. The MAS model describes the roles defined by the roles "agentification" in the organizational model. Thereafter we describe models of the MAS model.

The Role model in the system described intermediation roles correspond to the transformation of the organizational role from the organizational model. These roles correspond to the "agentification" activities at the organizational level. In our system we count many roles : Dialogue Manager Role manages the communication between different agents system (via the technological tools used in the CoPs). The Cooperative Activities Manager Role: in charge of requests execution. They manage the interactions during tasks solving. The Knowledge base manager role supports management resources of CoPs and agent, and this through: Profile manager role; resources Manager Role: protocol activities manager role; authentication manager role.

The Communication Model: Defined the activities between the actors (human and software agent), their roles, and the resources they need to perform their activities. This model allows understanding and implementing communications situations and describes communication links between different agent types.

Jade follows FIPA standards so that, ideally, Jade agents can interact with agents in other languages and running on other platforms. There are inevitably dependencies and relationships between different roles in multi-agent system. It is therefore necessary to represent these relationships, these protocols in the communication model (Wooldridge et al. 2000). This model is composed of messages, protocols and interactions. Each role in the interaction model becomes a communication link between agents with similar objectives, the same inputs and outputs. Interaction Protocol specifies the interactions between agents. The interaction protocol is specified in the structure of the interaction activities of the system in terms of agreements between the roles played by members during the interactions. With this protocol, each activity becomes an interaction process.

Agent model: This model defines the type of agents in the system and structure of these agents depending on the tasks entrusted to them. A type of agent is derived from an agent or a set of roles. The agent of this model ensures the control and responsibility on the cooperation activities; this model is composed of: the skills and knowledge.

Conceptual phase

This phase will define the technical components of the intermediation model and implement the interaction between members of the intermediation model and of the JADE platform. In this model the components are necessary to implement the goals of the system will be represented. These are the aspects concerning the organizational structure, business cooperatives, agents, communications and knowledge. We count five groups of agents: The access manager agent is "agentified" and supports two types of roles, the manager dialog and the authentication role, the activity manager agent is "agentified" and supports one type of role, business manager role. The knowledge manager agent is "agentified" and support three types of roles, the manager profile role, the resource manager role, the protocol activities role. The transformation of the CoPs model to an agent-based model begins with the modeling of each member in the system. The application of intermediation model will implement the following technical features.

Example of application components to CoPeR

The agentification features will focus on the components specified in the identification phase, we show through this scheme at what level agents intervene.

The agents we use have the capacity to handle their tasks or solve problems. That's means agents have the ability to explicit knowledge representation and communication (Huhn, 1999). The process of "agentification" intermediation system is to identify the characteristics of intermediation model from the functional needs of the intermediation system.

The design process of multi-agents using the JADE platform is to identify, plan and services of each agent, behaviours and corresponding messages exchanged between agents. Therefore, mechanisms for communication between JADE agent (Bellifemine, and al, 1999) systems used by agents to communicate will be explored by identifying the elements necessary for their implementation. Cooperation between community members and the whole system of intermediation is done through the moderator an intermediation agent (agent manager access). Two types of agents will coexist in our system, there are also many human agents, including ActivMember agent, the agent asked, and another member later intermediation which is divided into various categories of intermediation agents.

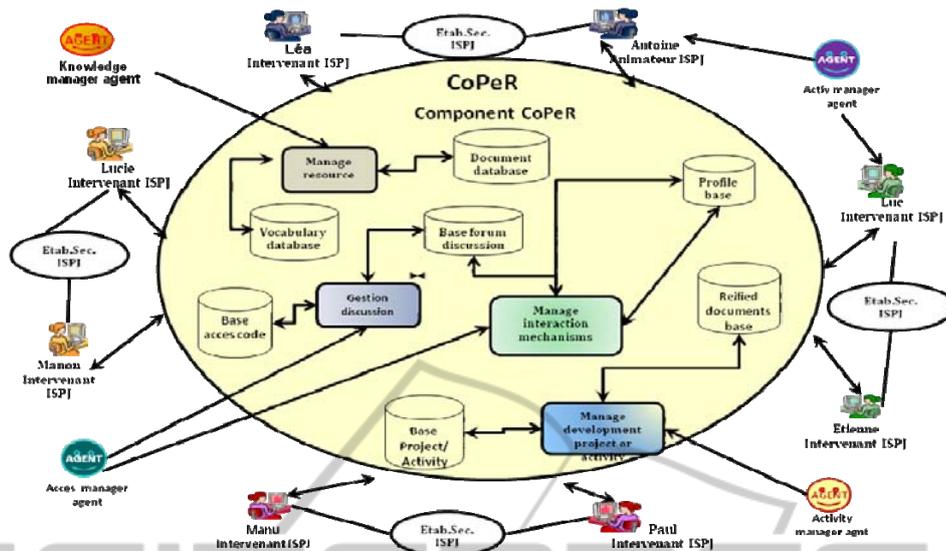


Figure 2: Example of cooperation between CoPeR Members.

4 CONCLUSIONS AND REFERENCES

In this article we presented a three-tier architecture to extract, represent and the emergence of explicit knowledge and tacit or transmitted in CoPs. Modeling agent was privileged strate 2 and 3 because the agents have characteristics of flexibility, learning and knowledge exchange through the protocols of interaction and negotiation. Following our work focuses on the complete implementation of our proposal in particular the implementation of interaction protocols. When communities become large (several hundred), a backup centralized / decentralized knowledge is desirable (in terms of reuse).

Currently we are focusing on building a shared ontology and a consensual own CoPs.

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