Review OF INTELLIGENT AGENT SYSTEM

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ABSTRACT

Intelligent agent is a kind of software program, a composition of computer software and statistics. It is capable to transfer from one computer to another autonomously and maintain its execution on the intention computer. Although agent systems are capable to finding applications in significant and insightful applications; however with these applications are initiating apprehensions for protection and privacy of such intelligent systems. This work study the potential of integrating the intelligent agents in web, since both these technologies are gifted and commercially helpful thus the idea is to solve problems pertaining in web by harnessing intelligent agent technology.

Keywords: Intelligent Agent, World Wide Web, KQML, ACL, MAS.
INTRODUCTION

Agents can be useful as autonomous entities that perform delegated jobs on behalf of a user however in an intricate situation; a single agent may not serve the desired purpose. Therefore agents must interact with other agents in the system leading to MAS. MAS provide several advantages over isolated agents like: reliability, robustness, modularity, scalability, adaptability, concurrency, parallelism and dynamism.

An intelligent agent should be able to communicate with each other. So communication language is the medium of communication [6]. A common language that shares common syntax, semantics, pragmatics and mutual understanding is required among the agents. However these languages are different from other methodologies through objects of discourse, semantic complexity and their ability to exchange more complex objects. Agent communication is based on various common languages and protocols. Various requirements of communication languages are as follow:-

- **Form:** A good agent communication language should be declarative, syntactically simple, readable, concise and easy to parse.
- **Content:** Agent communication Language should be layered into communication language that expresses communicative acts and content language that expresses facts about the domain.
- **Semantics:** Semantics of communication language include natural language descriptions and it should provide a model for communication.
- **Networking:** The language should work well with existing network technologies like point-to-point, multicast and broadcast etc.
- **Environment:** The environment should be highly distributed, heterogeneous and dynamic.
- **Reliability:** Communication should support reliable and secure communication among agents.

MULTI AGENT SYSTEM

A Multi Agent System (MAS) explains a structure with more than one agent. Shared agents contribute in arrangement of MAS. While a single agent can execute its predefined job only thus in order to afford intricate services agents collaborates with each other and forms MAS. Agents in MAS communicate with each other using a complex structured language called Agent Communication Language (ACL). When a task is assigned to an agent, the agent searches for the related information in its own database and if not found there, it will pass the query to other agents. After finding the related information, the agent will return the result to the client. Agent stores the result in its own database also and when the same information is requested again, it gives the result immediately.

CHARACTERISTICS OF AGENTS

Every agent is possessed with following features. An agent should be:

- **Communication Ability:** Software agents should provide a user-friendly interface so that the user can easily interact with the agent. Agents are social entities and often communicate and collaborate with one another in order to complete their tasks. For example, the travel agent program of one user must be able to communicate with other travel agents to find out about hotels which customers disliked and avoid such hotels.

- **Autonomous:** The agents themselves decide the sequence of actions to be performed to achieve the user’s task. This autonomy enables agents to operate without requiring human intervention [7]. Once the specifications are given to the travel agent, it should be able to proceed on its own to arrange the trip for the user without requiring the user to constantly monitor the agent.

- **Adaptive:** Agents learn about the user’s behavior and adapt themselves to suit the user’s needs. Consider a search agent that retrieves information for the user from the Internet. The search agent should be able to learn about the type of information the user is interested in and adapt itself to deliver only the relevant information to the user.

- **Collaborative:** Agents have to communicate with other agents so as to collaborate with other agents in their activities whenever required.

- **Competent:** Agents should be competent i.e. able to perform the task successfully and able to manipulate the environment accordingly.

- **Cooperative:** Agents should be cooperative in nature so as to work collaboratively to perform complex tasks.

- **Reactive:** Agents should be able to respond in a timely manner to the changes that occur in the environment.

- **Proactive:** To respond to their environment agents should exhibit an opportunistic and initiative behavior.

RELATED WORK
Extensive research has been done in the area of agent technology. This section highlights the work of eminent researchers and explores the challenges.

Subramaniam [1] provided an overview of agent communication Languages and protocols. They discussed the basic idea of each language and protocols associated with them. The comparison and drawbacks of each language are also discussed.

Ahmed et.al. [2] developed and implemented an agent communication language, based on the FIPA Standards, to demonstrate the usefulness of the system to take over the timing and execution of communication from the human actors to achieve a shared goal. They also proposed a model to develop an agent communication language based on the Foundation for Intelligent Physical Agents (FIPA) Standards.

Kravari et.al [12] describes an intelligent agent as software programs intended to perform tasks more efficiently and with less human intervention. Yuxiao et.al [6] describes agents are software programs that does job on behalf of another, an entity or a process. Intelligent agents are widely known and are useful for many applications areas like automation and electronic commerce.

Vijay et.al [5] have explored the necessity of intelligent agent in semantic web. Intelligent agent is an autonomous software program that has the ability to done its job on behalf of others. They can perceive the input from the environment and react according to them with the help of their abilities like mobility, learning ability, to be proactive, to be reactive, adaptability and ability to communicate. While learning from their own experience, they should be able to carry out their activities without requiring constant human guidance whenever it is necessary they should, communicate and collaborate with people and other agents by moving from one place to another over a network. Their work also highlights the role of agent community in knowledge grid.

Zheng, Yuan [4] applied Multi-Agent technology to logistics management system, through the interactivity, reactivity, social characteristics of Agent technology and mutual consultation between the Agent and the Agent. It improved the work efficiency of the logistics information management system rapidly and effectively, and can realize the intelligent logistics management.

AGENT COMMUNICATION LANGUAGES

KQML

KQML is a high-level, message-oriented communication language and protocol for information exchange independent of content syntax and applicable ontology. Thus, KQML is independent of the transport mechanism (TCP/IP, SMTP, IIOP, or another), independent of the content language (KIF, SQL, STEP, Prolog, or another), and independent of the ontology assumed by the content.

Conceptually, we can identify three layers in a KQML message: content, communication, and message:

- The content layer has the actual content of the message in the program's own representation language. KQML can handle representation languages in any of the format like ASCII strings.
- Communication layer encodes lower level communication parameters like identity of the sender and recipient and unique identifier of the communication.
- Message layer is the heart of KQML. It encodes message, finds possible interactions with KQML speaking agent, identifies network protocol and supplies performatives. The function of this layer is to identify the speech act or performative that the sender attaches to the content. This speech act indicates whether the message is an assertion, a query, a command, or any other of a set of known performatives.

ACL

The Foundation for Intelligent Physical Agents (FIPA) is an international organization that aims to develop a set of generic agent standards with the contribution of several parties involved in agent technology. FIPA’s agent communication language, like KQML, is based on speech act theory: messages are actions or communicative acts, as they are intended to perform some action by virtue of being sent. The FIPA ACL specification consists of a set of message types and the description of their pragmatics—that is, the effects on the mental attitudes of the sender and receiver agents. The specification describes every communicative act with both a narrative form and a formal semantics based on modal logic. It also provides the normative description of a set of high-level interaction protocols, including requesting an action, contract net, and several kinds of auctions. Agents who comply with the FIPA standard (FIPA ACL agents) are required to send correct, concise, and unambiguous messages that follow consistently selected protocols.

CONCLUSION
This paper elaborated details of intelligent agent along with a comprehensive discussion of agent characteristics and applications. Intelligent Agent find their applications in a wide range of discrete optimization problems such as finding dynamic shortest path in telecommunication network, sensor scheduling, continuous optimization & much more, which proves them good solution for semantic web. This paper also discussed multi agent system (MAS) which is relatively new approach in problem solving.

REFERENCES

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