

Intelligent Agents In DAML World¹

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Abstract

Darpa Agent Markup Language (DAML) is the newest effort for Semantic Web. It can be used to create ontologies and markup information so that information like Web pages can be understood by programs. We believe DAML is a good way to markup Agent Communication Content and exchange knowledge between agents. Moreover, we suggest that by embracing an agent based approach the semantic web vision may be more easily realized. In this paper, we describe the agent communication scenario in our ITTalks Project. The main concern of this paper is about 1) define ACL Content Language in DAML Language. 2) Parsing of the DAML Content Language. 3) Agent Communication scenario .

Keywords

Agent Communication Language, Ontology, Semantic Web, intelligent agents, DAML

1. Introduction

The semantic web [5] is a vision in which web pages are augmented with information and data that is expressed in a way that facilitates its understanding by machines. The current human-centered web is still largely encoded in HTML. Over the past few years we have seen a rapid increase in the use of XML as an alternative encoding, one that is intended primarily for machine processing.

RDF (Resource Description Framework) and RDFS (RDF Schema) provide representation frameworks that are roughly the equivalent to semantic networks in the case of RDF and very simple frame languages in the case of RDFS. However, RDFS is still quite limited as a knowledge representation language, lacking support for variables, general quantification, rules, etc. DAML is one attempt to build on XML, RDF and RDFS and produce a language that is well suited for building the semantic web.

The exact role of agents and their relationship to the knowledge encoded in documents on the semantic web is one part of the semantic web vision that has not yet been fully articulated. We believe that most work to date has followed one of two scenarios, each of which has serious shortcomings. We will describe these scenarios and offer a different model that we hope will be a better fit for what is needed. The semantic web assumes that information and knowledge is encoded in an appropriately rich web language (e.g., DAML or OIL or RDF) and made available in the form of pages or documents on the web. Of course, the information to be encoded may ultimately reside in databases or knowledge bases or in processes, but the way it is made available is in the form of documents completely encoded or at least partially marked up in a semantic web language.

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2. Agents that speak for web pages

In order for agents to get and use the information in these document two models have been used. The SHOE system has assumed that an agent will search the web for all web pages of interest that have semantic mark-up. All pages that are found are then loaded into the SHOE system's knowledge base. The KB can subsequently be queried by a user to answer questions about the information on the pages. The other model that we have seen is one in which a reasoning agent will find pages of interest, load their semantic web markup into it's knowledge base, extract the desired knowledge from the pages, and then remove the knowledge from the KB.

We are pursuing a third alternative in which a web page marked up in DAML or some other semantic web language will identify an existing agent that can be contacted to answer queries about the information on the page or to make statements about the information.

3. ITTLAKS Scenario

As part of UMBC's role in the DAML Program, we have developed ITTALKS; a web portal that offers access to information about talks, seminars, colloquia, and other information technology (IT) related events. ITTALKS provides users with numerous details describing the IT events, including location, speaker, hosting organization, and talk topic.

Consider following scenario which include three agents.

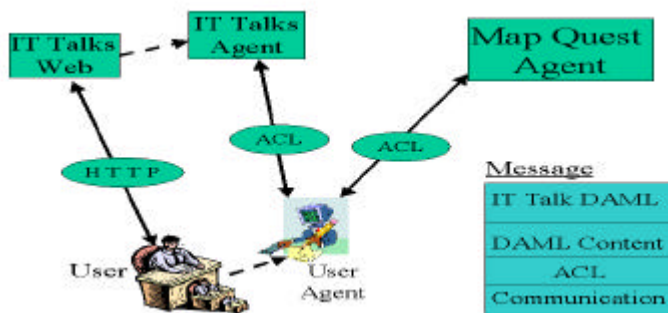


Figure 1: Ittalks Scenario

User go to ittalk website to register, tell ittalk the URI of his personal webpage, which include a link to his user agent. When there is a new talk added into Itaslkl. Ittalks agent send a talk daml file to user agent, and ask whether the user want to show up at the talk or not. The question will be encoded in DAML content language. We get an ACL message in which the message type is a query and the content is encoded in DAML. The ACL message delivered to the agent using standard agent-based messaging system, such as Jackal or a FIPA platform The user agent will parse the received DAML file, and model the message and its content using a representation and reasoning system. If needed, it may ask other agents like Map Quest agent, or query calendar agent sited in local. Finally User agent will return a result to Ittalks agent that the user will listen to the talk or not, and update user's calendar.

4. Approach

4.1 ACL DAML Content Language

Both the KQML language and the FIPA ACL language are designed to be used with multiple content languages. We have written a preliminary version of a specification of DAML as a FIPA compliant content language.

✂✂ **Objects:** all ACL object is a resource.

✂✂ **Propositions:** statements expressing that some sentences is true or false

✂✂ **Actions:** expresses an activity, carried out by an object, include three properties: An **act** identifies the operative part of the action; An **actor** identifies the entity that performs the act; An **argument** identifies the entity which is used by the actor to perform the act.

✂✂ **Rule and Query:** The if statement will include Prem part and Conc part. Query include question part and result.

4.2 Parsing of DAML content language

We defined XSB [9] Rule for RDF, RDF Schema and DAML. Based on the XSB rules, we have a Frame-like language which user agent can: Submit a DAML file, parse file and assert knowledge into knowledge base system ; Retract facts; Query the knowledge base system and return result.

4.3 Agent Communication Scenario

We describe here a couple of typical interactions that illustrate some of the features of ITTALKS. The first involves direct use by a human user, and the second, advanced features provided through the use of agents.

Human Interaction: a user, Jim, will register at Ittalk.

Agent Interaction: ITTALKS discovers that there is an upcoming talk that may interest Jim. ITTALKS opts to notify Jim's User Agent directly. This is done via ITTALKS own agent, which forwards the message using an ACL. Upon receiving this information, Jim's User Agent needs to know more; it consults with Jim's Calendar agent to determine his availability, and with the MapQuestTM agent to find the distance from Jim's predicted location at the time of the talk. Some more sophisticated interactions might take place at this time; for example, the Calendar and User agents may decide to alter Jim's schedule, and proceed to contact the User agent of some other individual. After making a decision, the User Agent will send a notification back to the ITTALKS agent indicating that Jim will/will not plan to attend. The ITTALKS agent will make the appropriate adjustments at the ITTALKS site.

5 Conclusion

There is no doubt DAML, as the name "Agent Markup Language" suggested, will be a important actor in the agent world.

The paper talks about the scenario of agent communication using DAML language, define ACL DAML Content Language and implemented the reasoning engine for DAML language. The future work includes:

✂✂ Ontologies share and exchange

✂✂ DAML Modeling, partial knowledge reasoning and default reasoning

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