An Ontology-based Method in Information Translation

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Abstract

An ontology-based method named AOBM is proposed in this paper. It fully takes into account the factors that will affect the communication, and using ontology can be represented in agent's knowledge base. Provided ontology did not belong to the public data or have any public ontology, AOBM establishes a layering algorithm, which is able to avoid logical exception handling policies, ensure the right understanding of the communication entity concept, and resolve the consistency problem of the concept translation. Experimental results show that AOBM is superior to other methods, and can effectively improve the communication consistency of a mobile agent system under certain conditions.

1. Introduction

Guaranteeing communication dependability can be generally divided into two aspects: Security question in the communication course; How both sides of communication carry the correct understanding to the concept which includes in the communication entity\(^1\). Extensive research has been carried out on the correct understanding question of the concept. F. Wiesman etc.\(^2\) has proposed some solutions\(^3\). Although the research is helpful in guaranteeing the correct understanding of entity's concept of the communication, it has disadvantages as following.

Depend on different assumptions: Heterogeneous ontology can be defined by a series of privately owned concepts to heterogeneous data sources; Have domain expert understand different to construct concept that heterogeneous ontology involve in detail (including concept relation among them, the questions, such as the conflict of the concept, the consistency of the concept, etc.); It does not consider the consistency question that is changed in an all-round way during the course of understanding and changing in concept.

2. Information processing method in AOBM

With the description method based on ontology, it seems to be particularly important that the effective management of the ontology, accurate knowledge source, and convenient management mode are able to directly influence efficiency of the communication and accuracy of the communication model. In order to guarantee the correct understandings in both sides of the communication, finding the logic accident in the communication effectively, adopt of the loose authorization management mode in AOBM is necessary. In different environments, the course is further detailed as follows:

1. The communication sender, Agent\(_1\), sends out the request to communicate with the receiver, Agent\(_2\);
2. Determine whether or not there was a public ontology between Agent\(_1\) and Agent\(_2\). If there was a public ontology, Agent\(_2\) will ask for a translation of M with regard to a public ontology, which will complete the communication course;
3. If Agent\(_1\) and Agent\(_2\) do not have public ontologies, Agent\(_1\) expresses message M\(_1\) through its private ontology O\(_1\);
4. Agent\(_1\) sends the request changing consistency information to AOBM;
5. AOBM sends obtaining request about message M relevant information to O\(_1\) and O\(_2\);
AOBM can give a consistency translation through additional information obtained from O1 and O2, which forms messages M2 expressed by O2;

AOBM sends conversion result M2 to Agent2.

This paper is seeking similar goals, which are:

To collect through the additional information obtaining private ontology O1 and ontology O2 of communication of both sides, each semantic element of concept S in the communication entity expressed by ontology O1, to utilize all available information (including concept structure, concept instance, concept attribute, and user feedback information, etc.), to find out concepts S and T of right consistency conversions on semantic element in ontology O2. Ontology formalization used in Agent communication environment in this paper is defined as following.

Ontology O is defined as a multi-tuple C, I, R, A, H, L, T. Where, C represents the set of the concepts. I represents the concept set of having instance, each element Ins(I, C, o) of the set is all a instance on C, o, is a value of degrees of membership at the concepts, the range of value is [0,1]. R is a set of the relation between two-tuple, each element r(C, C) of the set is all concept Ci and Cj relation between two-tuple. A(r) represents the attribute set of each relation, each attribute among which can be regarded as the function which is a process from the subset of 1 to the attribute value field. H represents the level system of the concept, which is partial order relation of preface on concepts, and defines the inherit relation between the concepts. L represents the semantic ground floor of concept or semantic empty concept in the concept sets. T represents the semantic top floor of concept or semantic whole concept in the concept sets.

Algorithm The internal concept substituting and losing degree Her(C, C) of any two concept C and concept C.

1. Init(Her(C, C));
2. IF (Her(C, C) = 1 OR Her(C, C) = 0)
   THEN RETURN(TURE);
3. GET_Rpath(C, C);
4. IF Rpath(C, C) = Φ
   THEN Her(C, C) = 0; RETURN(TURE);
5. ELSE
   IF Rpath(C, C) ∈ Rpath(C, C)
      THEN GET_Rdist(C, C);
      Her(R(C, C)) =
      \[\sum_{p=i} \frac{W(C, C)}{(R_1 \text{dist}(C, C) + 1)}\];
      IF Her(C, C) = t
      \[\text{THEN Her}(C, C) = \text{Her}(R(C, C));\]
      ELSE
      \[\text{ELSE go to } 3.\]

3. Analysis of performance and experiment of AOBM method

Base on the platform of Aglets [5], while two sides of Agent communication are not under the public data source and not having the public ontology, we have realized three kinds of methods to translate entity's concept of the communication. Method 1, adopting the expert craft way to translate the most approximation; Method 2, adopting Point-based method [4] to translate the approximate change; Method 3, adopting AOBM method to translate the approximate change. Carry out three times conversion tasks in the experiment.

Comming to say synthetically from experiment, if mobile Agent want to move many times, AOBM method with higher error rate and mistake rate will make the error of the whole communication result expand constantly. For AOBM method, though decline certainly on the correct rate, having obvious improvement to the error rate, having certain improvement to the mistake rate also. When Agent want to move many times, this method reduce the demand of the expert helping to a certain extent, proving AOBM method has certain practicability.

4. References


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