Modeling the negotiation object in social systems

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Abstract. As the computer systems are becoming more powerful and intelligent there arises a need to achieve proper modeling of negotiation object in human behavior. This article focuses on the analysis of the object in human negotiation and definition of its properties to achieve proper modeling. The approach is based on breaking down the set of negotiation object's attributes into particular capital sorts to eliminate complexity concerning the number of these attributes in negotiation object and negotiation goals.

1 Introduction

Modern computer systems study users and win additional information about their behavior. The question arises as to how it is possible to represent negotiation issues and relevant problems. This article focuses on the object in human negotiation and the definition of object's properties.

The negotiation object is different in every scenario. That's why analyzing its properties in general is very important because it leads to better modeling and understanding the particular scenario and to improving quality of negotiations.

We define the negotiation object as the subject in the negotiation that is the term to exchange between negotiation members due to their interests. In the following we will show what interests are the subject to model insofar and how we do it.

2 Related work

The existing research concentrates mostly on studying the dynamic aspects of negotiation – how negotiation is done, what messages between agents are sent, what format these messages have. The general structure of negotiation object is not defined and a universal approach for designing the negotiation object for some specific domain is missing. For example in [7] the negotiation object is described through technical is-

sues as scheduling information or service duration and not through the negotiation object in its context. This leads to misunderstanding the basis of negotiation and its basic properties.

3 Negotiation scenarios

The main aim of the suggested approach is to describe how the negotiation object could be generally defined for negotiation scenarios. We are working with scenarios that describe not only the commercial area but also with some others e.g. a scenario to find a term definition or to distribute human resources or financials in a university.

We introduce our general approach for modeling negotiation objects in different scenarios. A framework for describing negotiations including problems arising from the negotiation itself is introduced in [4].

The IPS framework (Issue-Partner-Step) specifies an Issue layer that perfectly reflects topics discussed in this article. This layer specifies three subordinate items – beliefs, concerns and issues that are explored using some utility function. The utility value is defined for particular negotiation object using capital sorts from the sociological theory of Bourdieu ([2]). We use the first experience from our INKA project to introduce a more general approach for modeling negotiation object in order to model the whole negotiation, its utility function and participating persons exacter.

The INKA scenario was chosen as the basis due to long term cooperation between Humboldt university Berlin and Technical University Berlin. In this scenario we introduce a social computer system for the university hospital Charite.

The INKA scenario describes negotiations on a shift plan in hospital environments ([1]). A shift plan consists of particular shifts that could be negotiated between employees. The necessity of negotiation on some particular shift arises from the requirement of a particular hospital employee to exchange his shift to have free time on certain day for reason of e.g. some personal needs. The shift plan is hard to change in whole because of difficulties in satisfying constraints that for example result from administration issues. That’s why the employee has to work out its personal strategy to get free on the day he needs, find another employee that can work in his shift and negotiate with this employee (Fig. 1).

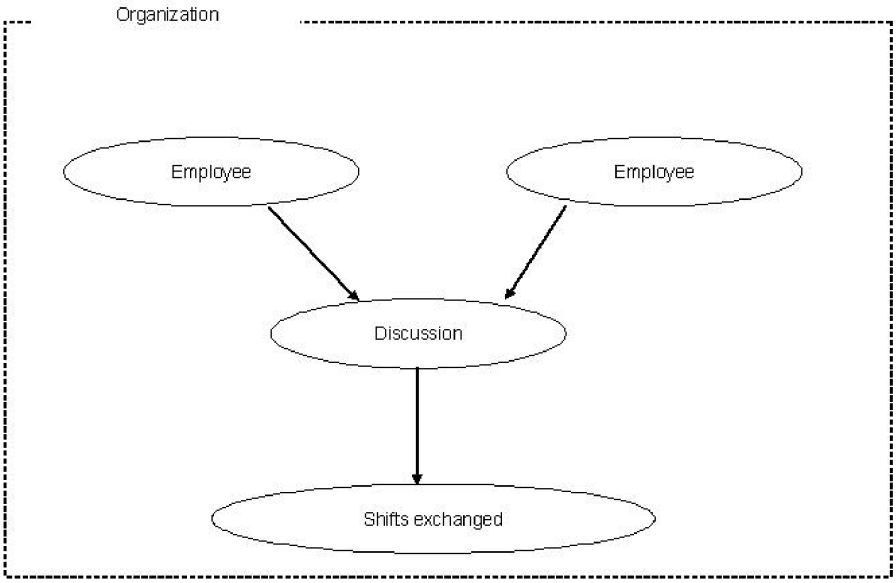

Fig. 1. The INKA scenario.

The INKA scenario describes negotiations in some organization. However, negotiations are typical not only for organization's employees, but are also general for every communication between humans. That's why we analyze the term definition scenario, where participating persons are not bound to each other by means of some organizational discipline.

The term definition scenario describes a scenario for finding a definition of some particular term. A group of several people is discussing the term and finds an appropriate definition for it ([4]). The negotiation is based upon knowledge and prestige of a particular person (Fig. 2).

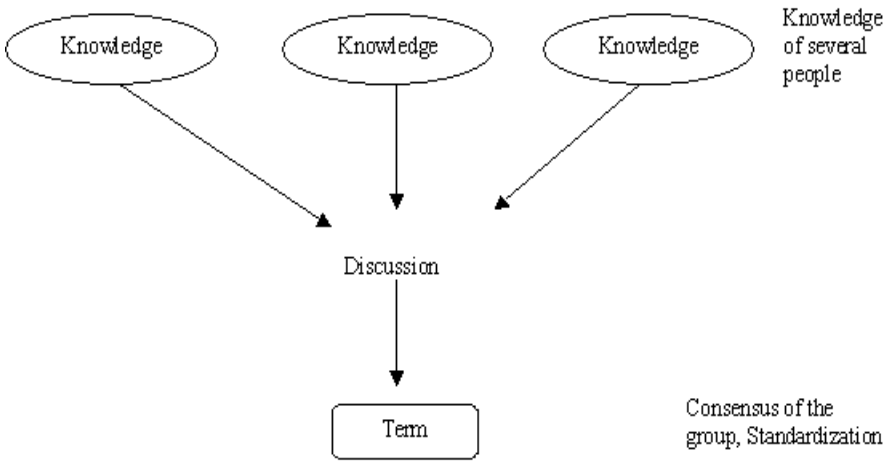

Fig. 2. The term definition scenario.

The term definition scenario can be easily represented as a scenario to find out a definition for a semantic network where users are trying to create a semantic network that best describes a term. There can be negotiations on components of the network and also on dependencies between these components and kinds of dependencies. Depending on contents of proposed item – part of the definition - and prestige of the person that make this suggestion group members can approve or refuse the term. Of course, it is unrealistic to assume that the persons participating on negotiation would outline a semantic network. Nevertheless, one can assume that some people would try to estimate the importance of a particular term where some other person would track advances in the negotiation.

There are a lot of other negotiation scenarios that deserve mentioning in order to test our approach. For example in the university scenario users are trying to apportion critical resources and to allocate them for particular university departments. Nevertheless, this scenario could be interpreted as the INKA scenario taking into consideration that the INKA scenario describes negotiations in organizations and the term definition scenario doesn't base on some institutes. That's why we thought that the presented two scenarios could serve as the beginning for analyzing the modeling of negotiation object.

4 Properties of the negotiation object

In our approach we define properties of negotiation object through interests of users dealing with this negotiation object. Each scenario assumes its set of interests that provide the basis for negotiation e.g. that the user wishes to achieve some sort of satisfaction and that's why he starts the negotiation.

The interests of the users – their capital sorts in the INKA scenario – are described using the sociological theory of Pierre Bourdieu that distinguishes from different capital sorts – social, economical, organizational, cultural capital sorts and allows simple reduction of the modeling complexity ([2]).

For the term definition scenario we introduce person attributes that include how important is the particular term of the negotiation object for the user (its functional description) and also the new value of his prestige if the group accepts the term proposed by this particular user. In other words the attributes describe how the person sees the meaning of the particular negotiation object in his current context.

5 Model of the negotiation object

The general model of the negotiation object independent from an application domain and scenario is described in Fig. 3.

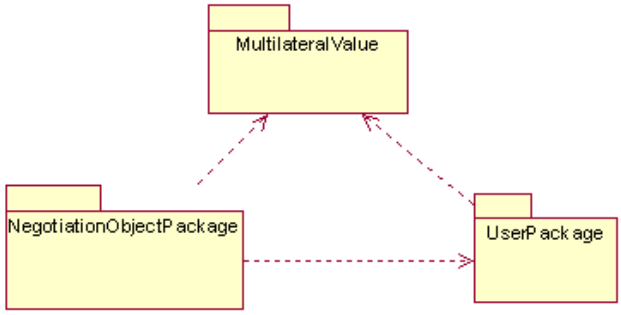

Fig. 3. Model of negotiation object.

Fig. 3 illustrates the main packages (the NegotiationObjectPackage, UserPackage, MultilateralValue packages) and dependencies between that are taking part in modeling of the negotiation object.

The NegotiationObjectPackage package describes the negotiation object itself and its parts (Fig. 4). The negotiation object can contain additional parts that can be negotiation objects itself.

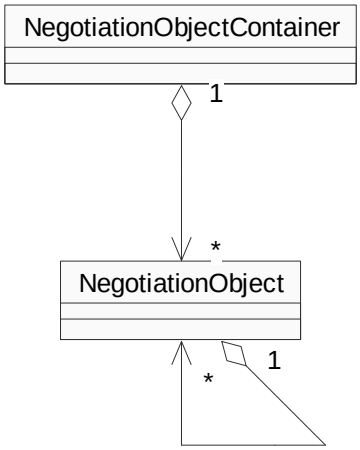

Fig. 4. Negotiation object package

The UserPackage package models the users taking part on negotiation (Fig. 5). As it should be possible to model not only individual users but also user groups the User class contains an aggregation to itself.

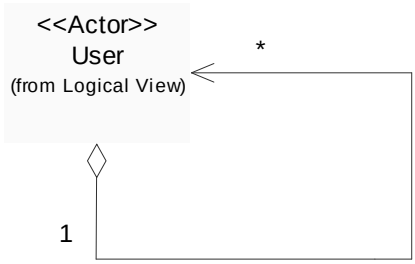

Fig. 5. User package

The MultilateralValue package is the most important component of the model (Fig. 5). It introduces cognition of different sciences (here dimensions) regarding negotiations where each science can describe different theories (here models) and provide its approaches to different issues. For example, the sociological model can be described in terms of Bourdieu's ([2]) and Luhmann's ([3]) theories. As we want to provide means for explicitly modeling interdisciplinary approaches we defined the AttributeDependencies class that models dependencies between different instances of attributes both from the same science and some other one.

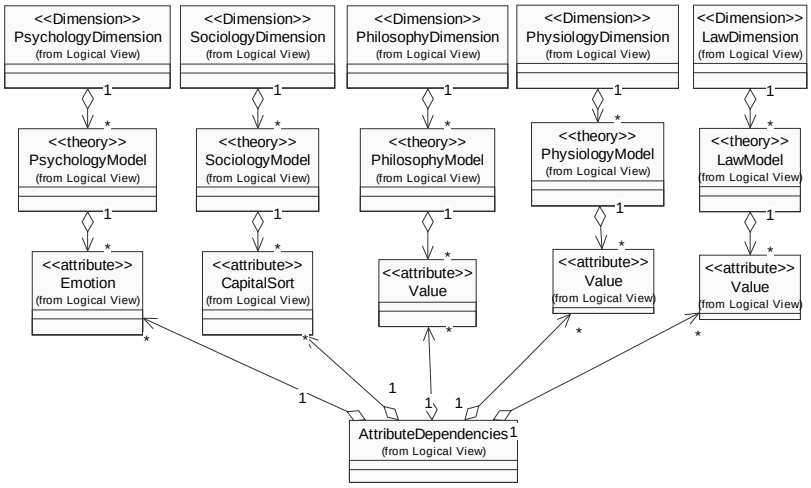

Fig. 6. Multilateral value

The collaboration Diagram for the INKA scenario is shown in Fig. 7. The actors (users) of the system negotiate with each other to achieve their interests. The diagram contains object instances that are described by the capital sorts resulting from Bourdieu's theory.

6 Collaboration diagram for the INKA scenario

The collaboration Diagram for the INKA scenario is shown in Fig. 7. The actors (users) of the system negotiate with each other on capital sorts to achieve their interests. The diagram contains object instances that describe the capital sorts resulting from Bourdieu's theory.

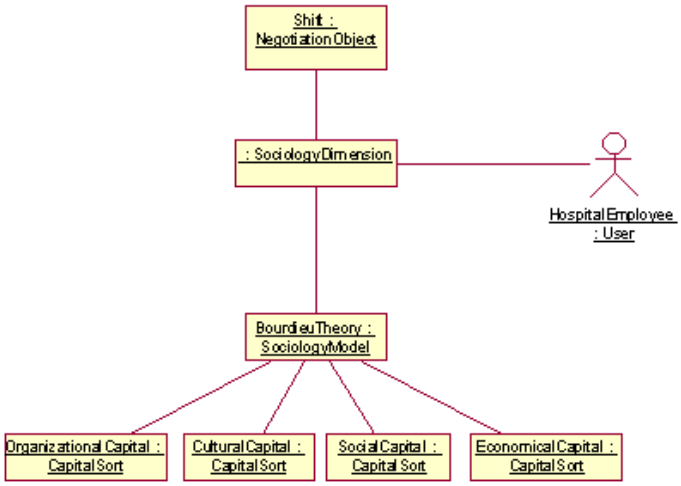

Fig. 7. Collaboration diagram for the INKA scenario.

7 Collaboration diagram for the term definition scenario

The discussed scenario for the term definition could be the one in which a group is discussing a semantic network. The goal of the negotiation is a semantic network that corresponds to the interests of the people involved in the discussion. Group members are discussing the semantic network providing their suggestions according to importance of particular items that could be approved or rejected on hand of the semantics of the particular item and the reputation of the suggesting person. One can imagine this discussion on the hand of debate on the meaning of a particular definition of the item “Vehicle”.

Let us assume that the meaning of this term is defined for drivers. Then this term is defined as in Fig. 8.

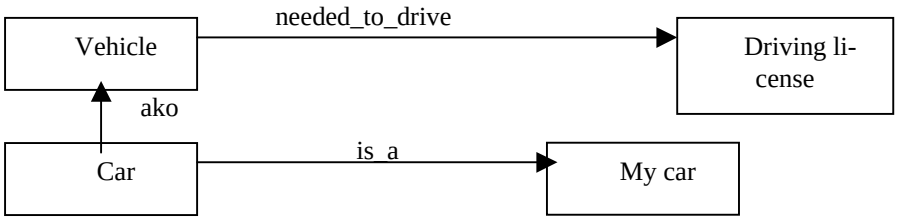

Fig. 8. Semantic network.

In the case the term definition is worked out for some other target group, e.g. managers that have to provide logistics for transferring goods from one place to another the particular meaning of the term “Vehicle” introduced in **Fehler! Verweisquelle konnte nicht gefunden werden.** is not adequate because it doesn’t define some other properties that could be interesting for this particular target group. It can identify some other relations in the semantic net answering the questions for example “What is this vehicle for?”, “What goods and in what amount can we transport with this vehicle?”, “How often should it be refueled?”, “Where is the parking place for this vehicle?”. If these questions are important for the group members they can define the semantic net suited to their particular point of view and specify necessary relations.

The model for negotiation among drivers identifies two attributes describing the negotiation – contents of the term and prestige of the particular person taking part in discussion (Fig. 9). Note that we don’t provide a science for the attribute “contents of the term” as we don’t know what term is discussed and what science describes it.

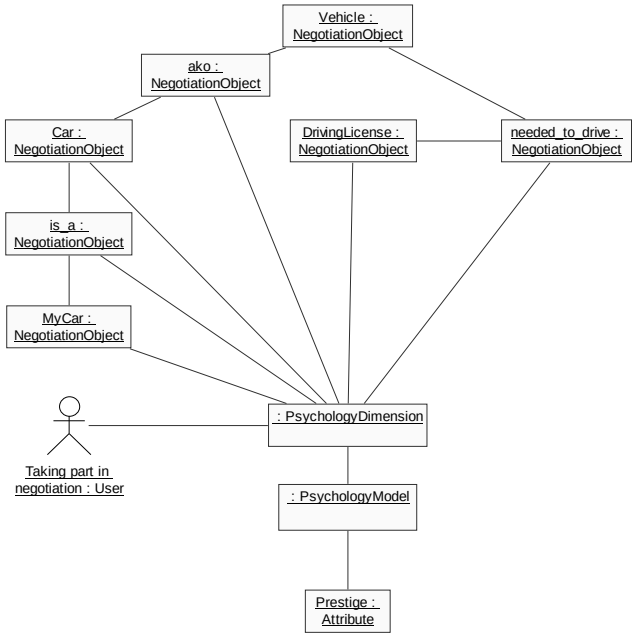

Fig. 9. Collaboration diagram for the term defining scenario.

8 Future work

We will continue to work on scenarios for negotiations to test our approach. We will develop a computer system for our term definition scenario to examine the proposed scheme.

We will try to find user profiles using notions of different sciences. The particular accent can be set on analyzing user behavior during negotiation using modeling of emotions and tracking their changes. Depending on these changes we could make assumptions on psychological profile of the user.

Analyzing group behavior depending on the number of users inside it is another interesting issue concerning modeling user resp. group behavior. The properties of a particular group can be the issue of further studies.

9 Summary

In this article we introduced an approach to model a negotiation object in different negotiation scenarios through analyzing different interests of users. For the INKA scenario we used the sociological theory of Bourdieu that recognizes different interests in the human negotiation For the term definition scenario we used empirical attributes – contents of the term and prestige of the particular person taking part in discussion.

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