An Approach for Defining Actions in Rules of the CaSenSa Application

Quentin Reul[1], Christophe Debruyne[1], Johan Criel[2] and Laurence Claeys[2]
(1) STARLab, Vrije Universiteit Brussel, Pleinlaan 2, 1050 Brussels, Belgium
(2) Alcatel Lucent, Copernicuslaan 50, 2000 Antwerp, Belgium

Introduction

Using the CaSenSa [1,2] application, elderly people and their caregivers are able to define rules such as “when i have walked 100 steps, send me an SMS with congratulations”. These rules can then be used to support elderly people with early dementia, which is the focus of the Belgian consortium within AmIE [3]. The concepts and their interrelations are represented with an ontology, which is a [formal,] explicit specification of a [shared] conceptualization [4]. While defining rules, which are often of the form *“IF condition THEN consequence”*, two types of problems can, and will occur:

- Whenever a concept does not exist and needs to be introduced, different people will come up with different results, e.g., different definitions of coffee machine (see Fig. 1a).
- Different persons will have a different way of approaching certain concepts to achieve a certain result, i.e., for sending an SMS: do you refer to the person who has a portable phone or do you refer to an SMS in which you specify the receiver (Fig. 1b)?

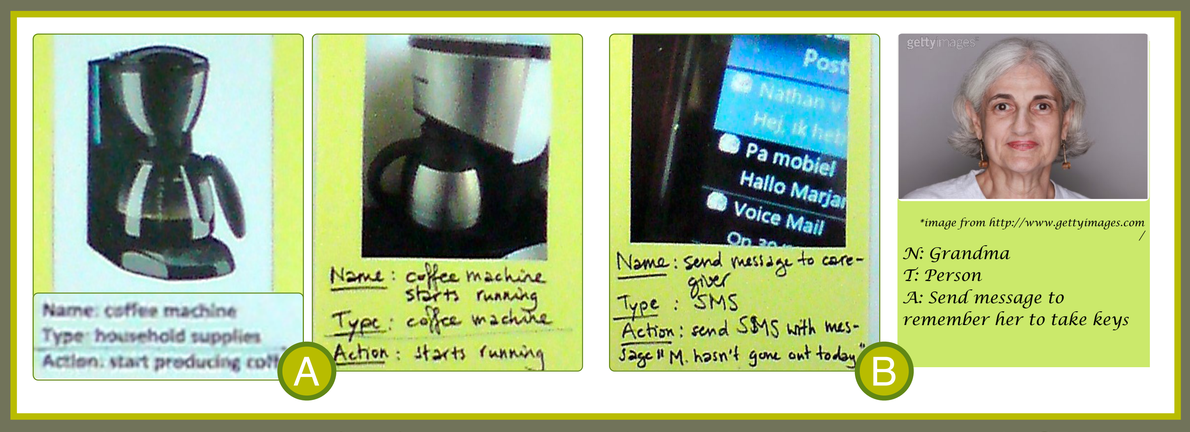

Fig. 1: Heterogeneity conflicts from an experiment held at Alcatel-Lucent together with STARLab

To reduce this heterogeneity, an appropriate methodology needs to be adopted.

The DOGMA Approach

DOGMA is an ontology approach and framework that is not restricted to a particular representation language. This approach has some distinguishing characteristics that make it different from traditional ontology approaches such as its groundings in the linguistic representations of knowledge and the methodological separation of the domain- and application-conceptualization, commonly known as the ontology double articulation principle. The idea is to enhance the potential for re-use and design scalability.

Conceptualizations are stored as lexons, which are 5-tuples declaring a relationship in some context G, e.g., ***<G, Person, currently at, has, Location>***. Another distinguishing characteristic of DOGMA is the explicit duality in interpretation between the language level and conceptual level. The goal of this separation is primarily to disambiguate the lexical representation of terms in a lexon (on the language level) into concept definitions (on the conceptual level), thus tackling the problem of synonyms and homonyms.

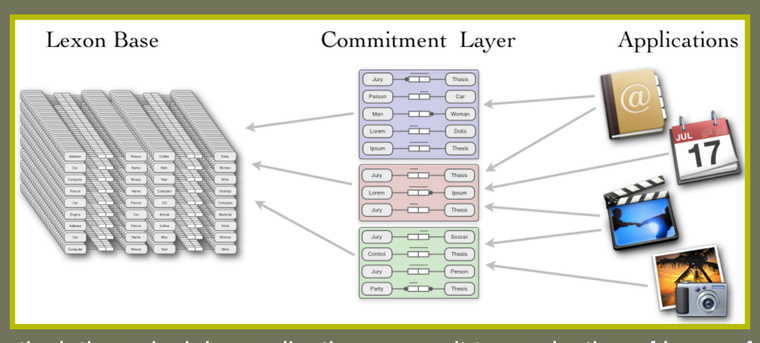

Fig 3. The double articulation principle: applications commit to a selection of lexons from the lexon base with additional constraints; conceptualization and axiomatization are thus strictly separated.

DOGMA-MESS, which adds a collaborative layer around the DOGMA Approach, helps communities consisting of different stakeholders to define shared ontologies that are relevant to their joint collaboration goals. It aims at providing support to make this complex and fuzzy shared meaning evolution process of a collaborative community as effective and efficient as possible.

Proposed Solution

Problems of the first type were easily solved with DOGMA-MESS [5], e.g., agreeing that the coffee machines to which the participants refer to are of the type “Coffee Machine” that are in turn of the type “Household Tools”. By creating a taxonomic relation where common behavior is grouped by a more abstract concept enables allows the system to comprehend action such as “turn all Household Tools off”. Problems of the second type were a bit more challenging. Here, DOGMA-MESS was used to find a solution that satisfies all needs.

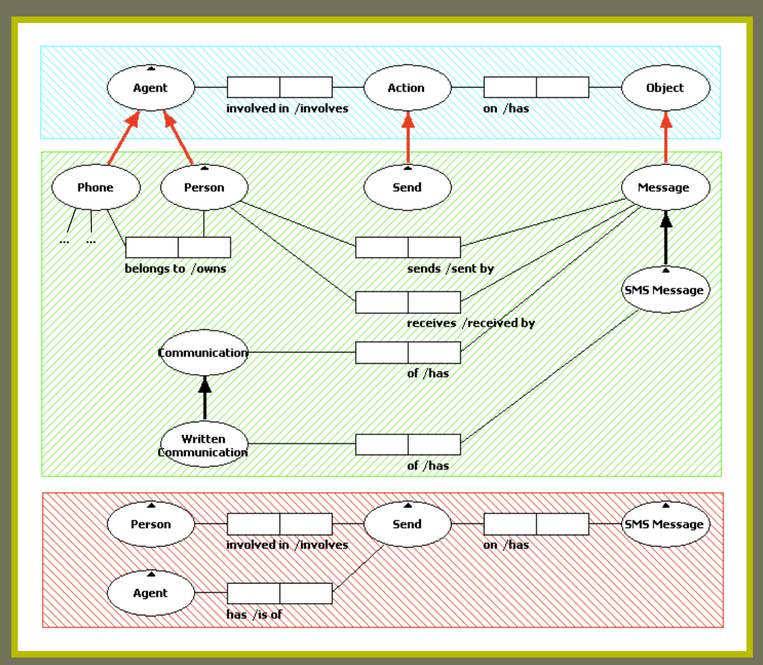

Fig. 2: Upper Common Ontology, Lower Common Ontology and Application Ontology that incorporates the different stakeholders’ perspectives.

Since in the case of sending an SMS both perspectives need to be included in the system for it to be usable by a maximum of people, we propose the following conceptualization of which an image is shown in Fig. 2:

- The Upper Common Ontology (UCO), depicted in the blue box, contains concepts and their interrelations at the meta-level that are valid across multiple domains
- In the green box we find the Lower Common Ontology (LCO) that contains concepts and relations that are common for a specific domain. These lexons are valid across applications in that domain and can be logically grouped in so called semantic patterns that enhance modularity and reuse.
- CaSenSa’s Application Ontology (AO) will, in order to solve the problem, contain: (A) relations to map concepts of the LCO to a type of concept in the UCO and (B) specializations of relations found in the UCO with links created in (A).

With this approach, users can choose “Send” either from phones or persons. Since SMS Message inherits from Message all the roles from Message (received by, sent by, etc.) and thus also its link to the UCO, the system can deduce that the objects on which that action are performed to are SMS Messages.

Results and Discussion

Interestingly, modeling rules with cards as proposed by the experiment held at Alcatel Lucent (Fig. 1) or used by the CAEMP Instantiation and Rule Editor [1] is made difficult by not only the problem encountered during the experiment, but also by placing all the information in one card. Letting users define actions corresponding to the relations found in the UCO might aid the user in defining actions.

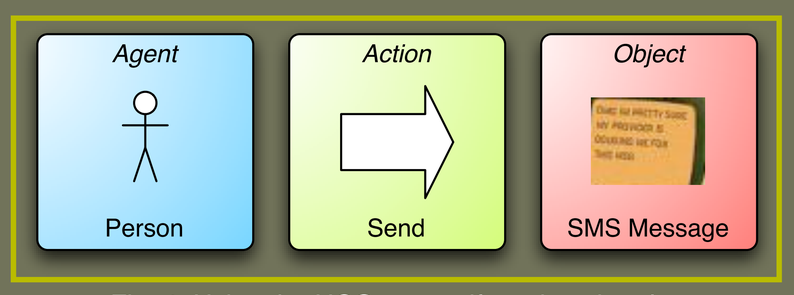

Fig. 4: Using the UCO to specify actions in rules

So instead of one card, users will have three cards “Agent”, “Action”, “Object”. Taking an “Agent” will show all the actions involved, which in turn shows all the objects. Taking an “Action” might let the system retrieve all possible objects and agents; specifying one would results in filtering the list from the other.

References

1. Claeys, L., Geerts, M., Criel, J., Dieryckx, L., Verschatse, A., Deboutte, P. (2009). *CaSenSa: probing, interviewing and role-playing the prototype*. Unpublished report. Alcatel-Lucent: Antwerp.
2. Claeys, L. & Criel, J. (2009). *Future Living in a Participatory Way*. Withworth, B. & De Moor, A. (Eds.) Handbook of Research on Socio-Technical Design and Social Networking Systems. Information Science Reference, Hershey, New York.
3. Ambient Intelligence for the Elderly (AmIE) http://www.amieproject.com/
4. Gruber, T.R. (1993) *Towards Principles for the Design of Ontologies Used for Knowledge Sharing*. In: Formal Ontology in Conceptual Analysis and Knowledge Representation: Guarino, N., Poli, R. (eds.), Deventer, The Netherlands, Kluwer Academic Publishers
5. A. de Moor, P. De Leenheer, R. Meersman (2006) *DOGMA-MESS: A Meaning Evolution Support System for Interorganizational Ontology Engineering*. ICCS 2006: 189-202