



Requirements Elicitation technique specification for higher quality using ontology

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Abstract:- *Requirements Elicitation (RE) techniques play a crucial role in information systems development processes. There are many excellent techniques of RE to assist requirements analysts and stakeholders in producing requirements specification of higher quality, and some of them are put into practice in industry. However, one of the issues of these RE techniques is that they do not handle semantic aspects of requirements. If we can deal with the meaning of requirements by using automated techniques, we can get more effective RE techniques to produce requirements specifications of higher quality. In this paper, we consider an ontology as a semantic domain so as to provide the meaning for requirements, and discuss the potentials of the RE techniques using an ontology as a semantic basis. We provide the semantics for goal descriptions written in natural language using a mapping from them to ontology.*

Index Terms:- Elicitation; Requirements; domain; ontology.

INTRODUCTION

Ontology is a formal, explicit specification of a shared conceptualization. Ontology is used to represent the common knowledge within a domain. Ontology is the philosophical study of the nature of being, becoming, existence, or reality, as well as the basic categories of being and their relations.

The reasons to develop ontology can be roughly classified into 5 categories:

- To Share common understanding of the structure of information among people or software agents.
- To enable reuse of domain Knowledge.
- To make domain assumptions explicit.

- To separate domain knowledge from the operational knowledge.
- To analyze domain knowledge.

To develop an ontology, typically includes the following steps.

- Define classes(Concepts in the domain)in the ontology.
- Arrange the classes in a taxonomic(sub class-super class)hierarchy.
- Define slots(Properties of classes and instances)and describing allowed values for these slots.
- Fill in instances.
- Fill in the values for slots of the instances.

Important benefits in applying ontology:-

- The knowledge is formal, explicit and shared, which means the knowledge is accessible to everyone.
- The common standards of a domain can be established by the experts.
- People with different background will have opportunities to acquire the knowledge without much professional training.

There is a long history of applying ontology for requirement engineering. The very first research effort dedicated to utilizing ontologism in the requirement engg can be dated back to early 1980's ("Revisiting ontology-based requirements engg in the age of semantic web"). From then a no. of ontology based requirement engg approaches have been studied, developed and proposed. Later an ontology based requirement model is introduced that facilities detecting incompleteness and inconsistency of requirement engg and predicting potential changes in later software engg process ("ontology based requirement analysis: Lightweight semantic processing approach"). A minimum model for describing requirement knowledge is presented.

In this research, we focus on semantic processing of requirements and re-usable parts by using ontology techniques. We are developing techniques that enable us to elicit semantically correct requirements and to select the implementation structures that are semantically suitable for those requirements. We have an ontology system whose concrete structure is the thesaurus of domain-specific words for each problem domain. In our new methodology,

requirements are elicited based on the ontology, or more concretely, the ontology system guides the analysts' activities to elicit requirements. As a result, the meaning of the elicited requirements can be represented with a set of relevant words included in the ontology system. Re-usable parts are also semantically related to the words in the ontology system; that is, the meaning of each re-usable part is provided by the ontology system. Consequently, we have a kind of database of re-usable parts, including their semantic information. The selection of re-usable parts is performed by means of word matching in the ontology system. The re-usable parts are then adapted so as to satisfy the requirements and are integrated into a final product. Our ontology system has two layers; one for requirements elicitation and the other for re-usable parts. By establishing relationships between the two layers, the ontology system can play a role in bridging gaps between a requirements specification and an architectural design at a semantic level.

Goal, Quality constraint and soft goal are proposed as the fundamental ontology concepts in requirement engg ("Ontology-based reasoning in Requirements Elicitation"). ("Towards semantic based Requirement Engg") Presents a well structured ontology based requirement model called SOFTWIKI, Which is capable of capturing and managing the requirement engg artifacts' for all stages of system development. Although all the approaches introduced above make great contribution to ontology-based requirement engg, they are not suitable for representing requirement knowledge for automated SPL.

"ontology based requirement analysis: Lightweight semantic processing approach"

Places its emphasis on artifacts' verification, while the model proposed is more theoretical than practical.

The objective of the method from (“Ontology-based reasoning in Requirements Elicitation”) is to ease the communication between requirement engineers and clients in requirement elicitation.

Contributions from most ontology-based requirement engg studies fall into 3 categories:

- Improving the quality of requirement engg artifacts (“ontology based requirement analysis: Lightweight semantic processing approach”, “Ontology-based reasoning in Requirements Elicitation”, “Ontologism in checking for inconsistency of requirement specification”)
- Defining a shared understanding among engineers and clients(eg:” A Domain ontology Building process for guiding requirements elicitation”, “Elicit O: A Quality ontology –Guided NFR elicitation tool”, “Design requirements management using an ontological framework”).
- Developing new knowledge-based requirement engg methods(eg: “Requirement ontology for Engineering design”, “GOORE: Goal oriented and ontology driven requirement elicitation method”, “Parsing from requirement specification to class model using application domain ontology”).

“Towards ontology driven Requirements Engg”

- it presents a meta model for ontology-driven goal oriented requirements engg.
- It also proposed that ontology consistency checking and rule driven complete tests are combined to measure the validity and coverage of evolving requirement model.

- Ontologism are useful for representing and interrelating various knowledge.
- A so called Requirement meta model is generated from the knowledge of the requirement analysis and builds the TBox of the requirement ontology. It formalizes the RE concepts as well as Relationships between requirement artifacts’.

“Domain Requirements elicitation and analysis – An ontology based approach”

- This paper presents an approach to elicit and analyze domain requirements based on ontology.
- Using subjective decomposition method, problem domain is decomposed into several sub problem domains.
- Top-down refinement method is used to refine each sub problem domain into primitive requirements, which are specified using ontology definition.

“An Ontology based Requirements Modeling for interactive software customization”

- This paper presents a novel approach of interactive requirements elicitation for the production of customized software systems.
- It first develops an ontology model to represent the knowledge of common and variable software assets and then suggests a 9 step process to create instances of the ontology model as abstract requirement model for specific application domains.
- Ontology has been used in requirement modeling to detect incompleteness and inconsistency, measure quality, and predict potential changes of requirements in later software engg phases.

“An Environment –Driven ontological approach to Requirements Elicitation for safety critical systems”

- This paper presents an ongoing work aiming to systematically organize the knowledge of system operating environment and facilitate the elicitation of environmental safety requirements.
- Proposed an ontological approach to achieve the objectives.

“Ontology-Driven Guidance for Requirements Elicitation”

- In this paper Requirements managers aim to keeping their sets of requirements well-defined, consistent and up to date throughout a development project’s life cycle.
- Semantic web technologies have found many valuable applications in the field of requirements engineering.
- In this work we present the prototypic implementation of a semantic guidance system.
- The semantic guidance system uses concepts, relations and axioms of a domain ontology to provide a list of suggestions the requirements engineer can build on to define requirements.
- The semantic guidance system effectively supports requirements engineers in defining well-structured requirements.
- Present a requirements elicitation tool that improves requirements quality by analysis.
- Future work will include setting up an evaluation to compare the elicitation time with and without the semantic guidance system.

- Our future work will improve elicitation tool that performance requirements quality by analysis.
- Combining goal-oriented and use case modeling has been proven to be an effective method in requirements elicitation and elaboration. However, current requirements engineering approaches generally lack reliable support for automated analysis of such modeled artifacts.

“Domain Requirements Elicitation and Analysis - An Ontology-Based Approach”

- An approach to elicit and analyze domain requirements based on ontology.
- Not only domain commonality, variability and qualities are presented, but also reasoning logic is used to detect and handle incompleteness and inconsistency of domain requirements.
- The top-down refinement method is used to refine each sub problem domain into primitive requirements.

CONCLUSION

In this paper we have presented an approach to capturing and validating a set of project requirements. We have implemented our approach and have performed an in-depth evaluation using an extant set of project requirements. This evaluation has shown that the approach is capable of dealing with a reasonably complex set of requirements from a real-world problem. The performance is such that it can be integrated into the requirements engineering workflow without becoming a burden on the requirements engineer. This paper introduces an ontology-based method for requirements elicitation. Ontology is used to represent the

common knowledge within a domain. Here, First We start with an ontology structure contains knowledge of functional requirements and relations among them. In this architecture first we map initial requirements to functions in domain ontology. The common standards of a domain can be established by the experts. In this paper, aim to keeping their sets of requirements well-defined, consistent and up to date throughout a development project's life cycle. The current approach for building an Ontology Based Requirements Elicitation is to capitalize on efforts made to design a preexisting model. Our current approach provides different solutions to achieve such a reuse of a reference ontology-based Requirements Elicitation. In the next future, we plan to evaluate our requirement elicitation approach, in particular to compare the domains of the Requirements extracted by our scenario.

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