Outline

- Introduction
- Requirements Elicitation
- Requirements Classification
- Requirements Verification
- Requirements Management
- Conclusion
Introduction

- An Ontology defines the concepts of a domain and relationships between those concepts [Noy, Natalya & McGuinness, 2001].
- Introduction of the DAML/OWL ontology language used to usher in the “semantic web”
- Application of ontologies in RE facilitates translation of user expectations into requirements documentation
Briefly, what is an Ontology?

- A knowledge engineering tool that allows you to express relationships between concepts.
Requirements Elicitation

- Two Methods
  - Ontology Reuse
  - Goal-Oriented Approaches
How do we recycle old ontologies?

- **Subjective Decomposition** [Lee, 2006]
  - Create concise and simple requirements which can easily be checked by observing the relationships

- **Merging Ontologies** [Jin et. al, 1998]
  - Draw on ontologies related to current domain and merge into a comprehensive ontology

- **Feature Mapping** [Dzung et. al, 2009]
  - Clients are interviewed. After interview, rules and relations among customer functionality are used to reason for formal requirements
The Goal Oriented Approach

- **Knowledge Acquisition of automated Specification (KAOS)**
  [Darimont et. al, 1997]
  ○ Create an ontology that explains the who, why and when aspects of requirement concept.

- **Attributed Goal-Oriented Requirements Analysis method (AGORA)**
  [Kaiya et. al, 2002]
  ○ Like KAOS but weights are added to concepts and relationships in ontology graphs to make requirements more accurate

- **Goal-Oriented and Ontology Driven Requirements Elicitation Method (GOORE)**
  [Shibaoka et. al, 2007]
  ○ Create an ontology focused on mapping client requests to ontology then with a graph algorithm.
Requirements Classification

- Ontologies in requirements classification is concerned with grouping requirements to facilitate documentation

- Two Approaches
  - General Approaches
  - Non-Functional Requirements (NFRs) Specific
General Approaches

- **Lightweight semantic approach** [Kaiya & Saeki, 2005]
  - Map words to requirements ontology based on words in the customer specification synonymous with ontology concepts

- **Semantic Expansion** [Marrero et. al, 2008]
  - Uses already existing groups to form categories for requirements

- **Requirements Analysis Tool (RAT)** [Verma et. al, 2008]
  - Translate elicited requirements into an ontology written in OWL style XML
NFR Specific Ontologies

● **Standardized NFR Ontology**
  ○ Proposal by Kassab et. al [2009] that the two types of requirements are stated together in requirements documents

● **Extending Core Ontology**
  ○ Dobson, Hall & Kotonya [2007] focus on extending the core ontology to make it domain-independent for any non-functional requirements
  ○ Jureta, Mylopoulos & Faulkner [2008] create a new core ontology not limited to inputs and outputs but more common requirements expressed by stakeholders
Requirements Verification

- Take analyzed requirements and confirm that they are specific and actionable
Requirements Verification

- Verification Using Fuzzy Ontologies [Dong et. al, 2012]
  - Fuzzy ontology takes requirements from the elicitation phase and confirms they have no ambiguity

- Elicited Requirements Checking [Dzung et. al, 2012]
  - Natural language processing extracts key elements from elicited requirements and processes them to confirm they are actionable

- Semantic Verification [Hu et. al, 2010]
  - Semantics of ontologies are used to create an algorithm that can verify requirements using formal methods
Requirements Management

- Activity through which requirements can be updated throughout the RE process
Requirements Management

● Three level ontology [Roy et. al, 2005]
  ○ Framework that emphasizes creating ontologies to be extensible in the future. The three levels are product, information and process

● Extensible Form Ontology [Kiviniemi & Fischer, 2004]
  ○ A structure for a project ontology based on the predicted product form ontology created at Stanford University
Research Opportunities – (Future Work)

- Unification of the methods of ontology and requirements elicitation in one coherent method
- Better research on general methods of requirements classification
- Good experiments on requirements verification ontologies
- An ontology method to synchronize all of these tasks
Conclusion

- Although much of the research is incomplete, requirements engineering has been making great strides.

- In requirements elicitation an ontology is primarily used to encourage common meaning of concepts between stakeholders and requirements analysts.

- In requirements classification an ontology is used to place requirements into logical groupings.
Conclusion

- An Ontology is used to check requirements for their validity in the requirements validation phase.

- Finally in the requirements management phase, requirements are engineered in such a way that the relationships between concepts are maintained even when requirements change.
References (In the order which they occur)


KIVINIEMI, A., AND FISCHER, M. Requirements management interface to building product models.