Software Protection Ontology Visualization

Bachelor thesis

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Starting date: immediately

Context
Ontologies capture knowledge about concepts and their relations, attributes and different instantiations in a domain of interest. They not only play an important role in understandability of subjects but also provide invaluable means for organization, communication and reusability of knowledge [1]. Consequently, visualizing ontologies in order to build, maintain and understand them has become of major importance [2]. As a matter of fact, visualization supports us with an adequate insight on data, for instance, by shedding light on hidden relations among concepts. Visualization of ontologies due to the complex relationship among elements is a daunting task, which is beyond a complex representation. In fact, to maximize the gain of such visualizations, multiple domain related factors have to be taken into account.

Software integrity protection is a field of study that encompasses a magnitude of concepts, attributes, instigations and complex relations. To analyze them, we have built an ontology based on the surveyed literature. At this stage, we are in pursuit of optimal visualization techniques that supports us in the analysis of the ontology.

Goal
The goal of this thesis is to develop a visualization concept for the ontology of software integrity protection techniques. The first step is to identify representations (e.g. 2D, 3D or specially tailored for ontologies) that play a role in the understandability and more importantly in the analysis of the ontology by security experts. For this purpose, we will provide ten candidate analysis cases upon which the student can identify relevant representations. Afterwards, they will implement/adopt up to three visualization techniques [3] in JavaScript with which they visualize the provided case studies. The framework shall also be integrated with our internal ontology analysis tool.

Workplan
1. Write a state-of-the-art survey on ontology visualization techniques
2. Identify required representations for the ten case studies
3. Implement/adopt a visualization framework comprised of up to 3 visualization techniques in JavaScript and integrate it into our internal ontology tool
4. Visualize the ten cases and evaluate the effectiveness of the visualization
   a. Analyze expert feedback to measure the effectiveness of visualizations
5. Write the final thesis document
   a. Description of the problem and motivation
   b. State of the art survey on ontology visualization
   c. Analysis of the ten case studies and identification of relevant representations
   d. Evaluation of the visualization w.r.t the ten case studies
   e. Conclusions and Future Work
Deliverables

- Docker container able to run a demo of the implementation, including instructions on how to run the demo
- The container should also include the source code of the implementation
- Technical report with comprehensive documentation of the implementation, i.e. design decision, architecture description, API description and usage instructions
- Final thesis report written in conformance with TUM guidelines

References

