Abstract

Nada M Hassan

An Approach for Validating Feature Models Using Domain Knowledge

Feature models (FM) are a way for capturing, modeling and describing the requirements in software engineering. They are widely used in software product lines to describe the commonalities and the variabilities of related products in specific domain. The Features in the feature models are used in differentiating the different products in Software Product Lines (SPLs). Accordingly, validating the accuracy of FMs is important to ensure the development of the desired software product. Current research in the area of FM analysis and the validation focuses on capturing the inconsistencies of the feature model configurations of software systems. Validating the FM semantically against domain knowledge using Description Logic (DL) is missed, although, the semantic web has been used to represent the FM as ontology using the Web Ontology Language (OWL) DL. This allows for the use of DL reasoners for validating the consistency of FM configurations. In this thesis, some challenges related to the validity of FMs against domain knowledge are investigated. To overcome some of these challenges, this research proposes an approach to use the ontology mapping to detect the semantic correspondences between a given FM and the domain ontology. It also proposes an approach for generating some recommendations for developers to enhance their FMs using the semantic mappings between FMs and domain ontologies. Two different Wireless Sensor Network (WSN) feature models are used for analysis. The well-known Semantic Sensor Network ontology (SSN) is used for the purpose of validation. Two ontology-matching tools are implemented and analyzed to map the feature model and the domain ontology. In addition, an algorithm is presented to provide recommendations to enhance a given FM based on the mapping of the FM and the domain ontology. The result shows that the String Equality shows better results than Log-Map in detecting the mappings between the FM and the domain ontology. Also, it shows that the approach enhances the FM and minimizes the gap between the FM and the domain knowledge.