Researches on Software Requirements Elicitation Approach of the Aviation Electronics Systems based on Multi-ontology

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Abstract—Software requirements elicitation as the basic work of requirements engineering not only has a direct impact on the requirements engineering activities itself, but also relates to the success or failure of the entire software project. It is increasingly valued as a key part of obtaining high-quality software. However, the current requirements elicitation activities still have the following problems, 1) ambiguity. The knowledge gap between software developers and domain users (domain experts) caused by differences in problem domains creates barriers to knowledge sharing and leads to different understandings of the same concept. 2) inconsistency. The increase in the size and complexity of software systems has made software development a multi-team collaboration activity. This makes multi-view, multi-paradigm development methods widely adopted, while increasing the heterogeneity of software requirements specifications and resulting in inconsistent content. 3) incompleteness. The increase in the size and complexity of software systems and the increasing complexity of types of R&D personnel have led to significant knowledge-intensive, diversified and complex software developments that have made it difficult to acquire complete knowledge. In the field of knowledge engineering, an ontology is an explicit specification of a conceptualization. In this paper, the ontology method is used to construct the requirement knowledge framework, and the various requirements knowledge is expressed as a clear, complete and consistent hierarchical ontology concept and association, which is more conducive to knowledge sharing and reuse, and reflects multiple viewpoints of stakeholders. Meanwhile, the relevant content of the decomposition of the generalization ontology is added in the framework, which is divided into the structure ontology and action ontology, which makes up for the deficiency of undifferentiated knowledge composition representation of the generalization ontology. Besides, the concept of software requirement error pattern is proposed and integrated into the multi-ontology framework of requirements knowledge in a consistent form. Based on the framework, the domain requirements model and the application requirements model can be constructed, and this can be adopted as the basis of the requirements elicitation activities, giving full play to its role of error avoidance, and playing a positive role in improving the quality and reliability of software products. The example verification part takes an unmanned aerial vehicle flight control system as the research object, and illustrates the effectiveness of the method proposed by this paper by quantitative analysis of the requirements inspection results and the quality of the requirements specification documents.

Keyword—software requirements elicitation; software requirements error; pattern; ontology; aspect-oriented