

Chapter 13

A Dualism Based Semantics Formalization Mechanism for Model Driven Engineering

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ABSTRACT

Firstly this article presents a thorough discussion of semantics formalization related issues in model driven engineering (MDE). Then motivated for the purpose of software implementation, and attempts to overcome the shortcomings of incompleteness and context-sensitivity in the existing models, we propose to study formalization of semantics from a cognitive background. Issues under study cover the broad scope of overlap vs. incomplete vs. complete, closed world assumption (CWA) vs. open world assumption (OWA), Y(Yes)/N(No) vs. T(True)/F(False), subjective (SUBJ) vs. objective (OBJ), static vs. dynamic, unconsciousness vs. conscious, human vs. machine aspects, and so forth. A semantics formalization approach called EID-SCE (Existence Identification Dualism-Semantics Cosmos Explosion) is designed to meet both the theoretical investigation and implementation of the proposed formalization goals. EID-SCE supports the measure/evaluation in a {complete, no overlap} manner whether a given concept or feature is an improvement. Some elementary cases are also shown to demonstrate the feasibility of EID-SCE.

INTRODUCTION

This is a revised and extended version of the work previously published in (Duan, Y., 2008c). Various languages and techniques of Model Transformations (MT) (Bar & Whittle, 2006; OMG, 2002) and Model Driven Engineering (MDE) (Atlee et al., 2002; Bézivin et al., 2006) are quickly gaining

strength and attentions with excellent application records. Many new proposals, features (Kang et al., 1990), concepts (Burmester et al., 2004; France et al., 2006) of languages of MT and MDE have been introduced and devised to further advance current practices, spanning from theoretical to industrial communities, syntax level (Bar & Whittle, 2006) to semantic level (Chitchyan et al., 2007), formal description to human-machine interactive modeling/implementation, functional

DOI: 10.4018/978-1-4666-0261-8.ch013

fulfillment to quality satisfaction (Bruel et al., 2004; Barbero et al., 2007), developers' views to system architects' artifacts, etc. However, current technologies do not provide a solution to evaluate whether a given proposal/concept/feature in a MT and MDE related system is an improvement (France et al., 2006) without writing all programs in a language, or trying out all the possible organizational environments in which software may be developed. Software engineering properties such as comprehensibility, evolvability, modularity, and analyzability, are crucial dimensions to consider in the assessment of the quality of software engineering activities and products by designers and users of MT and MDE languages and systems during the software modeling processes (Atlee et al., 2002; Bruel et al., 2004; Barbero et al., 2007).

It is a very insightful description that in the past, informatics put emphasis on external information processing while ignoring the fundamental fact that human brains are the original sources and final destinations of information and that any information must be cognized by human beings before it is understood (Wang et al.09). According to this strategy, it is reasonable to reach the conclusion that human are the original sources and final destinations of semantics. And the links among semantics and the creator of them should be given a high priority in a semantics formalization practices theoretically. This work is extended on this instructive strategy, and generally it falls into categories of Cognitive computing and Mathematical laws of software engineering of Cognitive Informatics (CI) (Wang 02; Wang 06; Wang et al 09). We propose to investigation from a new cognitive viewpoint of semantics formalization (Zhang, D., 2005; Shi, Z et al, 2006; Wang, Y.,2007a; Wang, Y.,2007b) problems of MT and MDE technologies to enable programmers to construct of a MT and MDE language with formalized semantic to help users to develop better software. The goal of the semantics formalization mechanism proposed in this article is expected to be beneficial to the

design, implementation, and optimization of MT and MDE languages fundamentally. Especially it is expected to support the measure/evaluation in a {complete, no overlap} manner whether a given proposal/concept/feature in a MT and MDE related system is an improvement.

MDE SEMANTICS PROBLEM ANALYSIS

Semantics Related Scenario

There are many problems with semantics perceiving and exploring which include but not limited to the following scenario:

- (a) Users have difficulty with combining their natural language (NL) semantics from their knowledge backgrounds with the semantics proposed in documents of enforcement.
- (b) Users might not persuade each other (Guarino, N., 2004) with the priorities of their perceived semantics on the presumed same concept by means of pure expression techniques.
- (c) Users might not convince themselves the {Yes/No, True/False} of their "self" conceived semantics in a consciously (vs. unconsciously) non-relativism, {complete, non-overlap} manner in a static or dynamic space (Block et al., 1998; Koch, C., 2004). They might not overcome/solve the beginning/first difficulty of locating/identifying themselves as an observer or insider of the target (whose?) semantics usually.

Most claimed solutions can only provide partially or empirical contributions limited to conceptual level with unsurpassable paradoxes/fallacies. This paper believes that cognitive analysis can initiate an ultimate formalization approach.

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