Towards Understanding of Classes versus Data Types in Conceptual Modeling and UML

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References:


Abstract:

Traditional conceptual modeling and UML take different vague, ambiguous, and apparently incompatible approaches to making a distinction between two different entity types – classes and data types. In this paper, an in-depth theoretical study of these ambiguities and discrepancies is given and a new semantic interpretation is proposed for consolidation. The interpretation is founded on the premise that populations of the two kinds of entity types are defined in two substantially different ways: by intensional (for data types) and extensional (for classes) definitions. The notion of a generative relationship set is introduced to explain the role of specific relationship types that are used to define populations of structured data types by cross-combinations of populations of the related entity types. Finally, some important semantic consequences are described through the proposed interpretation: value-based vs. object-based semantics, associations vs. attributes, and identity vs. identification. The given interpretation is based on runtime semantics and allows for fully unambiguous discrimination of the related concepts, yet it fits into intuitive understanding and common practical usage of these concepts.

Keywords:

object identity, formal semantics, Conceptual modeling, identification, relationship, class, association, entity, data type, Unified Modeling Language (UML), attribute