Logics for OO information systems: a semantic study of object orientation from a categorial substructural perspective

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Introduction

In this part we propose a model in which we can do theoretical research in object oriented technology. We will introduce two artifacts for this model:

- a *language* for expressing information in the object oriented way
- an *interpretation* of this language in a mathematical model; i.e. *semantics*

The language we present has a formal syntactic theory that has both textual and graphical components. The graphical components are called *edge graphs*. From these constructs we build so called *categorial graphs* to denote types and information models, and *object graphs* to denote actual information\textsuperscript{27}. The languages of categorial graphs and object graphs are generalizations of the language constructs in object oriented languages. The constructs connect closely to the high level languages for object oriented analysis and design, like UML.

The semantics consists of a mathematical model in which we have objects and partial descriptions. If an information modeler constructs a categorial description of an information system, all the instances of information content he envisages to be possible are actual models of the description.

So how do these models relate to the practical situation of an operational information system? A particular situation in an operational information system coincides with a particular semantic model that satisfies a description written down by the information system designer (written down in the language of categorial graphs). One can write down parts of actual or possible models using

\textsuperscript{27}In other words we use the categorial graphs to write specifications of objects, and object graphs to denote the actual objects categorized by the categorial graphs, just like a data model denotes specifications of information objects in a relational database, and records the actual information objects in a database.
the object graphs, just like one can write down diagrams in UML that exemplify actual or possible situations in an information system.

And how do these models relate to the practical object oriented languages? In analysis, design and implementation languages, one writes down (possibly graphical) symbols. These symbols have a meaning, i.e. we interpret these symbols to be something they stand for. In order to give a precise meaning, one needs to give that meaning in the form of a mathematical construction in which information objects live and behave as one has specified in the language. Such a mathematical construction will be presented in this part of the thesis.

We will start this part with a presentation of the language for object oriented information systems; the syntactical theory in chapter 3. The semantic domain, the mathematics in which we interpret the language of object oriented information systems will be presented in chapter 4.