# Institutions for Navigational Logics for Graphical Structures (Extended Abstract) *

Fernando Orejas Elvira Pino
Universitat Politècnica de Catalunya
Barcelona, Spain
{orejas,pino}@cs.upc.edu

Marisa Navarro
Univ. País Vasco (UPV/EHU)
San Sebastián, Spain
marisa.navarro@ehu.es

Leen Lambers
Hasso Plattner Institut
University of Potsdam, Germany
Leen.Lambers@hpi.de

The extensive use of graphs in all areas of Computer Science is the reason for the relevance of being able to express graph properties and to reason about them. In particular, we are interested in the area of software modeling where, in the context of graphical modelling formalisms, like the UML, graph properties may be used to express constraints for a given model, and we are also interested in the area of graph databases, where graph properties may be used not only to express database constraints, but where a graph logic may be used as a basis to define a query language.

In [3] Habel and Penneman defined the *logic of nested graph conditions* (LNGC), a specialized (visual) logic for reasoning about graph properties, proving among other results that it was equivalent to the first-order logic of graphs of Courcelle ([1]).

A main problem of (first-order) graph logics is that it is not possible to express relevant properties like "there is a path from node $n$ to $n'$", because they are not first-order. As a consequence, there have been a number of proposals that try to overcome this limitation by extending existing logics, like [4, 7, 5]. In particular, in [5] we extended the LNGC, allowing us to state properties about paths in graphs and to reason about them in a generic way (i.e. for arbitrary categories of graphical structures). Since this new logic allows one to describe properties of paths in graphical structures, we have called it a *navigational logic*.

Institutions were introduced in [2] to define the semantics of the Clear specification language, independently of any specification formalism. Showing that a given formalism is an institution allows us to use a number of constructions to structure and modularize our specifications [8]. For this reason, in the work that we aim to present [6], we show that a given navigational logic is a semi-exact institution. Moreover, using the properties of our institution, we also show how to structure single formulas, which in our formalism could be quite complex. For simplicity, in this paper we work with the specific category of labeled graphs, but the results can be generalized to arbitrary categories of graphical structures, following the lines of [5].

## References

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