

Padberg, Julia**Categorical approach to horizontal structuring and refinement of high-level replacement systems.** (English) [Zbl 0941.18001](#)

Appl. Categ. Struct. 7, No. 4, 371-403 (1999).

Summary: Based on the well-known theory of high-level replacement systems – a categorical formulation of graph grammars – we present new results concerning refinement of high-level replacement systems. Motivated by Petri nets, where refinement is often given by morphisms, we give a categorical notion of refinement. This concept is called \mathcal{Q} -transformations and is established within the framework of high-level replacement systems. The main idea is to supply rules with an additional morphism, which belongs to a specific class \mathcal{Q} of morphisms. This leads to the new notions of \mathcal{Q} -rules and \mathcal{Q} -transformations. Moreover, several concepts and results of high-level replacement systems are extended to \mathcal{Q} -transformations. These are sequential and parallel transformations, union, and fusion, based on different colimit constructions. The main results concern the compatibility of these constructions with \mathcal{Q} -transformations that is the corresponding theorems for usual transformations are extended to \mathcal{Q} -transformations. Finally, we demonstrate the application of these techniques for the special case of Petri nets to a case study concerning the requirements engineering of a medical information system.

MSC:[18A10](#) Graphs, diagram schemes, precategories[68Q85](#) Models and methods for concurrent and distributed computing (process algebras, bisimulation, transition nets, etc.)[94C99](#) Circuits, networks[18A30](#) Limits and colimits (products, sums, directed limits, pushouts, fiber products, equalizers, kernels, ends and coends, etc.)[68Q42](#) Grammars and rewriting systemsCited in **2** Documents**Keywords:**

graph transformations; Petri net transformations; horizontal structuring; high-level replacement systems; graph grammars; refinement; requirements engineering

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