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Double-categorical logic for unbiased categorical structures

Double categories are increasingly recognized as a powerful tool for formal category theory. The speaker and collaborators have developed a notion of double-categorical theory whose models are categorical structures, categorifying the familiar story from categorical logic that (one-dimensional) theories have set-theoretical structures as models. A cartesian double theory given by finite presentation describes the operations of a categorical structure in biased terms, categorifying the situation for algebraic theories; for example, a monoidal category is axiomatized in terms binary and nullary products, rather than n -ary products for each natural number n . However, some categorical structures, like multicategories and PROPs, are natively defined in unbiased form, whereas others, like monoidal categories and cartesian categories, admit unbiased axiomatizations that can be more convenient than the standard biased ones. In this talk, we propose a new notion of double theory able to give finitary axiomatizations of unbiased categorical structures, including all those mentioned above. The intended semantics for such a theory is a double monad on Span generalizing the familiar list monad on Set. We argue that this approach lends itself well to type-theoretic and computer implementation, sketching ongoing research to uniformly specify the internal languages of models of such theories and ultimately to implement those languages in the software system CatColab.