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Towards a characterization of the double category of spans

In [1] it was shown that the bicategory of spans in a category with finite limits can be characterized as a Cartesian bicategory in which every comonad has an Eilenberg-Moore object and every left adjoint arrow is comonadic. Motivated by this result, we study whether or not a characterization of spans as a Cartesian double category is possible. In this talk, we will define a Cartesian double category to be a double category $\mathbb{D}$ for which the diagonal double functor $\Delta : \mathbb{D} \to \mathbb{D} \times \mathbb{D}$ and the unique double functor $! : \mathbb{D} \to \mathbb{1}$ have right adjoints. We will describe some of their properties and we will specifically talk about Cartesian categories that are also fibrant. We will study the double category of comonads over a fibrant Cartesian double category that satisfies the Frobenius axiom and we will extend the theory of Eilenberg-Moore objects to double categories. It is worth mentioning that there are some results about the double category of spans already proven in [2], which will be very useful in our work.

REFERENCES:

[1] S. Lack, R. F. C. Walters and R. J. Wood, Bicategories of spans as cartesian bicategories, *Theory and Applications of Categories* 24 (2010) 1–24.

[2] S. Niefield, Span, Cospan, and other double categories, *Theory and Applications of Categories* 26 (2012) 729–742.