Double categorical equivalences

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Abstract.

Double categories are a flexible 2-dimensional setting that allows us to encode two types of morphisms between objects, as well as a notion of higher cells. Surprisingly, unlike most categorical structures, there is no canonical notion of "equivalence of double categories", as it seems that every possible definition requires us to make a choice. In this talk we will illustrate the issue that arises when defining double-categorical equivalences. Then, we will show how we can use homotopy theory to give a decisive answer as to who the "canonical double categorical equivalences" could be: we give strong evidence towards the claim that these should be the *gregarious equivalences* introduced by Campbell [1].

In the process, we will show how to construct a plethora of model structures on double categories whose homotopy theories encode different 2-dimensional structures. More precisely, we will present an efficient and user-friendly method for constructing any combinatorial model structure on the category of double categories whose trivial fibrations are the "canonical" ones: the double functors which are surjective on objects, full on both horizontal and vertical morphisms, and fully faithful on squares.

This talk will be based on work in preparation joint with Lyne Moser and Paula Verdugo [2].

References

[1] Alexander Campbell, *The folk model structure for double categories*, Seminar talk, http://web.science.mq.edu.au/groups/coact/seminar/cgi-bin/abstract.cgi?talkid=1616.

[2] Lyne Moser, Maru Sarazola and Paula Verdugo, Double categorical equivalences, in preparation.