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Homotopy Theory for Double Categories

In the literature there are various results relating internal double categories in the category of groups as well as certain double groups to homotopy n-types. See for example, [1], [2], and [4]. This suggests that the relationship between the homotopy theory of spaces and the homotopy theory of double categories should be investigated and clarified. Quillen model structures are particularly suited for this purpose. In this talk I will present various Quillen model structures for **DblCat**, the category of double categories, and discuss their properties.

Some of these structures are obtained by transfer along the adjunction involving the horizontal nerve, using the Lemma from Kan [3]. This lemma requires some results about certain pushouts of double categories. This led us to study a larger class of pushout diagrams of double categories and derive a nice result about the shapes of the double cells in the pushout double categories. If time permits I will discuss this result and give a sketch of the proof.

This is joint work with Simona Paoli and Tom Fiore.

References

[1] R. Brown and C. B. Spencer, *Double groupoids and crossed modules.* Cahiers Topologie Géom. Différentielle **17**(1976), 343–362.

[2] T. Fiore, *Pseudo algebras and pseudo double categories.* J. Homotopy Relat. Struct., to appear.

[3] P. S. Hirschhorn, *Model categories and their localizations.* Math. Surveys Monogr. **99**, Amer. Math. Soc., 2003

[4] J.-L. Loday, *Spaces with finitely many nontrivial homotopy groups.* J. Pure Appl. Algebra **24**(1982), 179–202.