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The homotopy relation in a category with weak equivalences

I will present the results of [1], where we develop a construction of the homotopy category which resembles that of [2] but in the more general setting of categories with weak equivalences [3]. Given a category with weak equivalences $(\mathcal{C}, \mathcal{W})$ we define a homotopy relation between the arrows of $\mathcal{C}$, and give a simple condition on $\mathcal{W}$ under which the quotient of $\mathcal{C}$ by the homotopy relation yields the localization of $\mathcal{C}$ at $\mathcal{W}$. For the weak equivalences between the fibrant-cofibrant objects of a model category this condition holds, and we show that our notion of homotopy coincides with the classical one. The proofs of these results become simpler than those that involve the whole structure of a model category, and I will briefly explain how this was used for their generalization to bicategories in [4].

REFERENCES:

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[3] Dwyer W.G., Hirschhorn P.S., Kan D.M., Smith J.H., Homotopy Limit Functors on Model Categories and Homotopical Categories, *AMS Mathematical Surveys and Monographs 113* (2004).

[4] Descotte M.E., Dubuc, E., Szyld M., A localization of bicategories via homotopies, arXiv:1805.05248 (2018).