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Dynamical systems and diagrams

A dynamical system is a space X with a pairing from $X \times S \to X$ for some parameter space S, and a map of such dynamical systems is an S-equivariant map. There is an injective and a projective model structure for the resulting category of spaces with S-action, and both are easily derived.

These model structures are special cases of model structures for presheaf-valued diagrams X defined on a fixed presheaf of categories E which is enriched in simplicial sets.

Simultaneously varying the parameter category object E (or parameter space S) along with the diagrams X up to weak equivalence is more interesting, and requires new model structures for E-diagrams having weak equivalences defined by homotopy colimits, as well as a generalization of Thomason's model structure for small categories to a model structure for presheaves of simplicial categories. These new model structures exist for arbitrary presheaves of simplicial categories E and their categories of diagrams.