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Algebraic Models of Homotopy n-Types. Preliminary report.

For a while now, we have known that groups model connected homotopy 1-types. In the 1940's, J.H.C. Whitehead introduced crossed modules and showed that there is a correspondence between crossed modules and connected homotopy 2-types. Behrang Noohi (re)proved the folklore that the homotopy category of crossed modules is equivalent to the category of connected homotopy 2-types. However, in forming the homotopy category of crossed modules, one must resort to computing derived morphisms using non-constructive topological methods, but Noohi was able to find an algebraic model of these derived morphisms called butterflies, thus making a completely algebraic model of connected homotopy 2-types. Reduced crossed complexes are a generalization of crossed modules (also introduced by Whitehead) and model a subclass of connected homotopy n-types. We will present algebraic objects called n-butterflies which satisfy similar properties to butterflies and begin to generalize the theory of butterflies to model morphisms of connected homotopy n-types. (Received August 31, 2017)