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New Dualities From Old: generating geometric, Petrie, and Wilson dualities and trialites of ribbon graphs

We present twisted duality tools to identify and generate new graphs with various forms of self-duality including geometric duality, Petrie duality, Wilson duality, and both forms of triality. Previous work typically focused on regular maps, but the methods presented here apply to general embedded graphs. In contrast to the very large self-trial map of Wilson $(9,9)_9$, we show that there are self-trial graphs on as few as three edges. We reduce the search for graphs with some form of self-duality to the study of one vertex ribbon graphs, and we conclude with a fast algorithm that will find all graphs with any of the various forms of self-duality in the orbit of a graph that is isomorphic to any twisted dual of itself.

Joint work with Lowell Abrams, George Washington University