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New Dualities From Old: Generating Geometric, Petrie, and Wilson Dualities and Trialites of Ribbon Graphs

Abstract for the Combinatorics Seminar 2019 April 16

I present joint work with Lowell Abrams (George Washington University) on twisted duality tools to identify and generate new surface embeddings of graphs with various forms of self-duality including geometric duality, Petrie duality, Wilson duality, and both forms of triality (like duality, but with triples instead of pairs). Previous work typically focused on regular maps (they are certain kinds of embedded graphs), 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. I conclude the talk 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.
