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Topologically protected tricolorings

Topological vortices are codimension-one topological defects that arise in various phys- ical systems, such as liquid crystals, Bose–Einstein condensates, and vacuum structures of Yang–Mills theories. Under certain homotopical assumptions that are satisfied in many realistic systems, topological vortex configurations admit faithful presentations in terms of colored link diagrams. The most well-known coloring scheme of links is given by tricolorings: each arc of the link diagram is colored by one of three possible colors (red, green, or blue) in such a way that, in each crossing, either all arcs have the same color, or all arcs have a different color. A tricolored link is topologically protected if it cannot be transformed into a disjoint union of unlinked simple loops by a sequence of color-respecting isotopies and color-respecting local cut-and-paste operations. The above operations are referred to as topologically allowed local surgeries. We use equivariant bordism groups of three-manifolds to construct invariants of colored links that are conserved in allowed local surgeries, and employ the invariant to classify all tricolored links up to local surgeries. The talk is based on joint work with Hermanni Rajamäki, Roberto Zamora Zamora, and Mikko Möttönen.