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Latin bitrades and Eulerian triangulations

Informally, a Latin bitrade is a pair of partial Latin squares obtained by superimposing two Latin squares (of the same order and with the same symbol set) and removing from both squares those cells that contain the same symbol in corresponding positions.

Latin bitrades which satisfy some natural conditions (that can be easily achieved) correspond to vertex 3-colourable Eulerian triangulations of orientable surfaces. This leads to a natural definition of the genus of a Latin bitrade. It was recently shown that all spherical Latin bitrades can be embedded in a finite Abelian group while there exist toroidal Latin bitrades that can be embedded in no group.

We show that spherical Latin bitrades correspond to spherical Eulerian triangulations (that is, the vertex 3-colourability is implied in this case). We prove that the algorithm for inductive generation of spherical Eulerian triangulations (due to Batagelj, Brinkmann and McKay) can be simplified by removing one of the two local transformations that it uses. We discuss an analogous algorithm for generation of toroidal Latin bitrades.

This is joint work with N. Cavenagh and A. Drapal.