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DNA Origami and Knots in Graphs

Motivated by the problem of determining unknotted routes for the scaffolding strand in DNA origami self-assembly, we examine existence and knottedness of A -trails in graphs embedded on surfaces in space. We construct infinite families of embedded graphs containing unknotted A -trails as well as infinite families containing no unknotted A -trails. While not every embedded Eulerian graph contains an unknotted A -trail, we conjecture that every abstract Eulerian graph has some embedding containing an unknotted A -trail. We prove this in the 4-regular case, giving an algorithm for finding such embeddings. Lastly, we discuss construction of knots using A -trails of rectangular grids.