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Genus distributions of graphs under self-edge-amalgamations

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Abstract

We investigate the well-known problem of counting graph imbeddings on all oriented surfaces with a focus on graphs that are obtained by pasting together two root-edges of another base graph. We require that the partitioned genus distribution of the base graph with respect to these root-edges be known and that both root-edges have two 2-valent endpoints. We derive general formulas for calculating the genus distributions of graphs that can be obtained either by self-co-amalgamating or by self-contra-amalgamating a base graph whose partitioned genus distribution is already known. We see how these general formulas provide a unified approach to calculating genus distributions of many new graph families, such as co-pasted and contra-pasted closed chains of copies of the triangular prism graph, as well as graph families like circular and Möbius ladders with previously known solutions to the genus distribution problem.

Keywords: Graph, genus distribution, self-edge-amalgamation.

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Porazdelitev rodu grafov pri povezavnih amalgamacijah

Povzetek

Raziskujemo dobro znani problem preštevanja vložitev grafov na vse orientabilne ploskve, pri čemer se osredotočimo na grafe, ki jih dobimo tako, da zlepimo skupaj dve korenski povezavi nekega drugega baznega grafa. Predpostavljamo, da je razdeljena porazdelitev rodu baznega grafa glede na korenski povezavi znana, in da imata obe korenski povezavi dve 2-valentni krajišči. Izpeljemo splošne formule za izračun porazdelitve rodu grafov, dobljenih bodisi s ko-amalgamacijo ali s kontra-amalgamacijo baznega grafa, katerega deljena porazdelitev rodu je že znana. Te splošne formule omogočajo poenoten način računanja porazdelitve rodu za mnoge nove družine grafov, kot na primer ko-zlepljene in kontra-zlepljene zaprte verige kopij grafa trikotne prizme, kot tudi za družine grafov, kot so npr. krožne lestve in Möbiusove lestve, za katere so rešitve problema porazdelitve rodu znane že od prej.

Ključne besede: Graf, porazdelitev rodu, samo-povezavne-amalgamacije.