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# Simultaneous current graph constructions for minimum triangulations and complete graph embeddings

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**Abstract**

The problems of calculating the genus of the complete graphs and of finding a minimum triangulation for each surface were both solved using the theory of current graphs, and each of them divided into twelve different cases, depending on the residue modulo 12 of the number of vertices. Cases 8 and 11 were of particular difficulty for both problems, with multiple families of current graphs developed to solve these cases. We solve these cases, in addition to Cases 6 and 9, in a unified manner, greatly simplifying previous constructions by Ringel, Youngs, Guy, and Jungerman. All these new constructions are index 3 current graphs sharing nearly all of the structure of the simple solution for Case 5 of the Map Color Theorem.

*Keywords: Topological graph theory, current graphs, map coloring, triangulations.*

*Math. Subj. Class.: 05C10, 05C15*

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# Simultane konstrukcije tokovnih grafov, uporabnih za minimalne triangulacije in vložitve polnih grafov

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**Povzetek**

Problema računanja rodu polnih grafov in iskanja minimalne triangulacije za vsako ploskev sta bila oba rešena s pomočjo teorije tokovnih grafov, pri čemer se je vsak od njiju razdelil na dvanajst različnih primerov, glede na ostanek števila točk po modulu 12. Primera 8 in 11 sta bila še posebej težavna pri obeh problemih, in za njuno rešitev so razvili številne družine tokovnih grafov. V tem članku rešimo ta dva primera, poleg tega pa še primera 6 in 9, na enak način, ki precej poenostavi predhodne konstrukcije Ringela, Youngsa, Guya in Jungermana. Vse te nove konstrukcije so tokovni grafi indeksa 3 in si delijo skoraj vso strukturo z enostavno rešitvijo primera 5 izreka o barvanju zemljevidov.

*Ključne besede: Topološka teorija grafov, tokovni grafi, barvanje grafov, triangulacije.*

*Math. Subj. Class.: 05C10, 05C15*

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