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Calculating genus polynomials via string operations and matrices

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Abstract: To calculate the genus polynomials for a recursively specifiable sequence of graphs, the set of cellular imbeddings in oriented surfaces for each of the graphs is usually partitioned into *imbedding-types*. The effects of a recursively applied graph operation τ on each imbedding-type are represented by a *production matrix*. When the operation τ amounts to constructing the next member of the sequence by attaching a copy of a fixed graph H to the previous member, Stahl called the resulting sequence of graphs an *H-linear family*. We demonstrate herein how representing the imbedding types by strings and the operation τ by *string operations* enables us to automate the calculation of the production matrices, a task requiring time proportional to the square of the number of imbedding-types.

Keywords: Graph imbedding, genus polynomial, production matrix, transfer matrix method.

Math. Subj. Class.: 05A15, 05A20, 05C10

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Izračunavanje rodni polinomov s pomočjo operacij na zaporedjih znakov in matrik

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Povzetek: Za izračunavanje rodni polinomov rekurzivno določljivega zaporedja grafov se množico celičnih vložitev v orientabilne ploskve za vsakega od grafov običajno razdeli v *vložitvene tipe*. Učinki grafovske operacije τ , rekurzivno uporabljene na vsakem od vložitvenih tipov, so predstavljeni s *produkcijsko matriko*. Kadar operacija τ omogoča konstruiranje naslednjega člana zaporedja z dodajanjem kopije danega grafa H k prejšnjemu članu, se dobljeno zaporedje grafov po Stahlu imenuje *H -linearna družina*. Tukaj pokažemo, kako nam predstavitev vložitvenih tipov z zaporedji znakov in operacije τ z *operacijami na zaporedjih znakov* omogoča avtomatizirati izračunavanje produkcijskih matrik; to delo zahteva čas, sorazmeren kvadratu števila vložitvenih tipov.

Ključne besede: Vložitev grafa, rodni polinom, produkcijska matrika, transferna matrična metoda.

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