

Self-dual polyhedra of given degree sequence

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Abstract

Given vertex valencies admissible for a self-dual polyhedral graph, we describe an algorithm to explicitly construct such a polyhedron. Inputting in the algorithm permutations of the degree sequence can give rise to non-isomorphic graphs.

As an application, we find as a function of $n \geq 3$ the minimal number of vertices for a self-dual polyhedron with at least one vertex of degree i for each $3 \leq i \leq n$, and construct such polyhedra. Moreover, we find a construction for non-self-dual polyhedral graphs of minimal order with at least one vertex of degree i and at least one i -gonal face for each $3 \leq i \leq n$.

Another application is to rigidity theory, since the constructed families of polyhedra are generic circuits, and globally rigid in the plane.

Keywords: Algorithm, planar graph, degree sequence, polyhedron, self-dual, quadrangulation, radial graph, valency, rigidity.

Math. Subj. Class.: 05C85, 05C07, 05C35, 05C10, 52B05, 52B10, 52C25

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Samodualni poliedri z danim zaporedjem stopenj

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Povzetek

Opišemo algoritem, ki za dano zaporedje valenc vozlišč v samodualnem poliedrskem grafu konstruira ustrezen polieder. Če v ta algoritem kot vhodni podatek vnesemo permutacije danega zaporedja valenc, je možno, da dobimo neizomorfne grafe.

Kot primer uporabe, izrazimo kot funkcijo $n \geq 3$ minimalno število vozlišč samodualnega poliedra z najmanj enim vozliščem stopnje i za vsak $3 \leq i \leq n$ ter konstruiramo ustrezne poliedre.

Predstavimo tudi konstrukcijo za nesamodualne poliedrske grafe minimalnega reda z vsaj enim vozliščem stopnje i in z vsaj enim i -kotnim licem za vsak $3 \leq i \leq n$.

Druga aplikacija se nanaša na teorijo togosti, saj konstruirane družine poliedrov tvorijo generične cikle, in so globalno toga v ravnini.

Ključne besede: Algoritem, ravninski graf, zaporedje stopenj, polieder, samodualen, kvadrangulacija, radialni graf, valenca, togost.

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