

A universality theorem for stressable graphs in the plane

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Abstract

Universality theorems (in the sense of N. Mnëv) claim that the realization space of a combinatorial object (a point configuration, a hyperplane arrangement, a convex polytope, etc.) can be arbitrarily complicated. In the paper, we prove a universality theorem for a graph in the plane with a prescribed *oriented matroid of stresses*, that is the collection of signs of all possible equilibrium stresses of the graph.

This research is motivated by the Grassmanian stratification (Gelfand, Goresky, MacPherson, Serganova) by thin Schubert cells, and by a recent series of papers on stratifications of configuration spaces of tensegrities (Doray, Karpenkov, Schepers, Servatius).

Keywords: Maxwell-Cremona correspondence, Grassmanian stratification, oriented matroid, equilibrium stress.

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Univerzalnostni izrek za obremenljive grafe v ravnini

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Povzetek

Univerzalnostni izreki (v smislu N. Mněva) trdijo, da je predstavitveni prostor kombinatoričnega objekta (konfiguracije točk, razporeditve hiperravnin, konveksnega politopa, itd.) lahko poljubno zapleten. V tem članku dokažemo univerzalnostni izrek za graf v ravnini s predpisanim *orientiranim matroidom obremenitev*, definiranim kot zbirka predznakov vseh možnih ravnotežnih obremenitev grafa.

To raziskavo sta spodbudila grassmansko razslojevanje (Gelfand, Goresky, MacPherson, Serganova) s tankimi Schubertovimi celicami ter nedavna serija člankov o razslojevanju konfiguracijskih prostorov tensegritet (Doray, Karpenkov, Schepers, Servatius).

Ključne besede: Maxwell-Cremonova korespondenca, grassmansko razslojevanje, orientiran matroid, ravnotežna obremenitev.

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