


Transit sets of two-point crossover*

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Abstract

Genetic Algorithms typically invoke crossover operators to produce offsprings that are a “mixture” of two parents x and y . On strings, k -point crossover breaks parental genotypes at at most k corresponding positions and concatenates alternating fragments for the two parents. The transit set $R_k(x, y)$ comprises all offsprings of this form. It forms the tope set of an uniform oriented matroid with Vapnik-Chervonenkis dimension $k + 1$. The Topological Representation Theorem for oriented matroids thus implies a representation in terms of pseudosphere arrangements. This makes it possible to study 2-point crossover in detail and to characterize the partial cubes defined by the transit sets of two-point crossover.


Keywords: Genetic algorithms, recombination, transit functions, oriented matroids, Vapnik-Chervonenkis dimension.

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Tranzitne množice dvo-točkovnega prehoda*

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Povzetek

Genetski algoritmi uporabljajo operatorje prehoda za generiranje potomcev, ki so “mešana” dveh staršev x in y . Na zaporedjih znakov k -točkovni prehod zlomi starševske genotipe na največ k ustreznih mestih in združi alternirajoče fragmente obeh staršev. Tranzitna množica $R_k(x, y)$ vsebuje vse potomce te oblike. Oblikuje položajno množico uniformnega orientiranega matroida z Vapnik-Chervonenkisovo dimenzijo $k + 1$. Topološki predstavitveni izrek za orientirane matroide torej implicira predstavitev v smislu psevdosfernih razporeditev. To omogoča natančno preučevanje 2-točkovnega prehoda in karakterizacijo delnih kock, definiranih s tranzitnimi množicami dvo-točkovnega prehoda.

Ključne besede: Genetski algoritmi, rekombinacije, tranzitne funkcije, orientirani matroidi, Vapnik-Chervonenkisova dimenzija.

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