Also available at http://amc-journal.eu
ISSN 1855-3966 (printed edn.), ISSN 1855-3974 (electronic edn.)
Ars Mathematica Contemporanea Volume 6, Issue 1, Year 2013, Pages 127–145

Consensus strategies for signed profiles on graphs

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Abstract

The *median* problem is a classical problem in Location Theory: one searches for a location that minimizes the average distance to the sites of the clients. This is for desired facilities as a distribution center for a set of warehouses. More recently, for obnoxious facilities, the *antimedian* was studied. Here one maximizes the average distance to the clients. In this paper the mixed case is studied. Clients are represented by a *profile*, which is a sequence of vertices with repetitions allowed. In a *signed* profile each element is provided with a sign from $\{+, -\}$. Thus one can take into account whether the client prefers the facility (with a + sign) or rejects it (with a − sign). The graphs for which all median sets, or all antimedian sets, are connected are characterized. Various consensus strategies for signed profiles are studied, amongst which Majority, Plurality and Scarcity. Hypercubes are the only graphs on which Majority produces the median set for all signed profiles. Finally, the antimedian sets are found by the Scarcity Strategy on e.g. Hamming graphs, Johnson graphs and halfcubes.

Keywords: Plurality strategy, median, majority rule, Hamming graph, Johnson graph, halfcube.

Math Sci Net: 05C12 (05C22 90B80)

Konenzne strategije za označene profile na grafih

Povzetek

Problem *mediane* je klasičen problem lokacijske teorije: iščemo lokacijo, ki minimizira povprečno razdaljo do položaja strank. Tako npr. pri izbranih lokacijah stavb iščemo najboljšo za distribucijski center, ki bo oskrboval množico skladišč. Pred kratkim se je uveljavil tudi koncept *antimediane*. Tu maksimiziramo povprečno razdaljo do strank. V članku obravnavamo mešan primer. Stranke so predstavljene s *profilom* – zaporedjem vozlišč z dovoljenimi ponovitvami. V *označenem* profilu vsakemu elementu predpišemo znak iz množice {+, −}. Tedaj lahko upoštevamo, ali je stranki nek objekt pogodu (z znakom +) ali pa ga zavrača (z znakom −). Karakteriziramo grafe, pri katerih so povezane vse medianske množice, ter grafe, pri katerih so povezane vse antimedianske množice. Pri tem uporabimo razne konsenzne strategije za označene profile, npr. večinsko, pluralno in strategijo pomanjkanja. Hiperkocke so edini grafi, na katerih večinska

strategija proizvede mediansko množico za vse označene profile. Nazadnje najdemo antimedianske množice s strategijo pomanjkanja na primeru Hammingovih grafov, Johnsonovih grafov in polkock.

Ključne besede: Pluralna strategija, mediana, večinsko pravilo, Hammingov graf, Johnsonov graf, polkocka.