

## Domination game on paths and cycles

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**Abstract:** Domination game is a game on a simple graph played by two players,  $D$  and  $St$ , who are alternating in taking turns. In each turn a player chooses a vertex in such a way that at least one new vertex gets dominated by this move. The game ends when all vertices are dominated, and thus no legal move is possible. As the names of the players suggest,  $D$  tries to finish the game as fast as possible, while  $St$  wants to prolong its end as long as she can. By  $g$  ( $g'$ ) we denote the total number of moves in the game when  $D$  (resp.  $St$ ) starts, and both players play according to their optimal strategies. In a manuscript from 2012, Kinnersley et al. determined  $g$  and  $g'$  for paths and cycles, but have not yet published this very important result. In this paper we give an alternative proof for these formulas. Our approach also explicitly describes optimal strategies for both players.

**Keywords:** Domination game, game domination number, paths, cycles.

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## Dominacijska igra na poteh in ciklih

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**Povzetek:** Dominacijska igra je igra na enostavnem grafu, ki jo igrata dva igralca,  $D$  in  $St$ , ki izmenično vlečeta poteze. Vsak igralec vselej izbere vozlišče tako, da najmanj eno novo vozlišče postane dominirano s to potezo. Igra se konča, ko so vsa vozlišča dominirana, torej ni več dovoljenih potez. Kot namigujeta imeni igralcev,  $D$  poskuša končati igro kolikor hitro je to mogoče, medtem ko hoče  $St$  odlagati njen konec. Z oznako  $g$  ( $g'$ ) označujemo skupno število potez v igri, ko jo začne  $D$  (oz.  $St$ ), oba igralca pa igrata v skladu s svojima optimalnima strategijama. V rokopisu iz 2012 so Kinnersley in dr. določili  $g$  in  $g'$  za poti in cikle, vendar še niso objavili tega zelo pomembnega rezultata. V tem članku podamo alternativen dokaz teh formul. Naš pristop tudi eksplicitno opiše optimalni strategiji za oba igralca.

**Ključne besede:** Dominacijska igra, dominacijsko število igre, poti, cikli.

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