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**The curse of sequentiality in routing games.** (English) Zbl 1404.91047

Markakis, Evangelos (ed.) et al., Web and internet economics. 11th international conference, WINE 2015, Amsterdam, The Netherlands, December 9–12, 2015. Proceedings. Berlin: Springer (ISBN 978-3-662-48994-9/pbk; 978-3-662-48995-6/ebook). Lecture Notes in Computer Science 9470, 258-271 (2015).

Summary: In the "The curse of simultaneity" [in: Proceedings of the 3rd conference on innovations in theoretical computer science, ITCS'12. New York, NY: Association for Computing Machinery (ACM). 60–67 (2012; Zbl 1348.91014)], *R. P. Leme* et al. show that there are interesting classes of games for which sequential decision making and corresponding subgame perfect equilibria avoid worst case Nash equilibria, resulting in substantial improvements for the price of anarchy. This is called the sequential price of anarchy. A handful of papers have lately analysed it for various problems, yet one of the most interesting open problems was to pin down its value for linear atomic routing (also: network congestion) games, where the price of anarchy equals 5/2. The main contribution of this paper is the surprising result that the sequential price of anarchy is unbounded even for linear symmetric routing games, thereby showing that sequentiality can be arbitrarily worse than simultaneity for this class of games. Complementing this result we solve an open problem in the area by establishing that the (regular) price of anarchy for linear symmetric routing games equals 5/2. Additionally, we prove that in these games, even with two players, computing the outcome of a subgame perfect equilibrium is NP-hard.

For the entire collection see [Zbl 1326.68026].

**MSC:**

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|---|---|
| 91A43 | Games involving graphs |
| 91A05 | 2-person games |
| 91A18 | Games in extensive form |
| 68Q17 | Computational difficulty of problems (lower bounds, completeness, difficulty of approximation, etc.) |



**Keywords:**

routing games; sequentiality; price of anarchy; subgame perfect equilibrium; NP-hardness

**Full Text:** DOI

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