

Title:

MEV Auction games

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Created:

2022-01-24

Status:

Completed

Github:

[mev-research/FRP-19.md at main · flashbots/mev-research · GitHub](#)

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Background and Problem Statement

In [Flashboys 2.0](#), Philip Daian et al. proposed a formalization of the price gas auction (PGA) model and proved mathematically and empirically the existence of Grim-Trigger Nash equilibrium under certain constraints. However, different chains and protocols emerged, such as Polygon and mev-geth. This induced new MEV auction games, that could potentially bring new incentives to searchers. Leading to different Nash equilibrium strategies, negative externalities, and validator's expected revenue.

The goal of this FRP is to survey the games and the Nash equilibrium of MEV extraction in PGA auctions, private mempools, Flashbots auctions, and the composition of all of them. Further, we will initially focus on a proper game theory formalization of latency, gas optimization, extractable value optimization, and action space of the games. With a proper formalization, we expect to find and characterize all the Nash equilibrium of MEV auction games, providing data and mathematical proofs to show the results obtained. We suspect that in each game, the players will have different strategies such as spamming, cartelizing, censoring, and/or improving geographic localization to maximize their payoff.

Plan and Deliverables

- Formalize the PGA in different domains and the Flashbots Auction game.
- Try to provide a universal framework that parametrizes all standard MEV-auction games.
- Try to find all Nash equilibrium strategies in the MEV auction game. Moreover, precise the existence of evolutionary stable Nash equilibrium strategies.
- Compare the negative externalities on users and searchers of these MEV auctions games.
- Provide an overview of the consequences of the MEV games on decentralization, liveness, chain growth, and chain quality in general Blockchains.

References

- [MEV in 2021](#)
- [Flashboys 2.0](#)
- [Evolutionary games](#)
- [MEV explorer](#)
- [Auction theory](#)

Output

- Summary report [GitHub - GrimmBrothers/MEV-games-summary](#)
- Paper “Price of MEV: Towards a Game Theoretical Approach to MEV” (Published at the ACM CSS workshop on DeFi) [\[2208.13464\] Price of MEV: Towards a Game Theoretical Approach to MEV](#)