Guided Research Proposal

Analytical and Empirical Evaluation of the Feasibility of MEV Extraction Techniques on the Algorand Blockchain

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Introduction

Miner Extractable Value (MEV) is a phenomenon in the blockchain ecosystem where privileged actors can extract value from transactions by exploiting the transaction-ordering dependencies. These actors include miners and other actors, such as high-frequency traders or arbitrage bots specifically designed to generate profit by strategies such as reordering transactions, frontrunning, sandwich attacks etc. [1].

Algorand is a blockchain that aims to be secure, scalable, and decentralized. The Algorand platform supports smart contract functionality, and its consensus algorithm is based on a proof-of-stake, and Byzantine Agreement protocol [2]. Algorand’s native cryptocurrency is called Algo [3].

To prioritize transactions in a blockchain using MEV, searchers analyze the transactions in the mempool and look for opportunities to extract MEV. They may include transactions that offer a higher fee, even if they were not submitted first, to extract the maximum possible value from the network. Additionally, miners may engage in other types of MEV extraction, such as frontrunning or sandwich attacks, in which they place a transaction in a specific position in the transaction order to take advantage of the price movements that will result from its execution.

This Guided Research project aims to analyze the feasibility of MEV extraction on the Algorand Blockchain. Algorand has no developed fee market; thus how users can prioritize their transactions is currently unknown. Since most MEV extraction techniques depend on the exact position of a transaction, it is important to analyze transaction orderings of past blocks. There has already been an ongoing discussion on this topic [4], and as part of this exercise, we would like to extend this discussion and provide an empirical basis for this discourse.

Research Questions

**RQ 1** What are the techniques that Algorand block proposers employ when ordering transactions in the blocks they build?

**RQ 2** Is it possible to execute position-dependent MEV strategies on the Algorand blockchain?

**RQ 3** Is it feasible to generate profits by analyzing the last blockchain state and developing a strategy based on it?
Methodology

To evaluate the feasibility of MEV opportunities on the Algorand blockchain, we will collect transaction data using an indexer and write scripts to analyze the data and execute various strategies. Our analysis will focus on understanding how to prioritize transactions, as without this information, frontrunning and sandwich attacks will fail. To achieve this, we will investigate the order of transactions on the Algorand blockchain to understand how block proposers order their transactions (as done in [5]). This will be useful to understand how an MEV searcher can prioritize his transaction. We will also monitor the mempool and execute strategies that seek to identify and exploit MEV opportunities, including sandwich attacks, in which we place an order on a DEX and attempt to sandwich our own swap transaction.

To detect profit-generating transaction strategies based on the current blockchain state, we will employ algorithms discussed in [5] and [6] that have been shown to be effective. We will use these algorithms to identify potential arbitrage opportunities and execute trades that seek to capture the MEV associated with them. We are also going to try to find profitable transactions by analyzing the blockchain state (e.g., DEX prices) as done in [6]. To determine the feasibility and potential profitability of MEV opportunities on the Algorand blockchain, we will analyze the results of our strategies and evaluate their effectiveness with respect to opportunity discovery time and algorand block time.

Planned Schedule

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References


