

Mining Revenue Optimization Algorithm of Miners in PoW-based Blockchain Networks

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Abstract

In order to improve the revenues of attack mining pools and miners under block withholding attack, we propose the mining revenue optimization algorithm (MROA) of miners in PoW-based blockchain network. MROA establishes the revenue optimization model of each attack mining pool and revenue optimization model of entire mining attack pools under block withholding attack with the mathematical formulas such as attack mining pool selection, effective computing power, mining cost and revenue. Then MROA solves the model by using the modified artificial bee colony algorithm based on Pareto. Namely, employed bee operations include evaluation value calculation, selection probability calculation, crossover operation, mutation operation and Pareto domination calculation, and can update each food source. The onlooker bee operations include confirmation probability calculation, crowding degree calculation, neighborhood crossover operation, neighborhood mutation operation and Pareto domination calculation, and can find the optimal food source in multidimensional space with smaller distribution density. Scout bee operations delete the local optimal food source which cannot produce new food sources to ensure the diversity of solutions. The simulation results show that no matter how the number of attack mining pools and the number of miners change, MROA can find a reasonable miner work plan for each attack mining pool, which improves minimum revenue, average revenue and the evaluation value of optimal solution, and reduces the spacing value and variance of revenue solution set. MROA outperforms the state-of-arts such as ABC, NSGA2 and MOPSO.

Full Text

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Figures

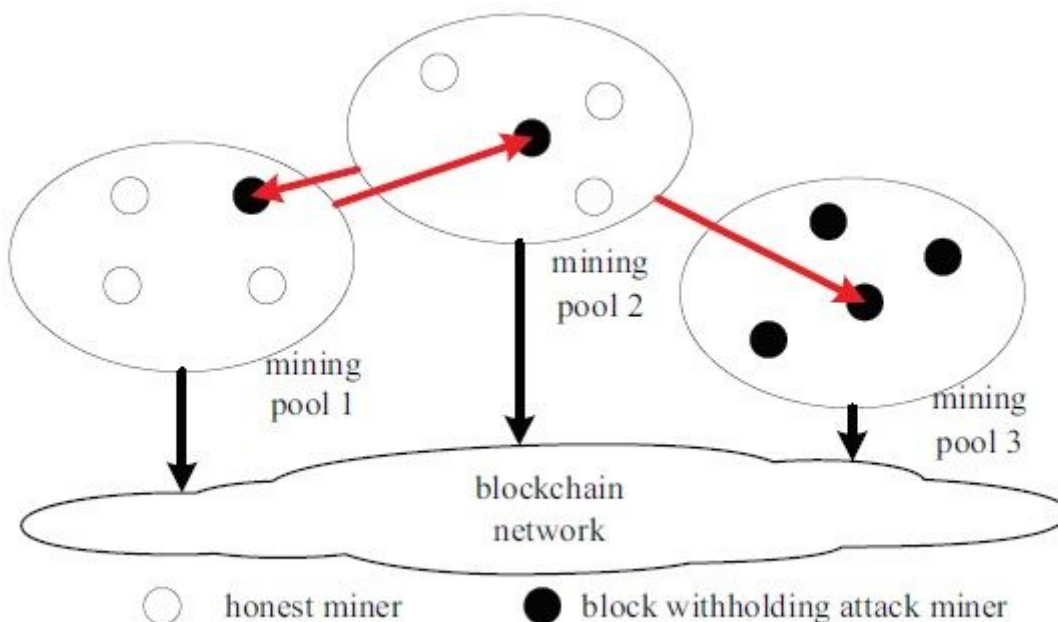


Figure 1

Schematic diagram of block withholding attack.

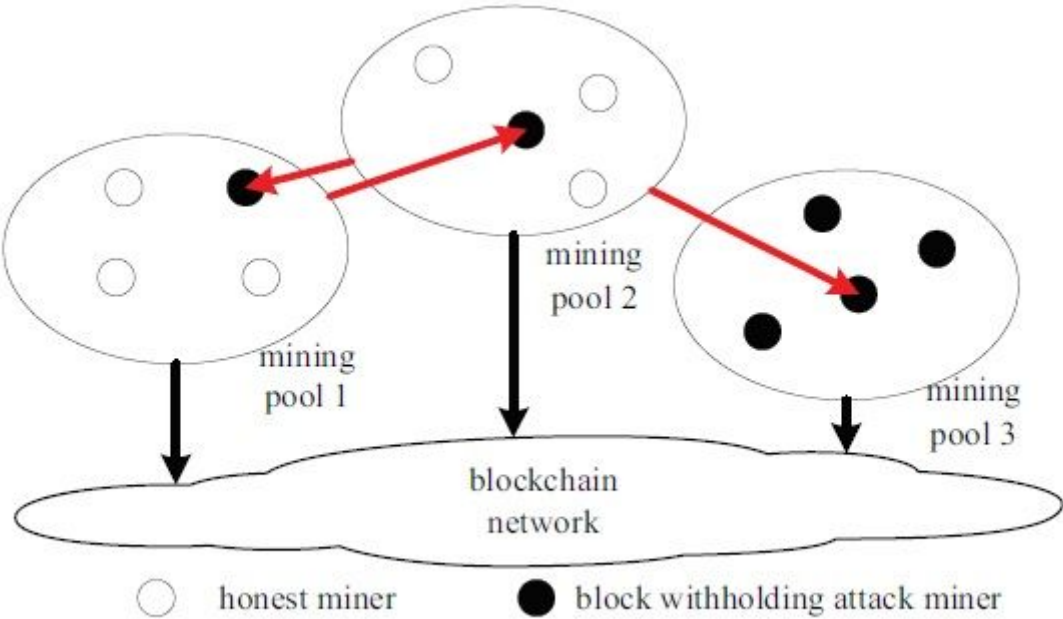


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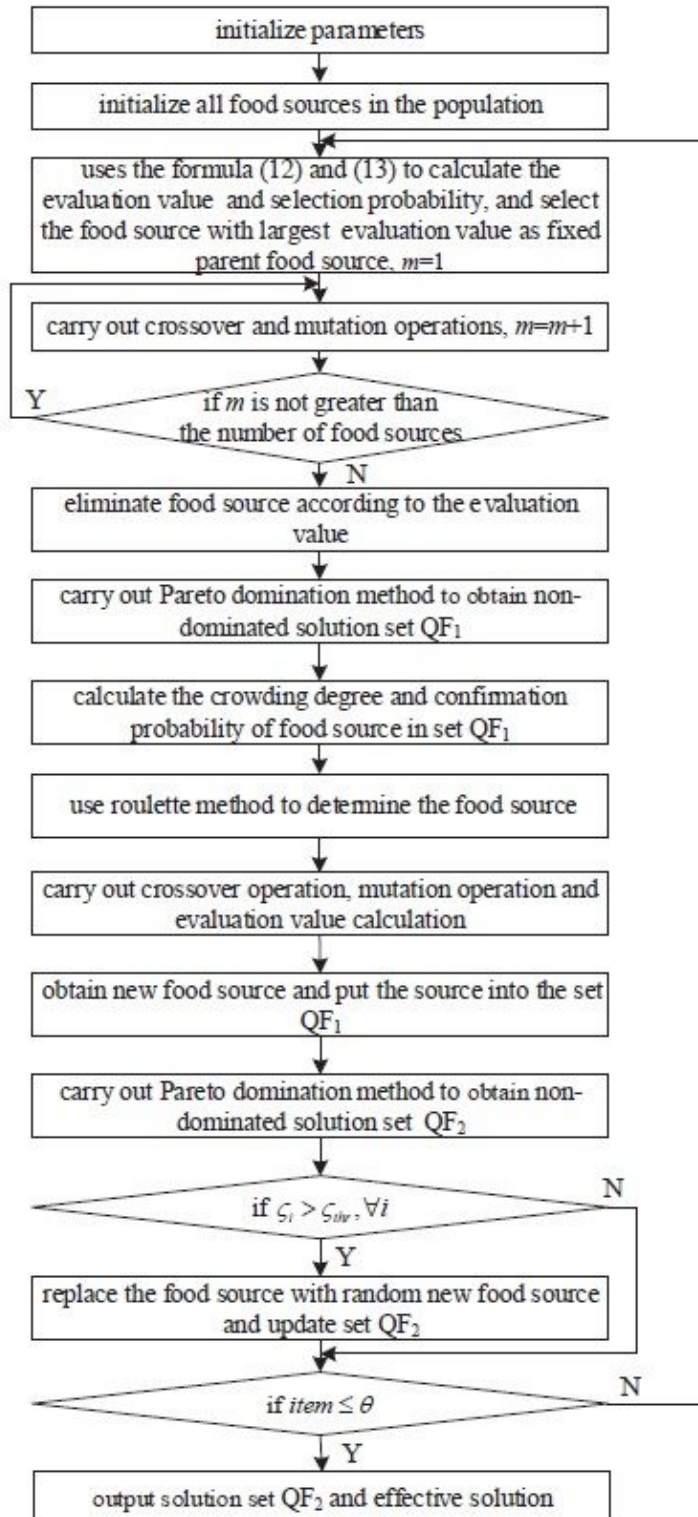


Figure 2

Flow chart of MROA.

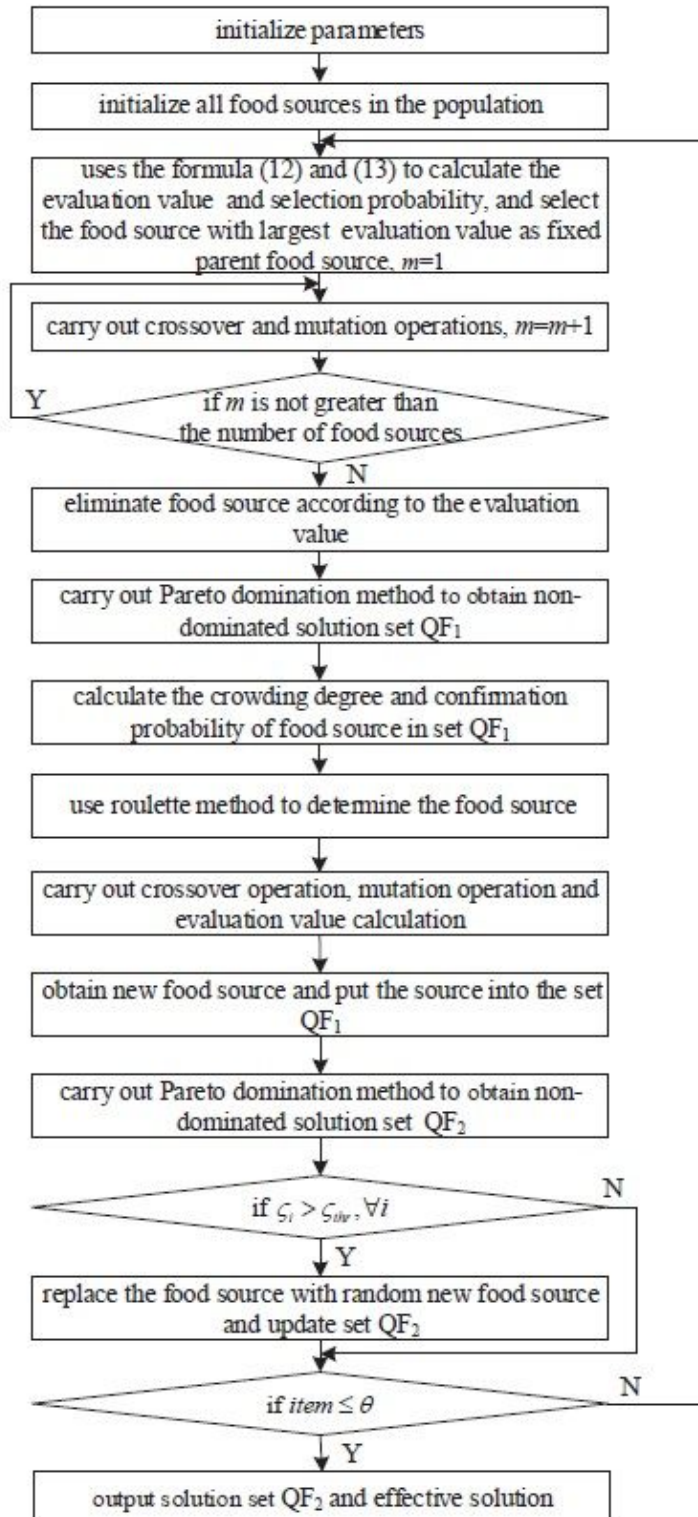


Figure 2

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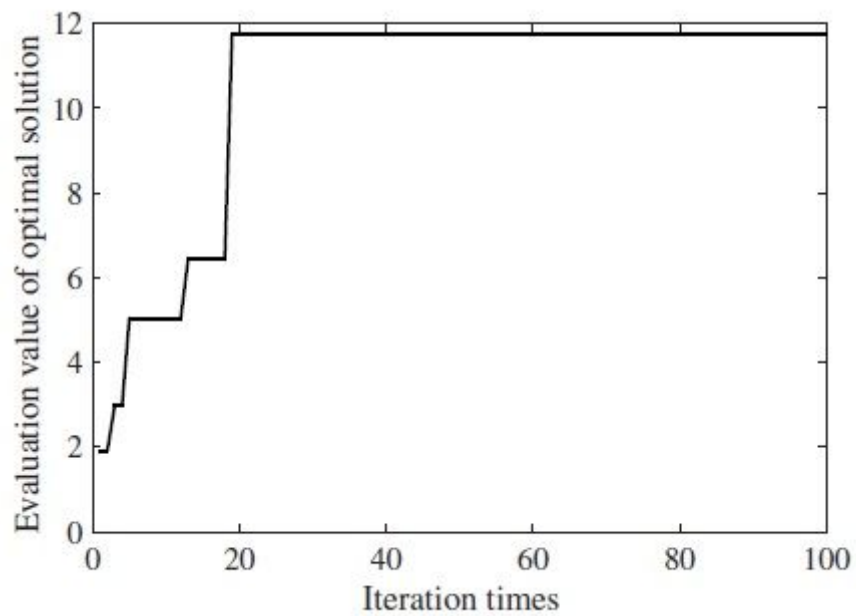


Figure 3

Convergence chart of evaluation value of food source.

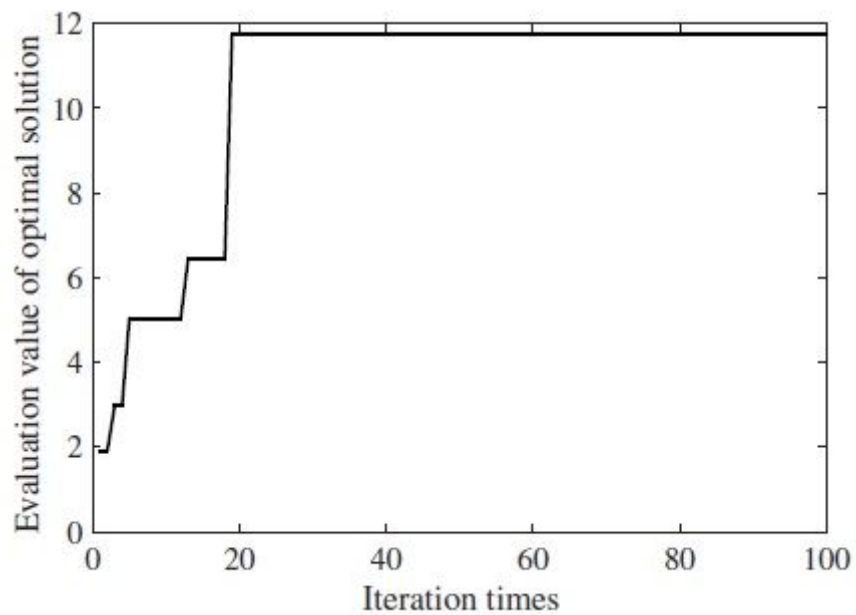


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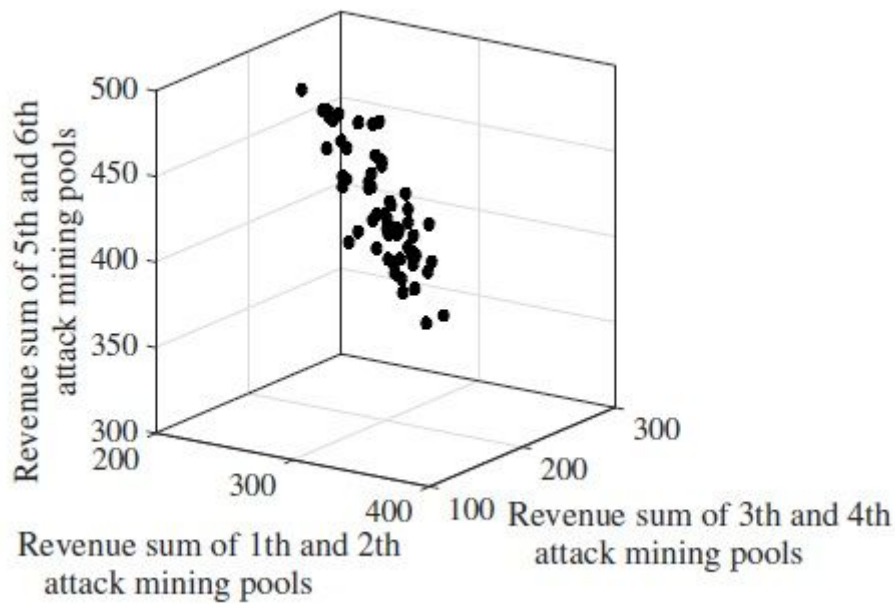


Figure 4

Distribution map of non-dominated solution set in MROA.

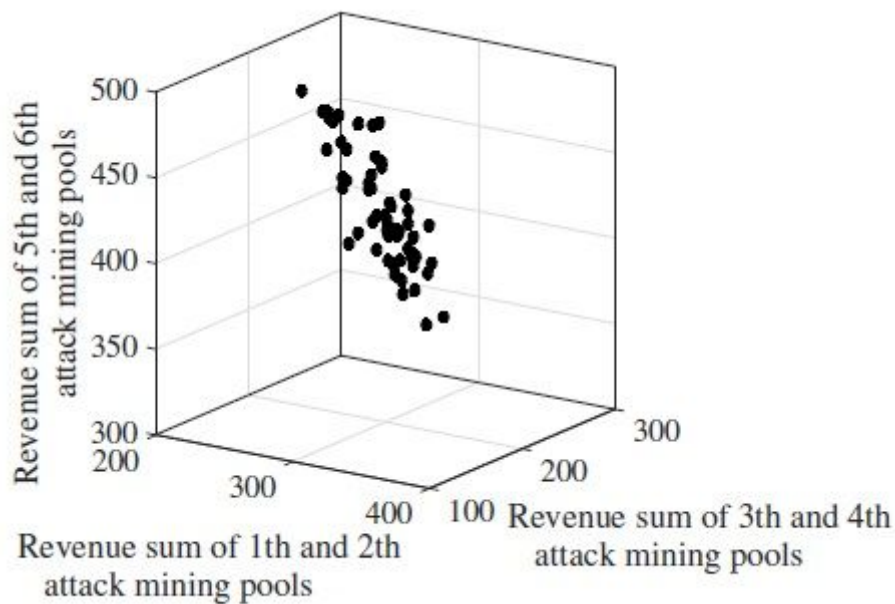


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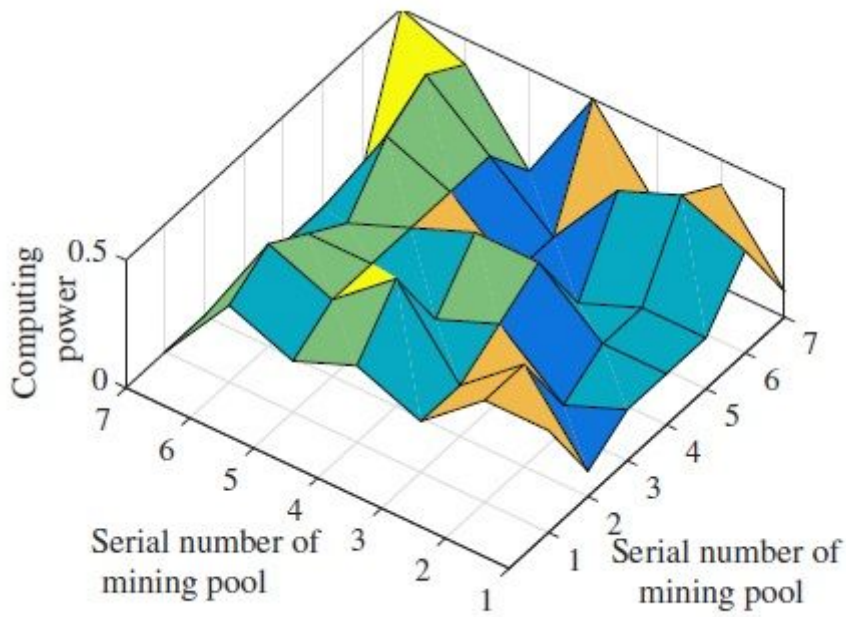


Figure 5

The allocation of computing power of each mining pool in the nal solution in MROA.

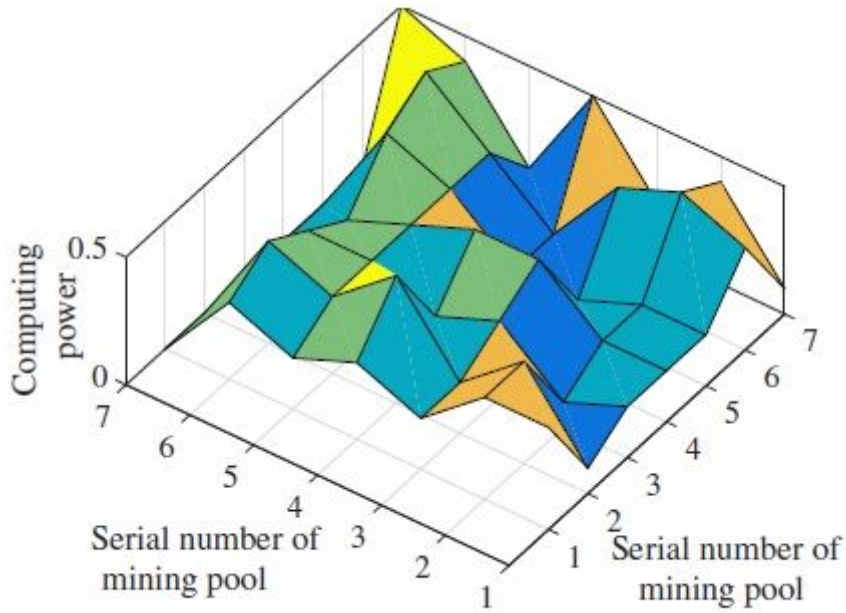


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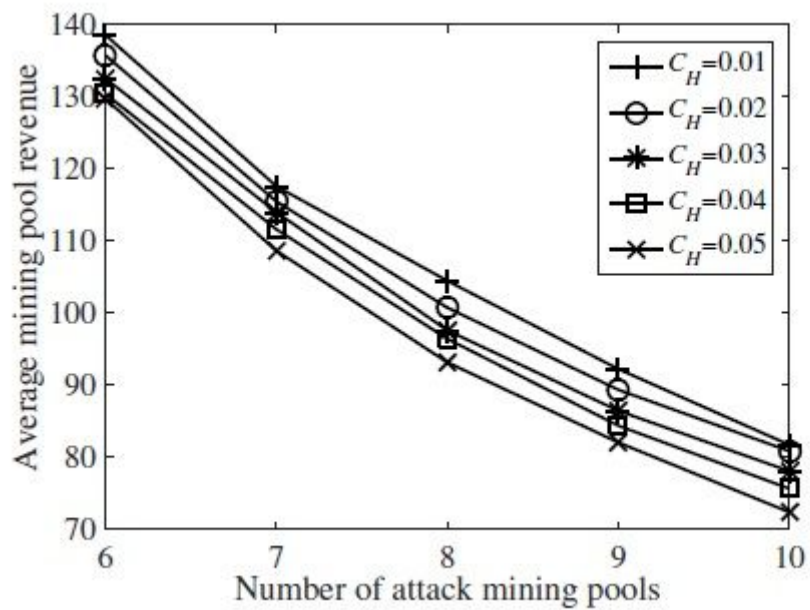


Figure 6

Influence of honest mining cost on the average mining pool revenue.

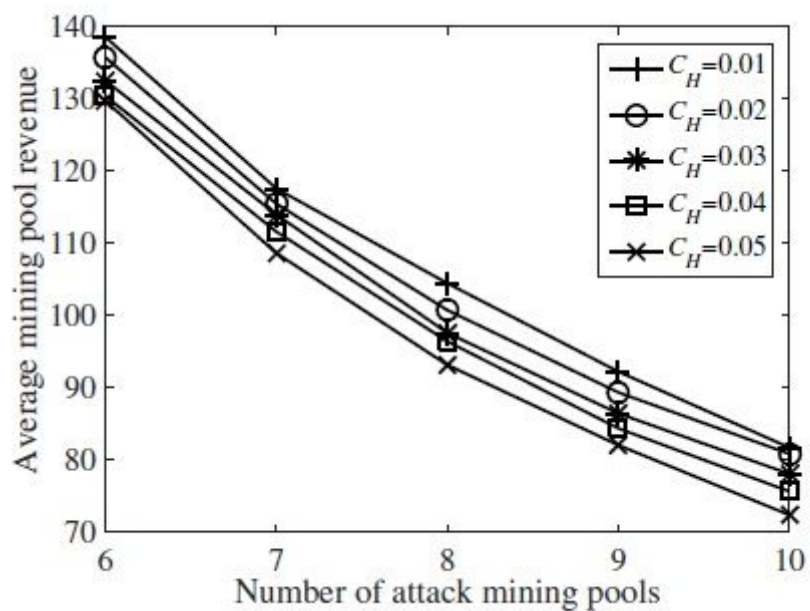


Figure 6

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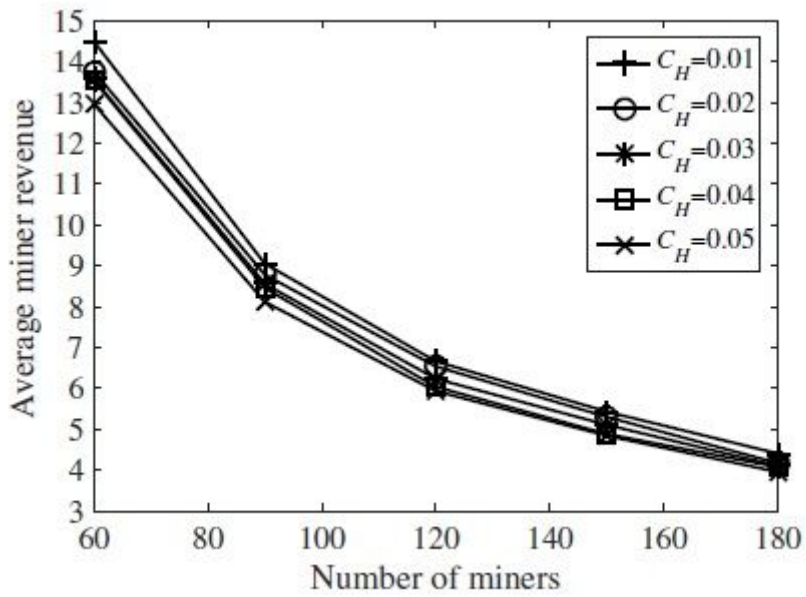


Figure 7

Influence of honest mining cost on the average miner revenue.

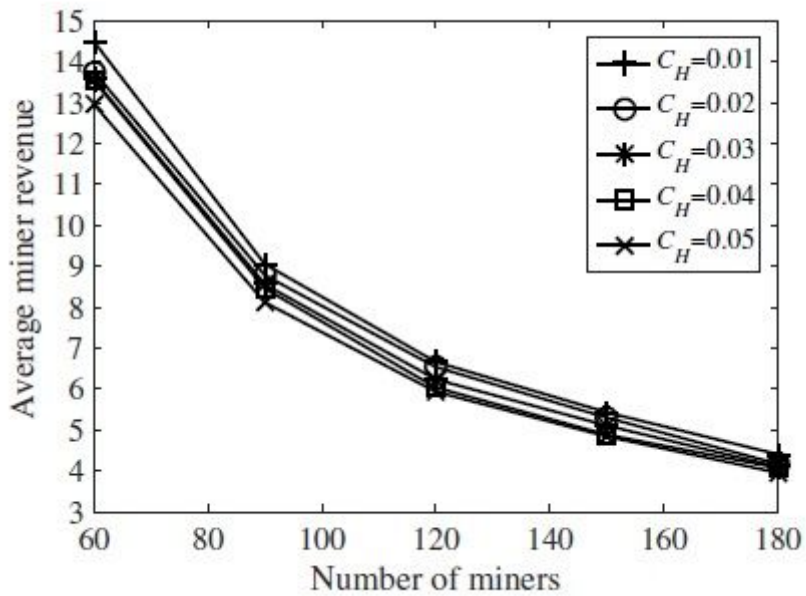


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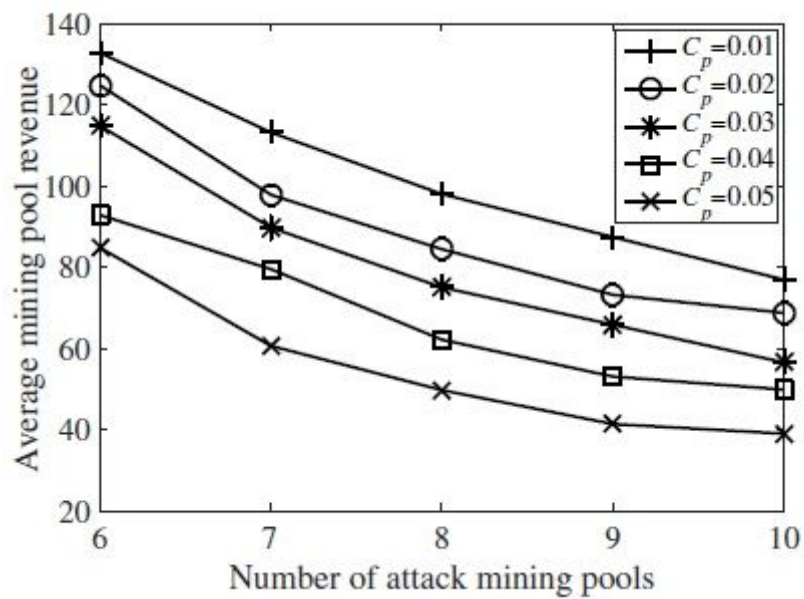


Figure 8

Influence of block withholding attack cost on the average mining pool revenue.

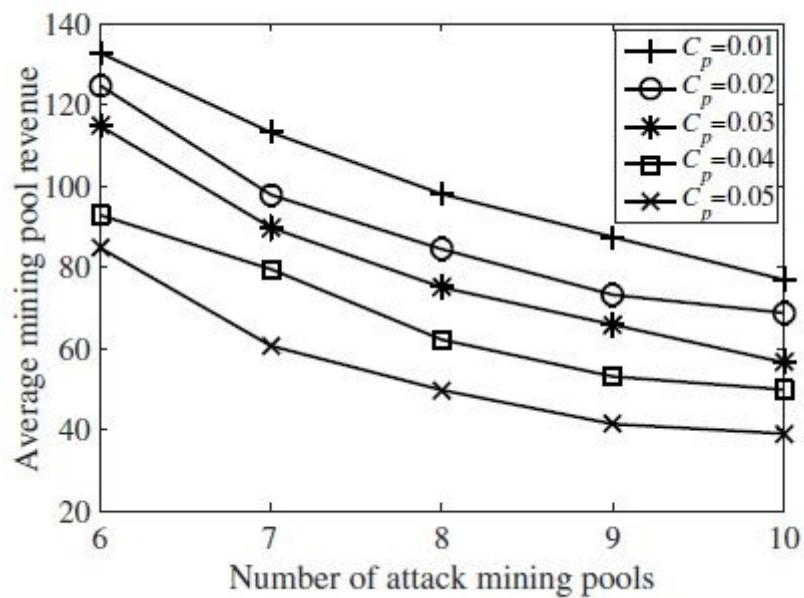


Figure 8

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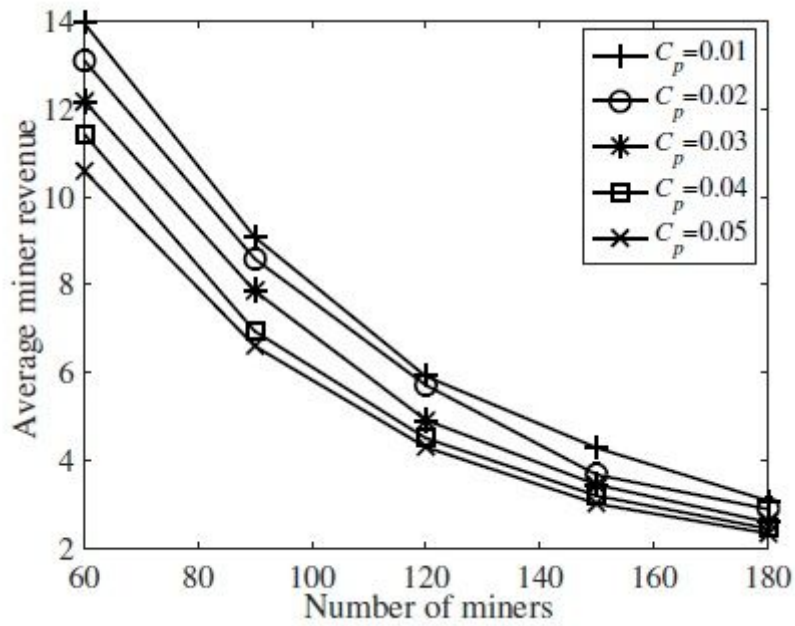


Figure 9

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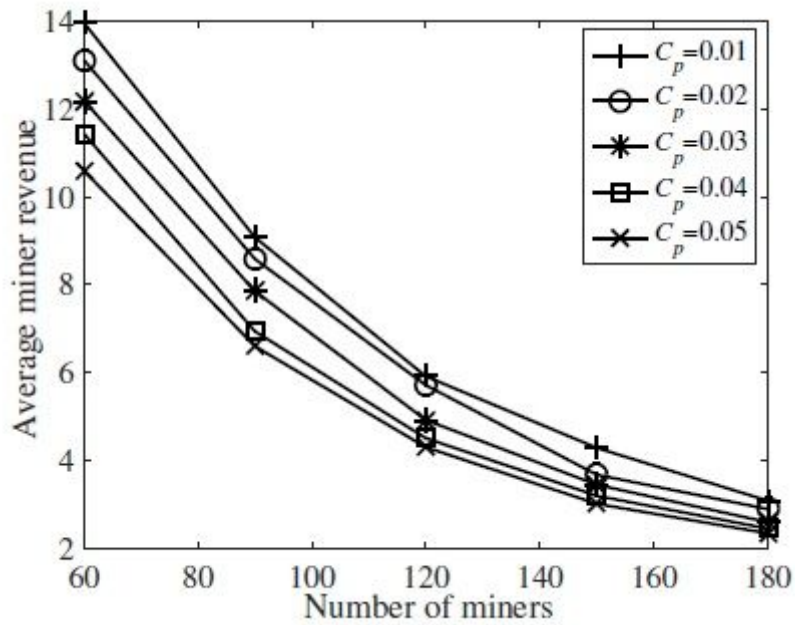


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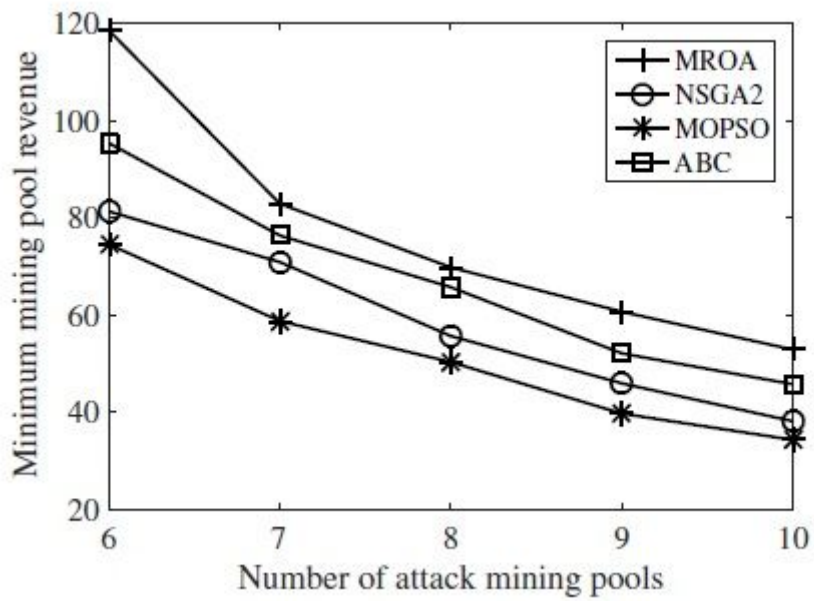


Figure 10

Influence of the number of attack mining pools on the minimum mining pool revenue.

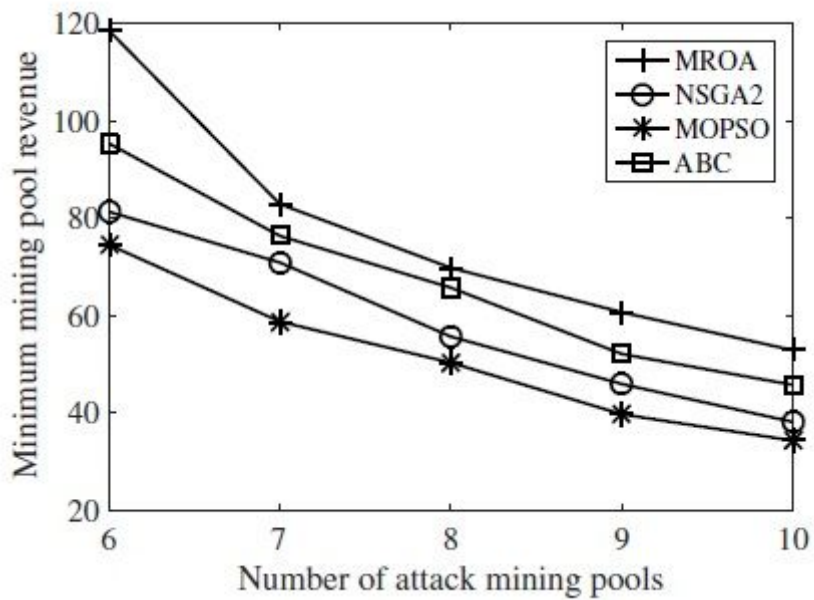


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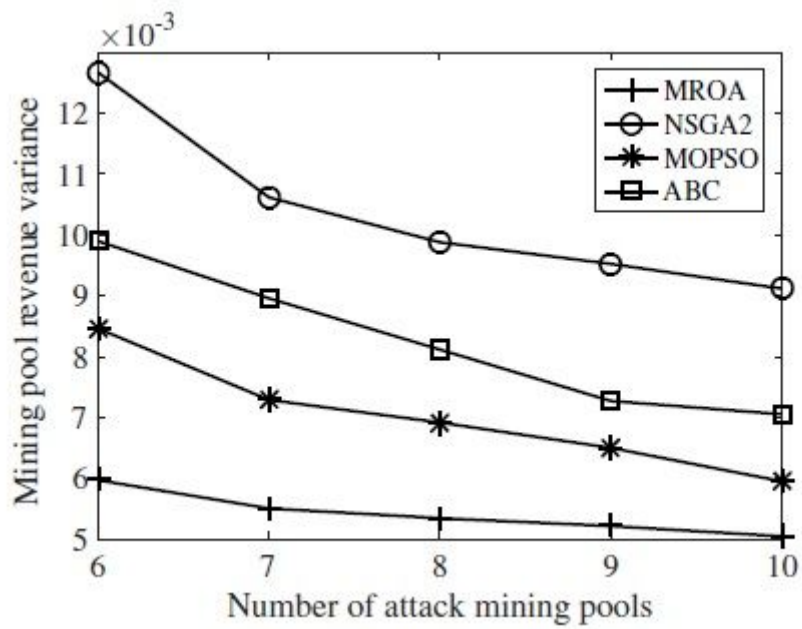


Figure 11

Influence of number of attack mining pools on the mining pool revenue variance.

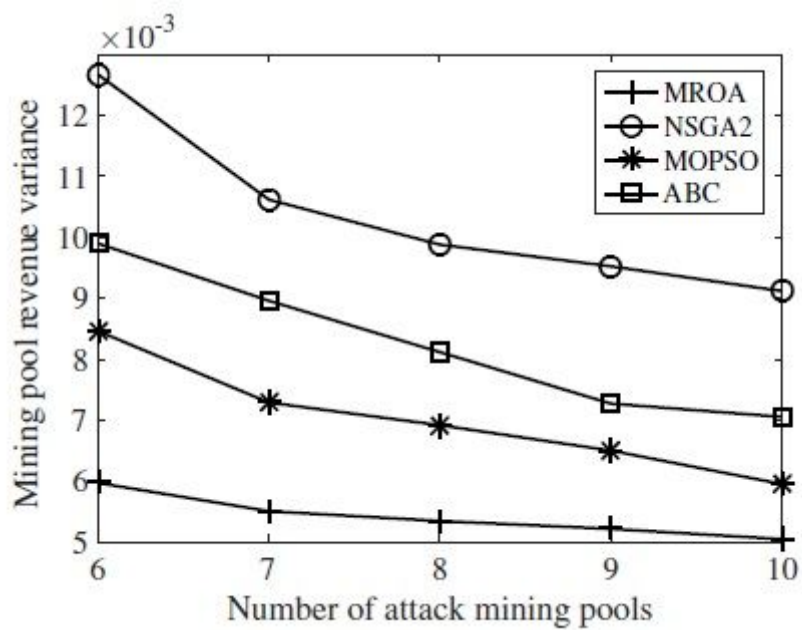


Figure 11

Influence of number of attack mining pools on the mining pool revenue variance.

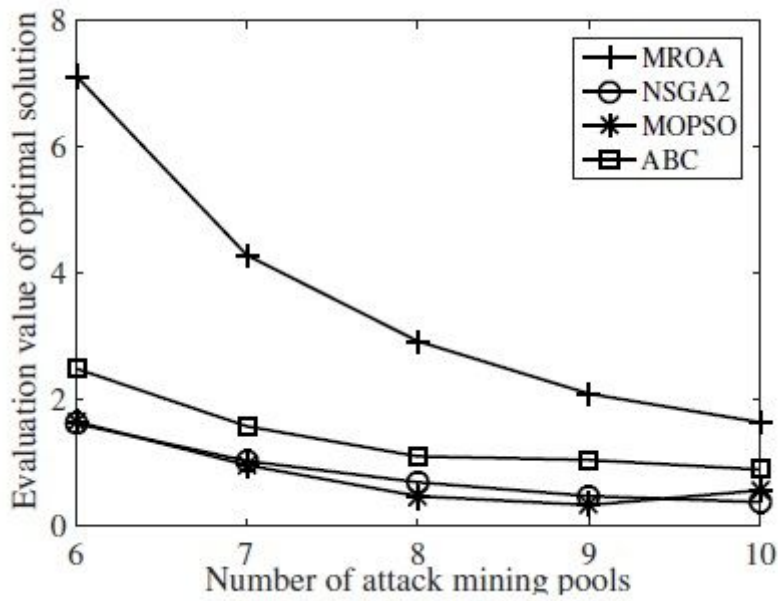


Figure 12

Influence of number of attack mining pools on the evaluation value of optimal solution.

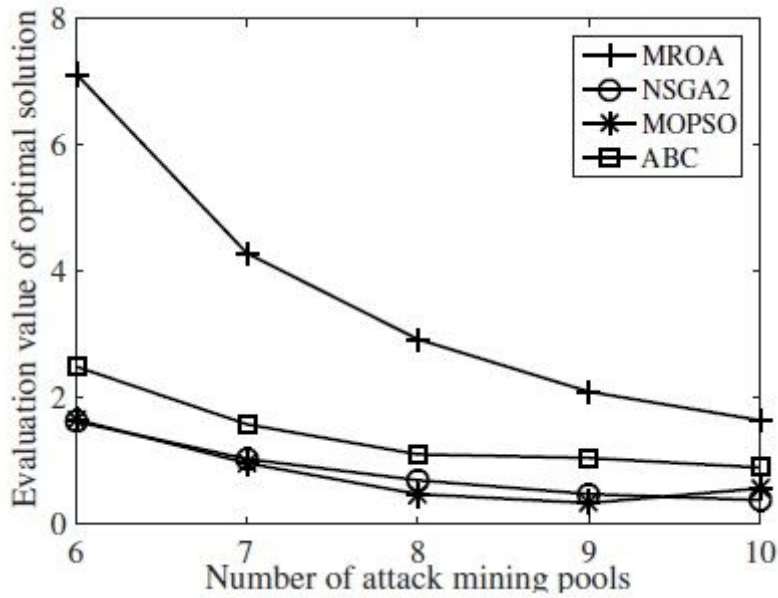


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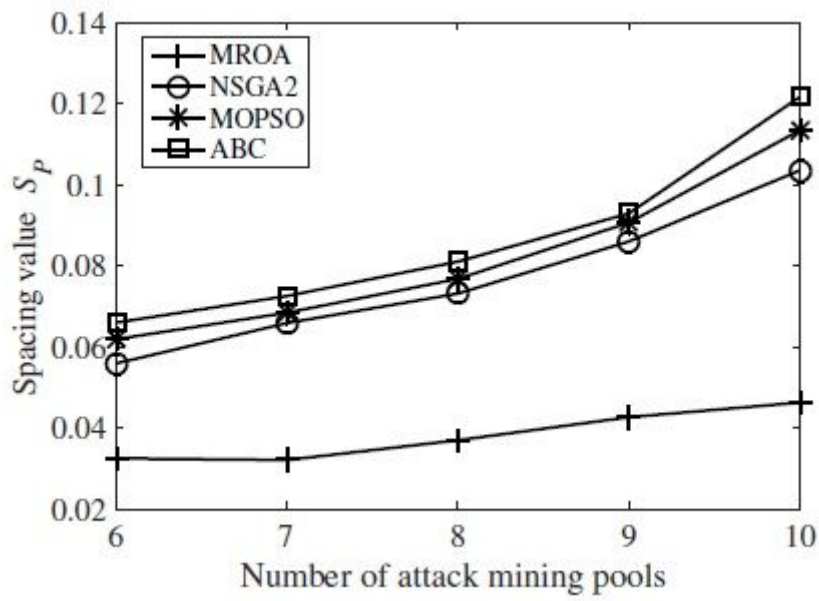


Figure 13

Influence of number of attack mining pools on the spacing value SP .

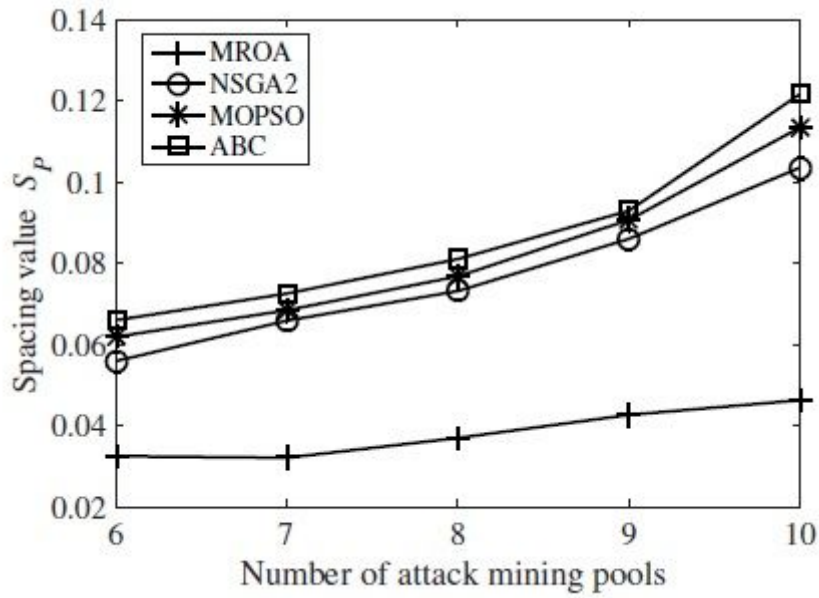


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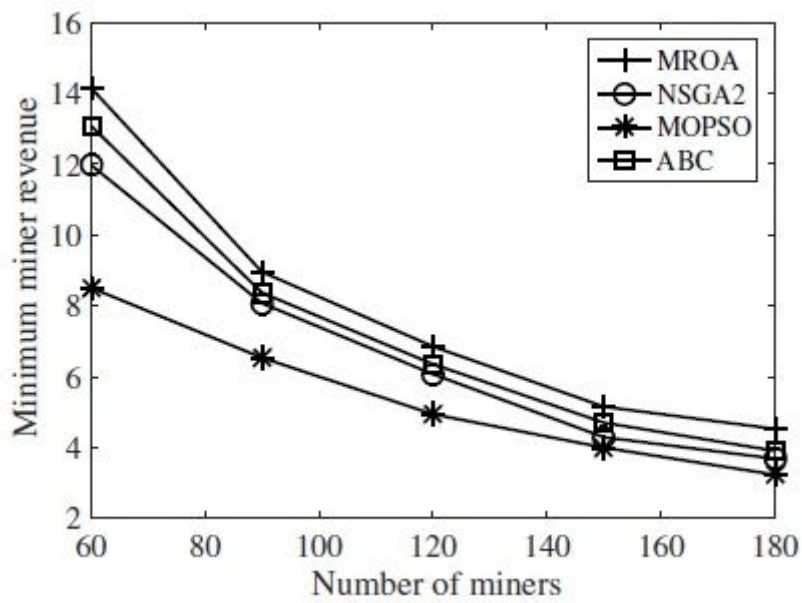


Figure 14

Influence of number of miners on the minimum miner revenue.

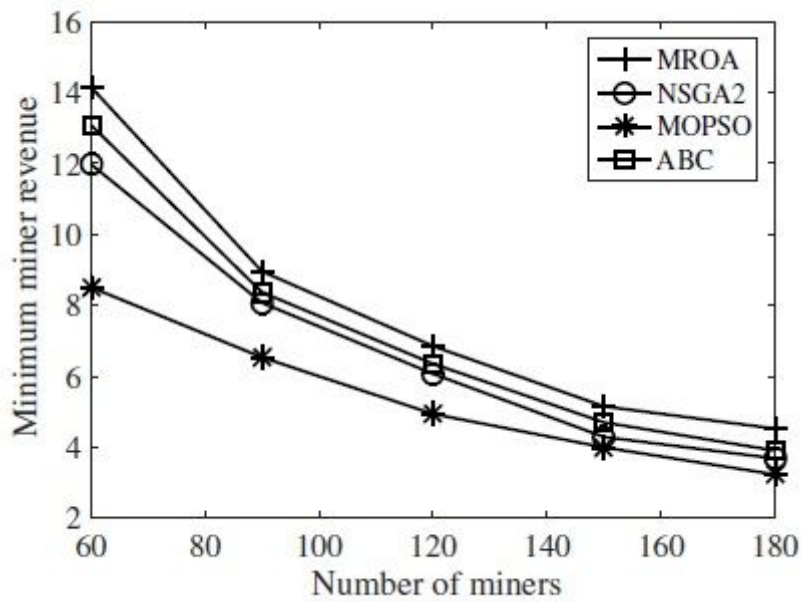


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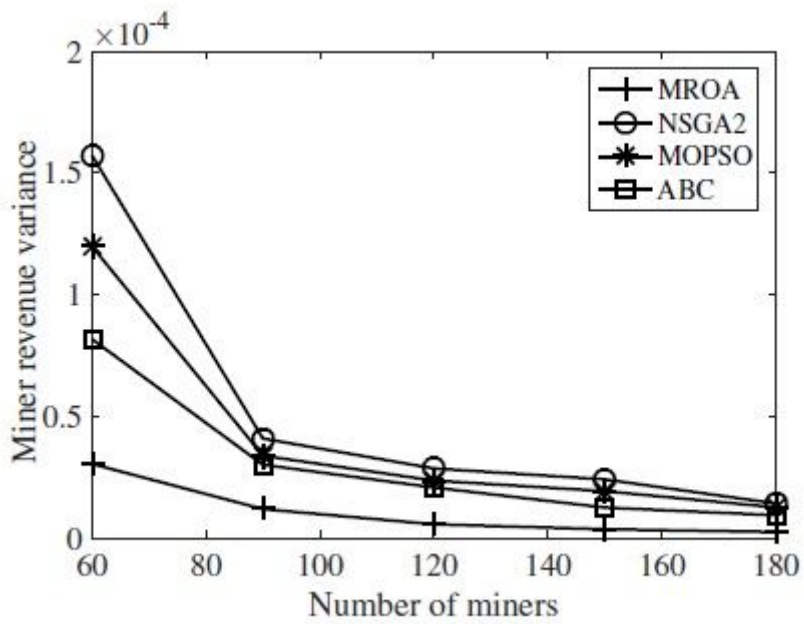


Figure 15

Influence of number of miners on the miner revenue variance.

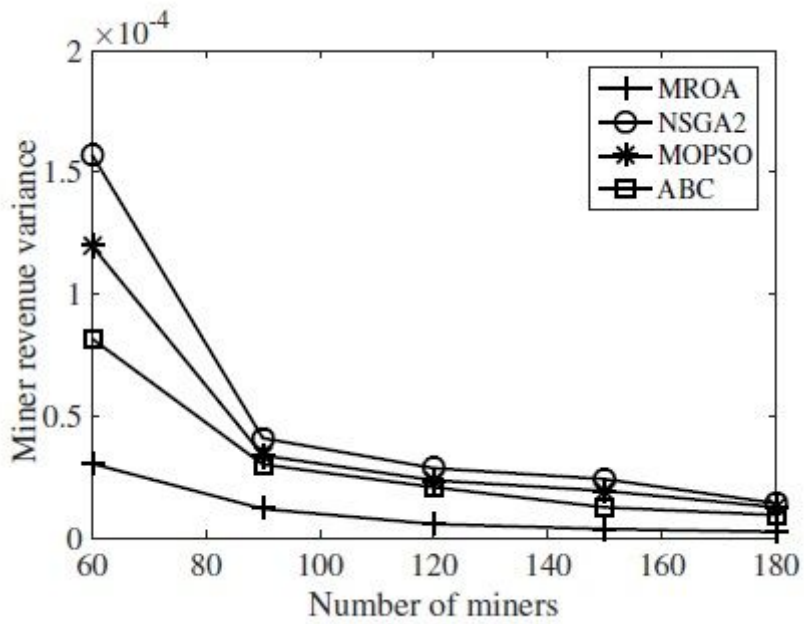


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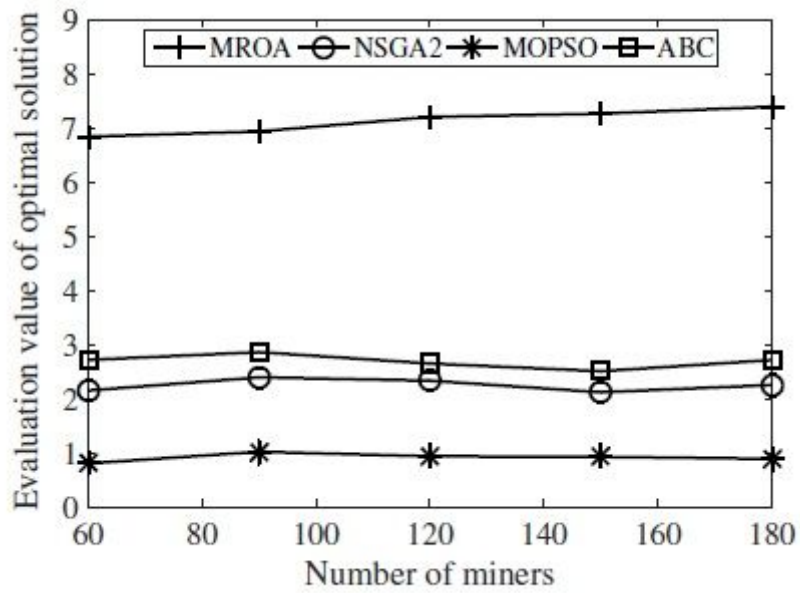


Figure 16

Influence of number of miners on the evaluation value of optimal solution.

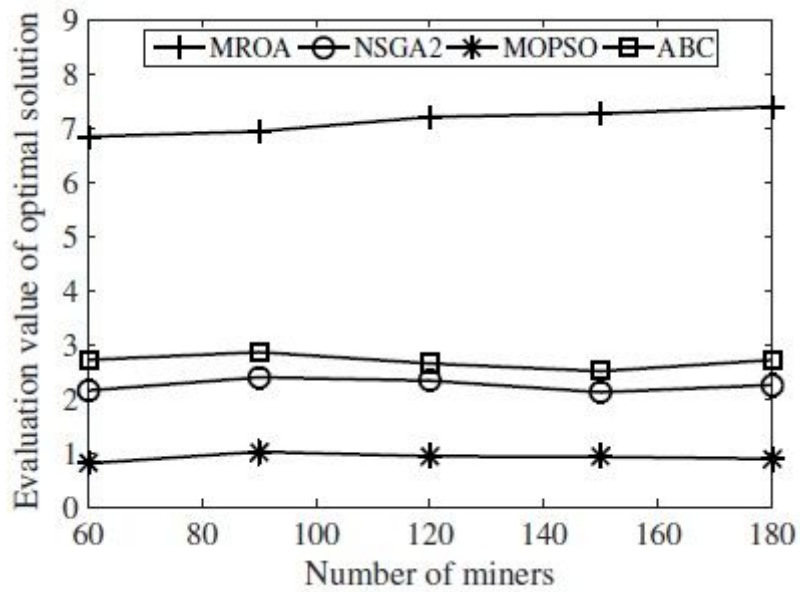


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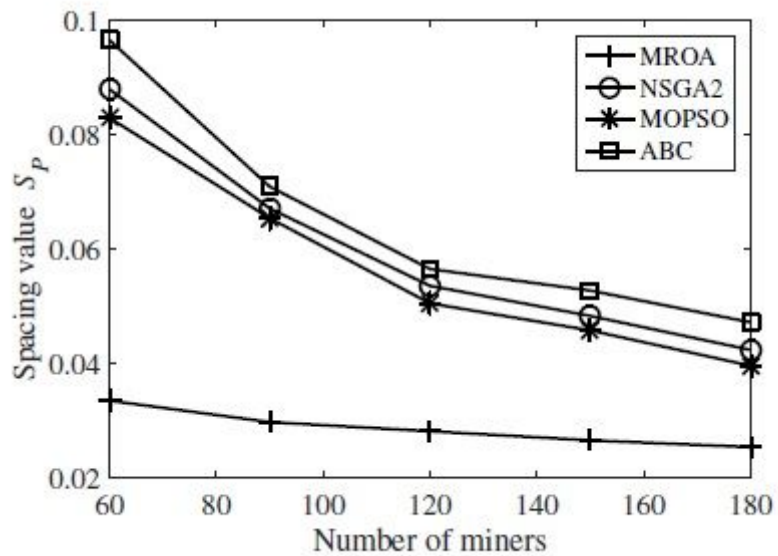


Figure 17

Influence of number of miners on the spacing value S_P .

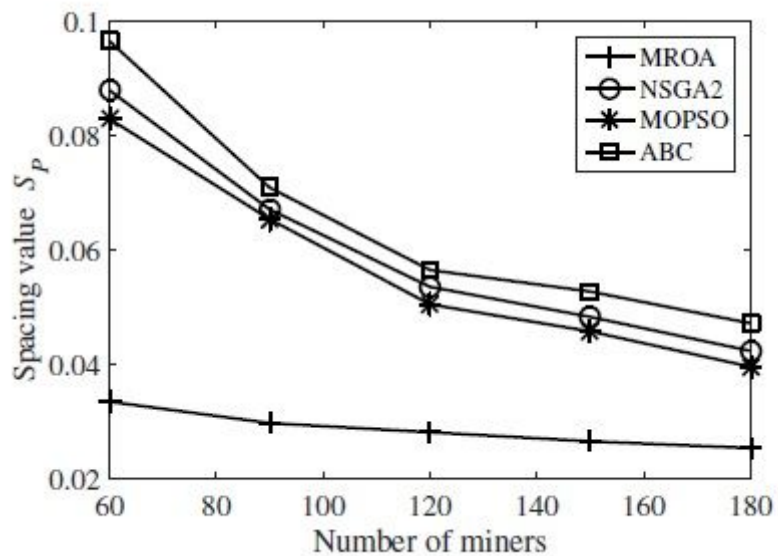


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