darkfi lottery simulation

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Contents

simulate darkfi consensus lottery with a discrete controler

1 discrete pid controller.

control lottery f tunning paramter

$$k_1 = k_p + K_i + K_d$$
$$k_2 = -K_p - 2K_d$$
$$k_3 = K_d$$
$$f[k] = f[k-1] + K_1 e[k] + K_2 e[k-1] + K_3 e[k-2]$$

2 simulation criterion

find K_p, k_i, K_d for highest accuracy running the simulation on N trials, of random number of nodes, starting with random airdrop (that all sum to total network stake), running for random runing_time.
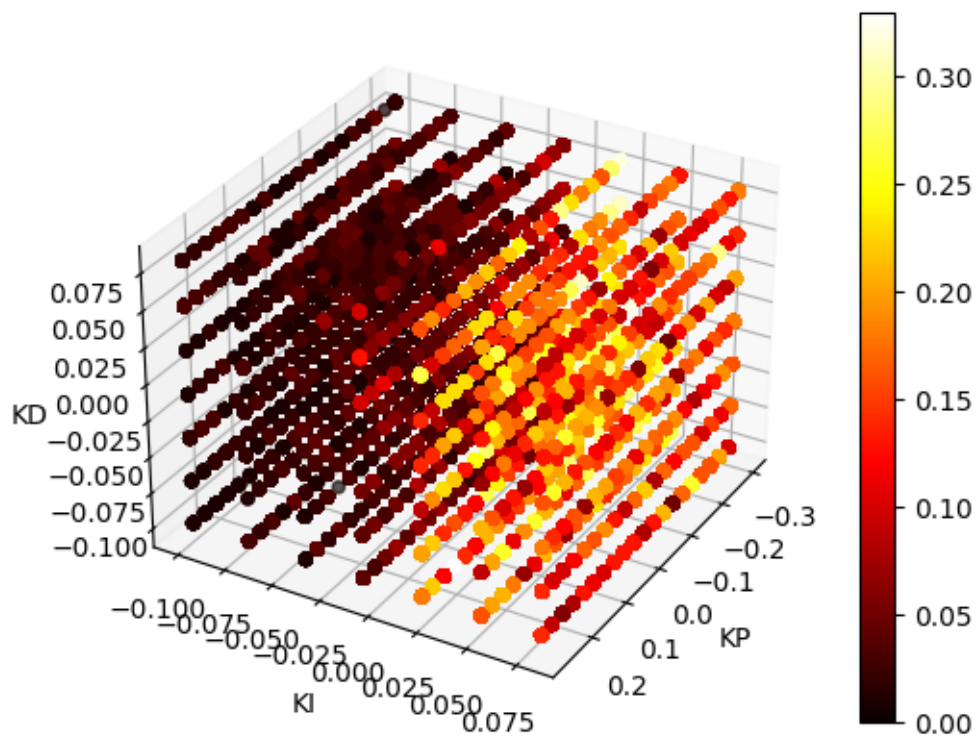
Figure 1: alt text

notice that best parameters are spread out in the search space, picking the highest of which, and running the simulation, running for 600 slots.
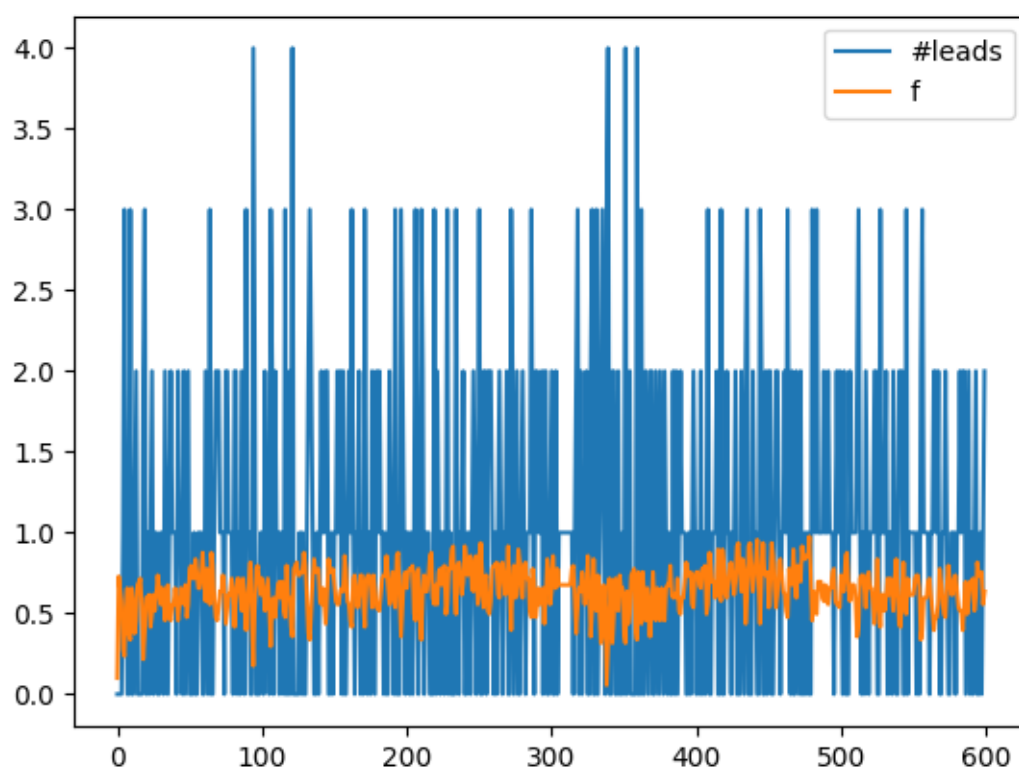
Figure 2: alt text

3 comparing range of target values between

notice below that both y,T in the pallas field, and simulation have same range.
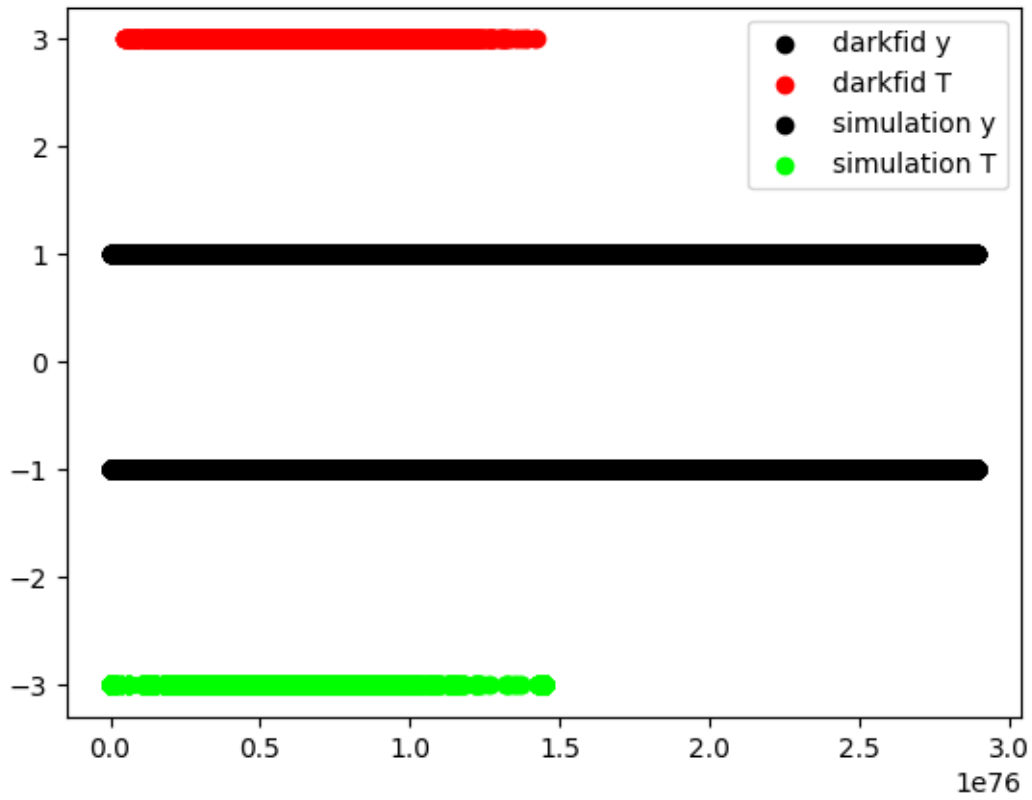
Figure 3: alt text

4   conclusion

using discrete controller the lottery accuracy $> 33\%$ with randomized number of nodes, and randomized relative stake. can be coupled with khonsu[1] to achieve 100% accuracy and instant finality.

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[1]https://github.com/ertosns/thunderbolt