Path Integral Control Theory

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1 Introduction

This work is mainly about the simulated annealing process. There are two parts in total. The first part mainly considered the iterative improvement. For both ferro-magnetic and frustrated situations, we will choose to flip 1, 2 or more spins to make the cost lower than before. The algorithm terminates when no improvement for any state.

2 Problem statement

1. In both ferro-magnetic and frustrated situations, how many restarts are needed for reproducible results?
2. In frustrated situation, investigate the influence of neighbourhood size.

3 Results

3.1 Exercise 1.1

Firstly, we did some experiments in the ferro-magnetic situation with $n = 100$. Firstly, in the situation neighbourhood size is 1, we need 436 restarts to get the minimal energy -2512. When we changed the neighbourhood size to 2, it just need 207 restarts. Finally, we tried with neighbourhood size 3, it just need 138 restarts to get the minimal energy.
Then, we did some experiments in the frustrated situation with $n = 100$. When neighbourhood size is 1, we did 1000000 restarts found minimal energy is -602. Then we did with neighbourhood size 2, and found minimal energy is -736 with 1000000 restarts. So for the frustrated situation, it is not easy to convergence. Especially with less neighbourhood size.

3.2 Exercise 1.2

In frustrated situation, it is not easy to get the minimal energy. We firstly did experiments with restart number 100000, it will take on average 10 seconds. The minimal energy is more or less -736, but we got it ranges from -736 to -586 in 5 times experiments.
Then we changes the restart number to 1000000. It costed 95 seconds, and got results ranged from -704 to -644 . It ranges less, but also didn't yield nice results.

4 Discussion

5 Conclusion

6 Appendix