Exploring Parallel MCTS on Chess Game

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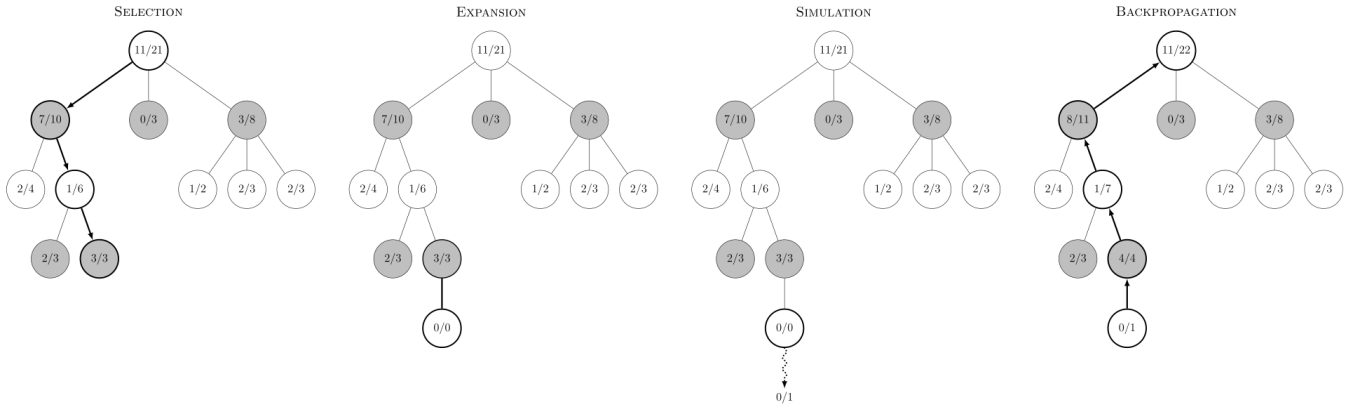

Figure 1: Illustration of a single step of MCTS

ABSTRACT

A project proposal for the course 'Parallel Programming Fall 2021'. We decided to explore the parallelization of MCTS using the techniques and knowledge we have learned in this course.

KEYWORDS

MCTS, parallel programming, Pthreads, CUDA

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1 INTRODUCTION

One of the most famous applications of MCTS is AlphaGO. It uses Monte Carlo tree search with 2 other neural networks to play Go. An early version of AlphaGo was tested on hardware with various numbers of CPUs and GPUs, running in asynchronous or distributed mode. It was tested with search threads from 12 to 64, number of CPUs from 48 to 1920, and number of GPUs from 1 to 280. And in 2016, it changed to use TPUs (tensor processing units) as its computing unit. In recent years, it keeps beating many go players. Overall, MCTS is an algorithm that can be highly parallelized. Hence, we decided to use MCTS as the topic of our final project.

2 STATEMENT OF PROBLEM

3 PROPOSED APPROACHES

4 LANGUAGE SELECTION

5 RELATED WORK

A pretty detailed work[1].

6 EXPECTED RESULTS

7 TIMETABLE

8 ACKNOWLEDGMENTS

Identification of funding sources and other support, and thanks to individuals and groups that assisted in the research and the preparation of the work should be included in an acknowledgment section, which is placed just before the reference section in your document.

9 APPENDICES

REFERENCES

[1] Anji Liu, Yitao Liang, Ji Liu, Guy Van den Broeck, and Jianshu Chen. 2020. On Effective Parallelization of Monte Carlo Tree Search. arXiv:2006.08785 [cs.LG]

A ONLINE RESOURCES

(1) Monte Carlo tree search (https://en.wikipedia.org/wiki/Monte_Carlo_tree_search)

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