THE 9TH GAME PROGRAMMING WORKSHOP IN JAPAN 2004
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Introduction

From November 12th to 14th the Japanese Game Programming Workshop was held for the 9th time. It is the biggest workshop on board games in Japan with a total of 59 participants from all over the country. It is also tradition to have at least one distinguished guest from overseas and this time Martin Müller and Akihiro Kishimoto from the University of Alberta were the invited speakers.

Other than the invited talks, there were 18 presentations in 7 sessions over three days. There also was a poster session with 11 posters. The majority of the presentations were about shogi (10 presentations), followed by Go (2), Bridge (2), Hex (1), BAO (1), Sokoban (1) and one general talk about the automatic generation of game programs. The overwhelming number of shogi papers could be viewed as a disappointment, as this workshop is a games workshop and not a shogi workshop. However, I think it is more an indication of the exciting times in shogi research, with professional level play just beyond the horizon. Here are small outlines of the presentations:

Session 1: Shogi (1)

For mating solvers in shogi, the Graph History Interaction problem is important when proving that a position is not mate. *Akihiro Kishimoto* from the University of Alberta presented a method to solve the GHI problem that used extra hash table entries based on the moves to the current position and the search depth. This method does not require much extra overhead when proving that a position is mate and can solve most of the difficult cases in which there is no mate.

Akihiko Sano from Shizuoka University proposed an improvement to the problem of searching for mate in too many nodes of the search tree in shogi endgames, thus slowing down the search too much. His method uses bit patterns and an evaluation of king danger to find mates of one move at every point in the search tree. Preliminary results show that this might lead to a significant improvement of search speed in shogi endgames.

Tomoyuki Kaneko from the University of Tokyo presented a new way to use an evaluation function to initialize proof and disproof numbers in proof-number search. First piece patterns from game scores are collected, then a small proof number search is run and the results are used for new positions. This method decreases the number of nodes needed to find mate, but still slows down the search too much.

Invited talk 1: Go-related Research at the University of Alberta

Martin Müller gave an overview of the work on Go at Alberta. Current efforts are focusing on playing endgames perfectly. Territory, temperature discovery and sum games are used to find optimal moves. There has been steady progress but there are still problems with using the methods in realistic cases and it is also unclear how to combine the different methods.

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Session 2: Go

In earlier work, *Tajima Morihiko* from the National Institute of Advanced Industrial Science and Technology has proposed possible omission numbers for the evaluation of opening positions in Go. However, the evaluation of larger frameworks (*moyo*) is needed for full evaluation of positions. As a first step to evaluating these frameworks, Tajima presented an algorithm to determine the inner areas of moyo.

Combinatorial game theory has been mainly used in the endgame of Go. *Teigo Nakamura* from the Kyushu Institute of Technology presented a method to use combinatorial game theory for simple capturing races. The analysis focuses on capturing races where loops (*ko*) are involved.

Session 3: Shogi (2)

Reijer Grimbergen from Yamagata University presented a new test set for shogi. Acknowledging the importance of test sets in other games and the shortcomings of current test sets used in shogi, this test set focuses on the problem areas of strong shogi programs. The test set consists of 100 positions that none of the three strongest shogi programs could solve.

Shogo Takeuchi from the University of Tokyo presented a method to decide when to invoke the *tsume solver* (mate searcher) during normal alpha-beta search. The aim of the method is to judge whether or not a move is a mating threat without doing any additional search. Properties of the move and the position are used to calculate a confidence value of the move being a threatmate. When this confidence value exceeds a certain threshold, the move is considered a threatmate and the tsume solver is invoked.

Takeshi Ito from the University of Electro-Communications had a presentation on his shogi program HIT. The aim of this program is to model the way humans play games. Instead of search, it currently only uses shogi knowledge to decide upon its next move. Even though still weak, it has shown that it can play a reasonable game of shogi.

Session 4: Bridge

Takashi Murakami of the Tokyo University of Technology had a presentation about the design and implementation of a Bridge teaching program. This program can be used to practice bidding, practice making contracts, but it is also possible to practice defense and teach deceptive play. The opponents have reasoning abilities to avoid bad play in losing situations.

Tomohito Otawa, also from the Tokyo University of Technology aims at making a strong bridge program. His program particularly focuses on deceptive play, which can not be handled well in current bridge programs. Instead of using Monte Carlo simulations of double dummy hands, the idea is to simulate the viewpoints of all three players (the cards the three players can see combined with their goals), and then making a search tree using three different evaluation functions.

Invited talk 2: Search Techniques for the One-Eye and Tsume-Go problems

In the second invited talk, *Akihiro Kishimoto* from the University of Alberta presented a method using search and almost no knowledge to solve one-eye and two-eye tsumego problems better than GoTools. The method is using df-pn search with extensions like simulation (a method to re-use similar solutions that was developed for shogi mating solvers).

Session 5: Others

Kohei Noshita of the University of Electro-Communications presented the new notion of union-connection to get a simple way of winning in 7x7 Hex that is easy to verify and can also be used for a new proof for 8x8 Hex.

Takenobu Takizawa from Waseda University presented data comparing different versions of the accelerated Swiss tournament system. This system has been used in the computer shogi world championship and the pairings have met with criticism in the past. Simulations show that the version used in the 2004 world championship deals better with the points of criticism than the systems used in 2002 and 2003.

Session 6: Shogi (3)

Jun Nagashima from Shizuoka University presented a method for automatic opening book tuning in shogi by self-play experiments. The aim of the method is to avoid selection of a position from a large opening book that is objectively at least even, but that the program does not understand well. The method selects random positions from the opening and use self-play to tune a priority weight that decides the probability with which a position will be selected during the opening phase of actual games. This method resulted in a significant improvement of the TACOS shogi program.

Ryuichi Ochiai from the Tokyo Institute of Technology presented a method that uses a probabilistic shogi player model (written in PRISM) to decide if a certain game is played by a strong or a weak shogi player.

Makoto Miwa from the University of Tokyo had the third talk about how to improve the problem of the overhead caused by calling the mating search in the search tree too often. This method uses 129 features of a positions, which become vectors elements, and then uses the SVM (Support Vector Machine) to decide if there is a possible mate in a position. This is much faster and almost as accurate as actually calling the mating search with a limited number of nodes. Because of the speed of this method makes, it seems the most promising of the three methods presented at this workshop.

Session 7: Games and Puzzles

Yasuhiro Inahata from the Kansei Gakuin University presented a method called SPIN to detect cycles in the game of BAO. With this method the characteristics of these cycles can also be described.

Masaru Odawara from the University of Tokyo presented a new method for detecting deadlock situations in Sokoban. It uses partial maps combined with local and global search to detect local and global deadlock situations.

Akira Suzuki from the Tokyo University of Agriculture and Technology is doing research into the automatic generation of game programs. As a first step in automatically generating the game tree, a method generating decision trees using the PIPE algorithm (a distribution estimation algorithm used for genetic algorithms) with conditional probabilities was presented.

Conclusion

The Game Programming Workshop is an event I am looking forward to every year. It is very well organized (thanks to Hitoshi Matsubara and Takeshi Ito) and the evening events (a traditional party on the second day and a small computer shogi tournament) provide the perfect environment for exchanging ideas. Next year will be the 10th anniversary of GPW and although there do not seem to be any plans for special celebrations, I am sure that it will be at least as informative and entertaining as this year.