# NEWS, INFORMATION, TOURNAMENTS AND REPORTS

## NATURAL DEVELOPMENTS IN GAME RESEARCH

### From CHESS to SHOGI to GO

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ABSTRACT

In game-programming research there are four interesting and related domains CHESS, XIANG QI (Chinese chess), SHOGI (Japanese chess) and GO In this article we compare CHESS with SHOGI by rules and by computational aspects We will see that CHESS and SHOGI are mostly very similar, but that there are some important differences which complicate SHOGI programming The most important difference is the game-tree complexity, which is considerably higher than the game-tree complexity of CHESS

We will then argue that the similarities and differences make SHOGI a good choice for advanced research in game programming In the near future CHESS will no longer be competitively interesting Since XIANG QI has a game-tree complexity similar to CHESS, the same AI techniques will also be successful in this domain, and, as a consequence, this game will also no longer be interesting GO is too risky as a next research target because little is known about the cognitive aspects of the game, which in our view hold the key to developing new techniques
A short history of computer Shogi with the results of the latest CSA computer Shogi tournament is given Conclusions are provided in Section 5 In the appendix, a short introduction to the rules of the game is included

## 1. INTRODUCTION

Considering the state of the art in game-programming research, we feel that there are four interesting and related research domains CHESS, XIANG QI (Chinese chess), SHOGI (Japanese chess) and GO Interesting can be defined here as competitively challenging, i e , not yet playing at world championship level This excludes games such as CHECKERS, DRAUGHTS and BACKGAMMON The four games mentioned are related in the sense that they are chess-type games For GO this might be disputable (see Section 3), but we hope to clarify why GO has been included in our list The relatedness chosen excludes other interesting games such as BRIDGE, RENJU and MANCALA type of games

CHESS, XIANG QI, SHOGI and GO are all complex games In this article we use three types of complexity state-space complexity, game-tree complexity, and decision complexity

**State-space complexity**

State-space complexity is defined as the number of legal game positions reachable from the initial position of the game (Allis, 1994) An upper bound to state-space complexity is obtained by noting that symmetrically equivalent positions are counted only once Below we see that the computation of the exact state-space complexity of these four games is hardly feasible An upper bound to the state-space complexity for each game has been estimated as

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- CHESS It has been recognized as $10^{43}$ by various authors (Schaeffer *et al* , 1991), while Allis (1994) stated as being close to $10^{50}$
- XIANG QI $10^{48}$ (Allis, 1994)
- SHOGI $10^{71}$ (Ohtsuki, 1995)
- GO $3^{361} \approx 10^{172}$

**Game-tree complexity**

Game-tree complexity is defined as the search space to be expected in a game, based on the average branching factor and average game length in ply For each game the game-tree complexity has been estimated as

- CHESS $10^{123}$, based on a branching factor of 35 (cf Hartmann, 1989) and an average game length of 80 ply
- XIANG QI $10^{150}$ (Tsao, Li, and Hsu, 1991), based on a branching factor of 38 and an average game length of 95 ply
- SHOGI $10^{226}$, based on a branching factor of 80 (Matsubara and Handa, 1994) and an average game length of 115 ply (Japanese Shogi Association, 1994)
- GO $10^{360}$ (Allis, 1994), based on a branching factor of 250 and an average game length of 150 ply

**Decision complexity**

Decision complexity is defined as the problem's complexity to find the optimal move in a given position It is easy to fabricate an artificial example of a game with high state-space and game-tree complexity, but with a low decision complexity An example for GO can be found in Allis, Van den Herik, and Herschberg (1991) Of course, it is difficult to measure quantitatively the decision complexity The fact that all four games are being played on a large scale and that only a small percentage of the players' population can be considered experts (i e , professionals) is in our view sufficient evidence of a high decision complexity For SHOGI, more evidence of decision complexity can be found in Iida and Uiterwijk (1992) Below, we provide, for each game, informal estimates of the players' population and the experts' (grandmasters') population[1]

| | # of players | # of experts |
|---|---|---|
| • CHESS | 100,000,000 | 400 |
| • XIANG QI | 700,000,000 | 100 |
| • SHOGI | 15,000,000 | 200 |
| • GO | 25,000,000 | 700 |

Our main interest is the game of SHOGI (Japanese chess) In Section 2, we describe the similarities and differences between CHESS and SHOGI in detail In Section 3, we explain why SHOGI is a natural target for continuing game-programming research, even more natural than continuing research in CHESS or than putting more effort in XIANG QI or GO In Section 4, we will give a short history of computer Shogi Section 5 contains conclusions

## 2. CHESS AND SHOGI: SIMILARITIES AND DIFFERENCES

In this section we look at the similarities and differences between SHOGI and CHESS, both regarding rules and computational aspects In Appendix A, a short introduction to SHOGI and its rules is given Elaborate introductions to SHOGI have been written by Leggett (1966) and Fairbarn (1984)

[1] The definitions of 'expert' are different among the four games Moreover, the exact number of all players of the games has been estimated So it is difficult to compare the ratios quantitatively

### 2.1 Similarities

1. Both CHESS and SHOGI are two-person perfect-information games. Therefore, in any position all possible moves can be considered and a game-theoretical value can be attached to each position (Allis, 1994).

2. Both games are sudden-death games. The game can end abruptly when the King of either player is captured (checkmate).

3. Most pieces in CHESS and SHOGI are either the same (King, Rook, Bishop) or similar (Pawn, Knight). Only three pieces are different: in SHOGI there are Golden Generals (shortened: gold), Silver Generals (shortened: silver) and Lances.

4. In both games it is possible to draw by repetition of moves. Both in CHESS and SHOGI this way of drawing is not very common.

### 2.2 Differences

In this section we only look at those differences that are important from the game-programming point of view. We therefore do not discuss unimportant details about the shape of the pieces, or that in SHOGI Black plays up the board and is the first player to move instead of White.

#### 2.2.1 Differences in rules

1. CHESS has an $8 \times 8$ board, while SHOGI has a $9 \times 9$ board.

2. In CHESS there are 6 different pieces, in SHOGI there are 8 different kinds of pieces. In CHESS a player has 32 pieces in total (16 pieces each), while in SHOGI a player has a total of 40 pieces (20 pieces each).

3. Most pieces in SHOGI are short-range pieces. Each side has only one Rook and one Bishop. Among the other pieces, only Lance and Knight can move more than one square from their starting square. In CHESS, only the King, Knight and Pawn are limited in their movement.

4. In CHESS only the Pawn is allowed to promote. In SHOGI promotion is allowed for 6 different kinds of pieces. Also, in CHESS promotion is only allowed on the $8^{th}$ rank (for White) or the $1^{st}$ rank (for Black). In SHOGI promotion is possible in the camp of the enemy, being the top three ranks or the bottom three ranks of the board. Another interesting difference as far as promotion is concerned is the fact that in SHOGI promotion is not obligatory (except in a few minor cases).

5. The most important difference between SHOGI and CHESS is the possibility of reusing pieces in SHOGI. When a piece is captured, this piece does not disappear from the game (like in CHESS), but is put next to the board. If it is a player's turn, he can either choose to play a move with a piece on the board or take one of the pieces previously captured and put it on a vacant square on the board[1]. There are almost no limitations to where a piece can be 'dropped', even giving mate by putting a captured piece back on the board is allowed.

6. A draw by agreement or a draw because of the fifty move rule is not possible in SHOGI. Stalemate is theoretically possible, but because of the possibility of dropping pieces on the board this has never happened in a normal game. However, there is the possibility of impasse, where both Kings enter into the enemy camp and can no longer be mated (jishogi). On average, only 2 out of every 1000 professional games end in jishogi (Japanese Shogi Association, 1994). At amateur level, this is even rarer. As a result of these differences in the rules concerning draws, a draw is quite rare in SHOGI. Fewer than 1% of all professional Shogi games end in a draw. Again, this figure is even less for amateur players.

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[1] As a result, all pieces in SHOGI have the same colour The difference between one's own pieces and those of one's opponent is only determined by the shape of the piece, which is not symmetrical

### 2.2.2 Differences in game programming

The differences in rules between CHESS and SHOGI lead to differences in various aspects of game programming

1 CHESS is a converging game (the number of possible moves decreases in the later stages of the game), while SHOGI is diverging (in the endgame the number of possible moves increases) This is mainly caused by the possibility of dropping pieces However, since CHESS is slowly converging, the use of endgame databases is not so important as it is, for example, for MANCALA games and GO-MOKU (Allis, 1994) In SHOGI, no endgame database is of any use, even though a special Tsume-shogi[1] solver is part of almost every Shogi computer program

2 As stated in the Introduction, there is a considerable difference in state-space complexity and game-tree complexity due to the dropping possibility, the extra promotion possibilities and the virtual impossibility of draws As said before, the study by Matsubara and Handa (1994) shows that SHOGI has an average branching factor of about 80 In CHESS this is estimated at 35 (cf Hartmann, 1989) It is also known that the maximum branching factor in SHOGI is 593 The corresponding Diagram[2] is given as Diagram 1 and taken from Nozaki (1990)

   We do not know whether such an upper bound is known for CHESS, but we believe that it is considerably smaller than 248, which is the maximum branching factor if all pieces are on the board and have their maximum moving ability[3] We expect that the maximum branching factor of CHESS will be about 150

   It is also interesting to look at normal branching factors in the endgame (in SHOGI, usually the stage of the game where the outcome is to be decided) Diagram 2 provides an example of a position that occurred in an actual game between the top players M Nakahara and K Yonenaga

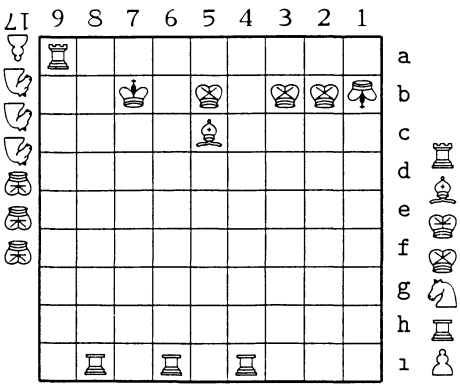


**Diagram 1:** An example of a maximum branching factor of 593

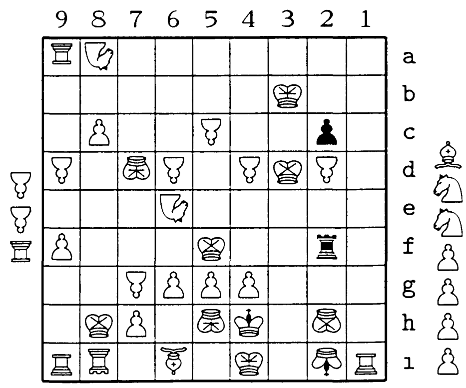


**Diagram 2:** An example of a position in an actual game played by two top players

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[1] Tsume-shogi is a shogi problem position where the King has to be mated by giving check on each move The idea is to mate before the opponent has a chance to counterattack, since check is a forcing move In Japan, composing and solving Tsume-shogi is very popular There are more than 100,000 different problems [see also pp 94-99 – Eds ]

[2] Diagrams, as well as the game score in Appendix B were produced by a special tool called OhTEX for LATEX

[3] It is possible to create a position with multiple Queens, but as the 8-queens problem shows, it is not easy to align multiple Queens in such a way that their interference is minimized

The position occurred in the first game of the match for the most prestigious professional title, called *Meijin title*. Here, Black (playing up the board) resigned. In this position, Black has 159 possible moves, while White (in the previous position) had 158. These are common values in the endgame of SHOGI.

3. On average, a game of SHOGI takes about 115 ply. The maximum game length (in actual games) is more than 500 ply. In CHESS, the average is about 80 ply, while the record game length is currently 382 ply.

4. As said before, many pieces in SHOGI have limited movement. This leads to a slow build-up and influences the average game length. It also influences the opening database which is so important in CHESS. There is a large number of books written on opening theory in SHOGI, but in general only patterns instead of strict move orders are being discussed. Also, new and interesting opening patterns are being developed until this day. Therefore, building a good opening database is more difficult in SHOGI than in CHESS.

We have seen that SHOGI and CHESS are very similar. However, from a programming point of view there are many important differences. A slow build-up and the diverging nature of SHOGI makes it difficult to aid the program in the opening and in the endgame. The most important difference, however, is the large game-tree complexity of SHOGI compared to CHESS.

## 3. WHY SHOGI INSTEAD OF CHESS, XIANG QI OR GO?

CHESS, SHOGI, XIANG QI and GO are all complex games, both in game-tree complexity and in decision complexity. Why then is SHOGI better suited as a new target for game-programming research? Why should we not continue research on CHESS or put more effort in the research of XIANG QI or GO? First, let us look at CHESS. We believe that CHESS soon will no longer be of interest to AI research for the following two reasons:

- Most programs use the same AI techniques: α-β search, a fine-tuned evaluation function, a move-generator that is embedded in hardware, and an opening and endgame database. The difference between programs seems to be only in the speed of the hardware and in the fine-tuning of the evaluation function. Therefore, CHESS is only of interest to those researchers developing new hardware and chess-players interested in the evaluation function.

- The competitive element, which in our view has been an important motivation for improving chess programs, will soon no longer be there. The developers of DEEP BLUE (formerly DEEP THOUGHT, Hsu *et al.*, 1990), which is considered the strongest chess-machine at present, already claim their new version will defeat the human World Champion. If that happens the strongest chess programs will be stronger than the best human player.

We believe that it is now time to choose a new game as the next target domain. Such a domain should be competitively interesting and current AI techniques should be expected to fail, thus creating the need for new research efforts. XIANG QI, GO and SHOGI are all competitively interesting. In all three domains the level of the best computer program is still far away from the level of the top players. What may discrimate is a question about the applicability of old and new AI techniques.

XIANG QI. The game-tree complexity of XIANG QI is similar to that of CHESS. We feel that in the near future current AI techniques will also be successful for XIANG QI, i.e., playing at expert level. This would render XIANG QI no longer competitively interesting. It should be noted that fine-tuning the evaluation function for XIANG QI is still difficult and interesting. However, our interests are in the development of new AI techniques.

GO. GO is even more complex than SHOGI and it is almost certain that current AI techniques will not be successful in the near future, if ever. It is our belief that new AI techniques should be more cognitively based, leading to special techniques for forward pruning. We are aware of the fact that these techniques have not led to promising results in CHESS. We think that the main reason was that this type of research was overshadowed by the competitive successes of less cognitively-based techniques in chess research. It is our belief that AI techniques based on cognition are still the key to the solution of many interesting problems in AI in general and in game-programming research in particular. If this is true, there are two problems in GO:

1. There is very little cognitive research done in GO. Furthermore, there is no game similar to GO from where cognitive results can be expected to expand to this domain.

2. The cognitive research that has been done in GO is sometimes inconclusive. For example: Reitman (1976) was not able to reproduce the study by Chase and Simon (1973) where it was shown that in CHESS positions are viewed in chunks (familiar subpatterns of information).

We believe that it is risky to start a major research effort in GO without knowing more about the game from a cognitive point of view.

SHOGI: The game-tree complexity of SHOGI is high enough to expect that current AI techniques will not be successful in the near future. We have also explained that SHOGI is very similar to CHESS and therefore we believe that most of the results in CHESS will expand to SHOGI.

## 4. HISTORY OF COMPUTER SHOGI

In the early 1970s the first working computer-Shogi programs were written. These programs could not cope with the game-tree complexity very well, so they could only play at the level of a beginner. However, important breakthroughs in hardware development, that have increased the strength of chess programs enormously, have also influenced computer Shogi. Currently, the estimated playing strength of computer-Shogi programs roughly correspond to that of MacHack VI in computer chess. At the moment there are many commercial Shogi programs on the (Japanese) market, the strongest of which act at the level of an average amateur. In the Japanese grading system this roughly corresponds to a level of 1-dan 2 or 2-dan, being the second and third grade of the weak amateur class. A complicating factor is that in SHOGI (as in other Japanese sports such as Judo and Karate), there is no ELO-like system to determine the current playing strength. Grades are based on optimal performances and a grade once gained cannot be lost. We estimate that an active 2 or 3 kyu player roughly corresponds to a player with an ELO of 1700 in CHESS.

A society for the study of computer Shogi, called the Computer Shogi Association[1] (CSA for short), was established in Japan in 1987. The CSA has motivated the leading researchers in computer Shogi to describe their programming techniques in a book (Kotani *et al*, 1990). Thereafter, many Shogi programs have been written. An annual Shogi tournament for computer programs has been organized by CSA since 1990. At the moment, KIWAME and MORITA-SHOGI are the names of the strongest programs. These programs run on NEC personal computers, and are commercially available on the Japanese market. The results of the 1994 tournament are shown in Table 1. A game score of the match between KIWAME and MORITA-SHOGI in this tournament is given in Appendix B.

A typical Shogi program consists of an $\alpha$-$\beta$ searcher with a static evaluation function, some forward-pruning method, iterative deepening and a Tsume-shogi solver to look ahead for mating possibilities.

In Japan, for a long time research on games has been considered as not scientific. That is why the tournament above only has commercial programs as participants. Special hardware and supercomputers have not yet been used in SHOGI. Lately, the characteristics of SHOGI have attracted the attention of more AI researchers and efforts in computer Shogi are gradually increasing. The first workshop on computer Shogi was organized by the CSA in 1994. Leading topics were techniques for making a Shogi program and a Tsume-shogi solver (e.g., Yamashita, 1994). SHOGI has now been established as an important research topic in AI (Iida and Kotani, 1991). This promises some improvement of the playing strength, but real progress is expected to come at a standstill around the 3-dan grade (ELO estimate: 2100), and that is still far from the level of expert players.

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[1] The CSA can be contacted at csa@etl go jp

| # | Name | 1st | 2nd | 3rd | 4th | 5th | 6th | 7th | total | SP | ranking |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Kiwame 2.1 | 12+ | 15+ | 2+ | 8+ | 5+ | 3− | 17+ | 6.0 | 28.0 | 1 |
| 2 | Morita-Shogi 5 | 13+ | 17+ | 1− | 15+ | 19+ | 8+ | 3+ | 6.0 | 27.0 | 2 |
| 3 | Kakinoki-Shogi | 14+ | 18+ | 8− | 20− | 12+ | 1+ | 2− | 4.0 | 32.0 | 6 |
| 4 | AI-Shogi | 15− | 10+ | 20+ | 18+ | 1− | 12+ | 8+ | 5.0 | 26.0 | 3 |
| 5 | Super Hashimoto-Shogi | 16+ | 20− | 10− | 19− | 17− | 6+ | 12+ | 4.0 | 23.5 | 10 |
| 6 | Denno-kaijin MK2 | 17− | 13− | 9+ | 14− | 10+ | 5− | 22+ | 3.0 | 21.5 | 14 |
| 7 | Oki | 18− | 14− | 16− | 21+ | 11− | 15+ | 10+ | 3.0 | 18.5 | 16 |
| 8 | Yano-Shogi II | 19+ | 22+ | 3+ | 1− | 20+ | 2− | 4− | 4.0 | 33.0 | 5 |
| 9 | Tsubakihara-Shogi | 20− | 16= | 6− | 13− | 21− | 10− | 11+ | 1.5 | 19.5 | 22 |
| 10 | Shouchon | 21+ | 4− | 5− | 22− | 6− | 9+ | 7− | 2.0 | 21.5 | 19 |
| 11 | Kikuchi 1.02 | 22− | 19− | 21+ | 17− | 7+ | 13− | 9− | 2.0 | 20.5 | 20 |
| 12 | Takada-Shogi V2.1 | 1− | 21+ | 13+ | 16+ | 3− | 4− | 5− | 3.0 | 26.5 | 12 |
| 13 | Ogawa-Shogi | 2− | 6+ | 12− | 9+ | 18− | 11+ | 14− | 3.0 | 23.5 | 13 |
| 14 | Sakashita-Shogi V0.5 | 3− | 7+ | 15− | 6+ | 22+ | 17− | 13+ | 4.0 | 22.0 | 11 |
| 15 | Kyoto 1200 | 4+ | 1− | 14+ | 2− | 16− | 7− | 21− | 2.0 | 28.5 | 18 |
| 16 | Hyper Shogi 1 | 5− | 9= | 7+ | 12− | 15+ | 20− | 19− | 2.5 | 22.5 | 17 |
| 17 | GNU Shogi 1.2 | 6+ | 2− | 18− | 11+ | 5+ | 14+ | 1− | 4.0 | 29.0 | 7 |
| 18 | Sogin | 7+ | 3− | 17+ | 4− | 13+ | 19+ | 20− | 4.0 | 28.0 | 8 |
| 19 | Amano-Shogi 0.6 | 8− | 11+ | 22+ | 5+ | 2− | 18− | 16+ | 4.0 | 25.5 | 9 |
| 20 | Tancho under Reiki | 9+ | 5+ | 4− | 3+ | 8− | 16+ | 18+ | 5.0 | 25.0 | 4 |
| 21 | OM-1 | 10− | 12− | 11− | 7− | 9+ | 22− | 15+ | 2.0 | 16.5 | 21 |
| 22 | Sekita-Shogi Win | 11+ | 8− | 19− | 10+ | 14− | 21+ | 6− | 3.0 | 21.0 | 15 |

**Table 1:** The results of the 5$^{th}$ CSA tournament in 1994.

## 5. CONCLUSIONS AND FUTURE RESEARCH

In this paper we have explained why we believe that the path Chess → Shogi → Go is a natural development in game research. Shogi is a chess-like game with a game-tree complexity far larger than Chess, albeit less than Go. This leads us to believe that current AI techniques will not be successful in Shogi in the near future, if ever. Shogi is similar to Chess, so it is expected that many research results in Chess, both from cognitive science and computer science, will expand to Shogi. Therefore, in developing new AI techniques, we can make use of most of the results found in Chess. Go, on the other hand, is a entirely different type of game, making it risky to extend claims from Chess to Go.

In order to research Shogi more effectively, a special environment for Shogi programming has been designed and implemented at our institute (Handa, Matsubara, and Motoyoshi, 1991). It is called *OhShow* (PDS) and runs under Unix and X-Windows. The authors will further develop the ideas presented in this paper. A new test method will be developed to measure the playing strength of both human players and computer programs. Also, new AI techniques will be developed, some based on new forward pruning techniques and some based on recent developments in pattern-matching theory and machine learning.

## 6. ACKNOWLEDGEMENTS

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## Appendix A: A Short Introduction to SHOGI

SHOGI, Japanese chess, is played by two players on a board of 9 × 9 squares The players move alternately, attempting ultimately to capture the opponent's King The initial set-up of the game is shown in Diagram 3[1] Each player has 20 pieces The first player to move is called **Black** or *Sente* (in Japanese) and plays with the pieces on the bottom three ranks of the Diagram The other player is **White** or *Gote* and his pieces are on the top three ranks of the Diagram In Diagram 3 you can see that Black's pieces are being displayed normally, while White's pieces are displayed upside down

The important difference between SHOGI and CHESS is the possibility of reusing pieces previously captured They can be put back on the board on almost any vacant square (this is called 'dropping a piece') In Diagram 2 the captured pieces are shown beside the board, Black's pieces on the right and White's pieces on the left

Each square on the board is represented in algebraic notation like in CHESS, and so are the moves For example, the white King in Diagram 3 is on square 5a If it were to move to 4b, this move would be represented by K5a-4b or K4b in short notation

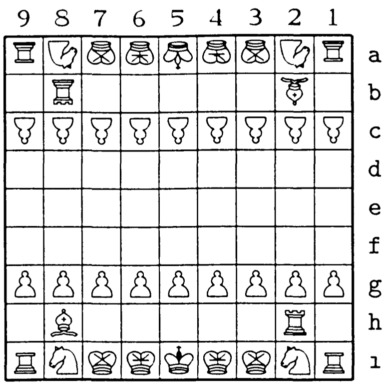


**Diagram 3:** Initial set-up of SHOGI

As can be seen in Diagram 3 Black's camp is on the bottom three ranks (**i** to **g**), which is also White's promotion zone Correspondingly, White's camp is on the top three ranks (**a** to **c**), which is Black's promotion zone Most pieces in SHOGI can promote, but promotion is not obligatory like it is in CHESS In the diagrams we use in this article the colour of a promoted piece is Black (see Diagram 2)

In SHOGI there are eight different kinds of pieces At the initial position of a normal game, each player has a King, a Rook, a Bishop, two Golds, two Silvers, two Knights, two Lances, and nine Pawns For each of the pieces we now describe how it moves and what happens to the piece if it promotes

**King or Gyoku** A King moves like a King in CHESS, so it can move one square in every direction (horizontally, vertically and diagonally) A King can not promote

**Rook or Hisha** A Rook moves like a Rook in CHESS, i e , any number of squares horizontally or vertically, but without the ability to jump over other pieces The promoted Rook keeps its original movement, but the ability to move one square diagonally in every direction is added

**Bishop or Kaku** A Bishop also moves like a Bishop in CHESS, i e , any number of squares diagonally (also without jumping over other pieces) A promoted Bishop keeps its original movement, but the ability to move one square horizontally or vertically in every direction is added

**Gold or Kin** A Gold moves like a King, except for the two squares diagonally backwards to which it can not move A Gold can thus move to six squares A Gold does not promote

**Silver or Gin** A Silver moves like a King, except for the two horizontal squares and the square backwards A Silver can thus move to five squares A promoted Silver moves like a Gold

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[1] Diagrams in Japanese Shogi magazines and books are exclusively written in kanji Diagrams used in this article are for the international community only

**Knight or Keima** A Knight moves like a Knight in CHESS, that is one square straight followed by one square diagonally. As in CHESS, it can jump over other pieces. However, a Knight in SHOGI can only jump to the two squares that are furthest up the board. For example, a black Knight on 5f can only jump to 6d or 4d. A promoted Knight moves like a Gold.

**Lance or Kyosha** A Lance can vertically move any number of squares, but only forward. It cannot move backwards and it cannot jump over other pieces. A promoted Lance moves like a Gold.

**Pawn or Fu** A Pawn can only move forward. There is no difference in the first move and capturing pieces is not done diagonally like in CHESS. A promoted Pawn moves like a Gold.

SHOGI has a history of over 500 years and currently over 10,000,000 people in Japan play the game. There is also a professional competition, which is completely separated from amateur play. The present top player, Y. Habu, earned over 1,000,000 on game fees alone in 1994.

## Appendix B: A Game Score Played by the Top Programs

The following game was played at the computer SHOGI tournament (1994) by the two strongest programs KIWAME 2.1 (winner) vs. MORITA-SHOGI 5 (runner-up).

**Black: Kiwame 2.1 (by S. Kanazawa)**
**White: MORITA-SHOGI 5 (by K. Morita)**
**The 5th CSA Computer SHOGI Championship**
**December 4th, 1994, Tokyo**

| | | | | |
|---|---|---|---|---|
| 1. ♙7f ♙3d | 2. ♗x2b+ ♕x2b | 3. ♕8h ♕3c | 4. ♕7g ♙4d | 5. ♕7h ♕6b |
| 6. ♕4h ♕3b | 7. ♔6i ♔4a | 8. ♕5h ♕5b | 9. ♔7i ♔3a | 10. ♙5f ♕5b4c |
| 11. ♕5g ♙8d | 12. ♙2f ♙5d | 13. ♙2e ♙7d | 14. ♙1f ♙8e | 15. ♙1e ♕5c |
| 16. ♙3f ♔2b | 17. ♙4f ♕6d | 18. ♙6f ♙7e | 19. ♙x7e ♕x7e | 20. ♙'7f ♙8f |
| 21. ♙x8f ♕x8f | 22. ♙'8c ♖x8c | 23. ♗'7B ♖8b | 24. ♗x6c+ ♕x7g+ | 25. ♘x7g ♕'8g |
| 26. ♙'8h ♕x7h+ | 27. ♔x7h ♗'3i | 28. ♖3h ♕'2h | 29. ♖x3i ♕x3i | 30. ♝6d ♙'7c |
| 31. ♕'7a ♖7b | 32. ♗'6c ♖x7a | 33. ♕'6b ♖'2h | 34. ♕4h ♖3a | 35. ♝x3a ♕x3a |
| 36. ♘1g ♗'9b | 37. ♘6e ♕3h | 38. ♕5i ♖2g+ | 39. ♖'8g ♜x8g | 40. ♙x8g ♖'2g |
| 41. ♖'5b ♕4b | 42. ♘5c+ ♗x5f | 43. ♔8h ♕x5c | 44. ♗7d+ ♕'7g | 45. ♔9h ♙x7d |
| 46. ♜x4b ♕x4b | 47. ♕'3c ♔x3c | 48. ♕5c ♖'8h | | |

White resigned.

The symbol ' denotes dropping, and + denotes promotion.

Photo by Jos Uiterwijk

THE CASTLES ARE THE KING'S ALONE
TWO POINTS WERE HELPLESSLY GONE
Jeroen Piket winning his mini match by 2-0.
The Hague, 11th AEGON Tournament, April 10, 1996.