L2/18-170

Proposal to encode a full set of pieces for the game of shogi.

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Introduction. Shogi is a board game of Japanese origin (also called Japanese chess), that is played on a 9x9 board, it is considered to be a chess variant but with very different rules as well as graphic identity and notation. It is a very old game, being played as early as the 16th century in its present form (according to Wikipedia). Along with Mahjong and Xiangqi, it is one of the most popular games in East Asia. Since Mahjong is already encoded and Xiangqi is due to be published soon, along with Go stone markers. I feel it is fitting to encode the Shogi pieces, to complement the sets of games already supported in Unicode.

Pedagogical uses. By assigning a single character to each individual piece, we can simplify books about shogi so that westerners can be familiar with it (similar to the regular chess notation), either by using the actual piece design or using a pictographic font, (things that will also be possible with Xiangqi). Books about shogi are bound to have pieces depicted in lines of text.

Current notation. In order to denote moves in lines of text, there are several systems of notation, all with its pros and cons**,** the predominant notation uses ☗☖ or ▲△ followed by numbers indicating the position and an ideograph indicating the piece (e.g. ☗ 2 六 歩), other notations use Latin letters to represent the piece, along with a plus sign to indicate promotion, however all share the same problem in that the glyph used to identify a piece looks nothing like the piece in the actual game. Usually the ideographs used to identify a piece are only part of the whole glyph (comprising up to three ideographs) and one piece could requires more than one character at a time in a grapheme cluster. Having separate codepoints for the pieces greatly simplifies the possible notation schemes one can use.

Board diagrams. Like regular chess, representations of different points in a game or set problems to solve, are better communicated by the 2-dimensional arrangement of the pieces. The encoding of the pieces would allow for easier composition of such diagrams.

In fact, many people have used the current chess symbols to play in text messaging applications. Of course, a dedicated app is always better, but even the development of an application would be simplified if the developers only had to reference coded characters with a public font, instead of designing dedicated graphics.

Current board diagrams use the “main identifier” for player one and the same ideograph but rotated for player two, this can be achieved by using the same encoded ideographs and some modern font technology features (Please see: “Consideration on the glyphs” below for more).

Because each cell on the board is not colored, adding the divisions is especially easy to implement by using character tabulation.

Many board diagrams include the captured pieces on the side of the board; this would also be easy to depict with our codepoints.

Current practice. Since there are only 6 distinct “chess” pieces for each player and shogi requires 15, current dingbat fonts do not use those codepoints, instead opting to map the pieces to ASCII characters. Another popular option is to use PUA codepoints.

Encoding model. Shogi is special amongst other chess variants, in that the pieces of both players are distinguished not by their color, but by their direction; so, each piece is paired with a rotated copy (see: Note on the use of the two kings). To reflect this, the pieces have been named “upward” and “downward” similar to arrow characters.

The common way of depicting a board, would make one’s own pieces be the upward facing ones (ignoring the third dimension), since that is what we perceive in either side of the board, so the bottom pieces could be said to correspond to player one, similar to chess, where the white pieces (which always go first) always start at the bottom of the diagram.

When depicting a single board diagram for two people, or when rotating the diagram for the other player is not considered worth it, one could place the plain shogi pieces next to the board for an absolute reference: ☗ ☖ or ▼ △, and players can just remember if they are black or white (usually black is assigned to player one or the lower ranked player unlike chess where player one is white and always goes first[1]).

Who moves first is decided by tossing five pawns like dice, if the number of promoted pawns facing up is higher than the number of unpromoted pawns, then the other player gets to be the "black" player and move first. This process is called "*furigoma*". The pieces could be used to record the result of such furigoma, for instance: ☗☗☗☗☗, or: 2☗ - 3▼

Vertical presentation. There is no evidence as far as we know, of Shogi diagrams in vertical layouts (or for that matter sideways diagrams). In the case of normal chess, the only effect of translation to a vertical environment is that the whole board is rotated 90 degrees, and the upper side becomes the left side and the lower side becomes the right side.

In Shogi however, while the information of the relative position of the pieces is kept, the glyphs would not turn as expected, and so the upper side with the downward facing pieces would become the left side, but we expect them to now point right but they still point down (similarly for the other side).

There is more than one solution, one is to assign them the vertical orientation property of vo=R, the only problem is that we expect them to turn counterclockwise instead of clockwise as in the specification. Hence, we may need a different value for the property that makes the glyph turn the other way. This value could be used beyond just shogi pieces, because it could aid in the rendering of scripts like the recently proposed Old Uighur.

Another option is to encode standardized variation sequences for each of the pieces, however using SVS's for vertical variants would be unprecedented.

The foolproof way of avoiding the issue, but probably the most extreme is to encode a set of sideways shogi pieces for both players and do character substitution in a change in layout; this would also allow to render sideways gameboards in horizontal contexts easier as well as the converse. However, character substitution should be considered a last resort since we always risk corrupting the data and also, these sideways pieces would only have that purpose which is not very elegant.

If we had to choose between the three, assigning them a new value of vertical orientation would be the best option, however such a property is not proposed here, because as we said already, there is very likely no demand for those cases, so having the default value should suffice for now.

Considerations on the glyphs. There have been many incarnations of the appearance of shogi pieces, the most common one is the "multi-ideographic style" and so the representative glyphs should look like that.

One thing to note that is different from Xiangqi: in a real board the Xiangqi pieces would probably have the enclosed ideographs line up with the perspective of each player (similar to Shogi), however in diagrams and indeed in the current glyphs, all the pieces depict the pieces of both players with the ideograph upright (probably to aid in legibility). It would be tempting to do the same for the glyphs here; to only rotate the pentagonal enclosure and keep the ideographs upright; however, we notice that no font does that, probably because the enclosure in itself is not sufficiently different graphically, and the fact that the orientation of the pieces and not color is the main difference, it is actually more legible to rotate the whole glyph.

Promoted pieces may be depicted with a red glyph to give emphasis to their status.

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[1] 江川清ほか・編(1996)『記号の事典 セレクト版』第 3 版, 三省堂, p. 107: ☗ 先手または下手 / △ 後手または上手

The pieces may be depicted in a 3d fashion.

A font designer may choose to color the upward facing pieces in a negative fashion, to make the difference between them even more pronounced (this is useful in pictographic fonts). This should not be done at the same time as using the convention to color the promoted pieces red. This also lines up with our intuition of the bottom player moving first and the fact that it usually correspond to the black pieces in notation.

In order to avoid encoding rotated versions of encoded ideographs, a designer may choose to use these codepoints and just change the glyph of those to be like the ideographs and their rotated counterparts (with or without the pentagon enclosure) to still be able to depict the traditional board diagrams. This is important, not only because of the possibility of transcription, but also because such depictions may be preferable in many circumstances, as the multi-ideographic style may be harder to read than the mono-ideographic style at smaller scales. The only recommendation is that such designs should have the glyphs look different in some way to the regular unified ideographs.

The predominant convention used in diagrams in Japan, have a very peculiar glyph for some promoted pieces (promoted silver, promoted knight and promoted lance), which consists on the identifying ideograph for that piece, with 成 stacked on top. This may be confused with a completely different ideograph; however, it is not very different from the Japanese era names. While there are ways to cluster both of the glyphs at the text editor and font level, the task to then rotate the stack on diagrams becomes tedious. Yet another reason in favor of dedicating codepoints to each piece.

On the identifying ideograph. The Wikipedia page gives some ideographs that are presumably used to identify the pieces either in notation or in diagrams. When it comes to the promoted rook, we have seen true ambiguity on what ideograph to use (龍 or 竜), but for other pieces, like the promoted knight or the promoted lance, only Wikipedia seems to point to the preference of using 全, (圭 or 今) and (杏 or 仝) over the stacked ideographs. It could reflect preferences of other countries apart from Japan. We did notice the use of cursive style ideographs in some publications.

We can however trace back the preference to use 个 to represent the promoted pawn, in the fact that Hiragana letters can take a different width than the rest of the ideographs and so diagrams would remain lined up by using that character instead.

Note on the use of the two kings. In a game. each player plays with a single king, so why are we proposing two kings in both orientations? Like we said, current board diagrams rotate the ideograph that identifies the piece, in the case of the king, that would be 王; however, this glyph looks very similar to its rotated version.

The need to avoid confusion has made players use a different looking piece (with a different looking corresponding ideograph: 玉) for the lowered ranked player. The lower ranked is usually the player with lowest proficiency.

The higher ranked player usually gets to do the furigoma, or it may let the other player do it out of courtesy. In each case the assignment of the kind of king remains the same. It can be ambiguous when both players are equally proficient, but this can always be decided by a game of rock, paper scissors.

In special games where there is a handicap, the higher ranked player is always assigned the black piece symbol in notation even though he always moves second.

So strictly speaking, even though four kings are proposed, players would only use two of them at a time. However, since we want to support both versions of the board (rotated 180°), all four versions should be encoded with extra care over which king is paired with another one.

A game that does not recognize rank, may render both kings as identical but still should use the correct pairing of codepoints to avoid losing information.

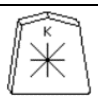
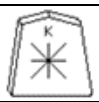
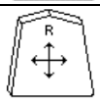
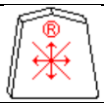
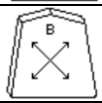
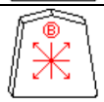
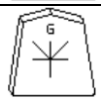
Code allocation. The characters proposed only take up two rows, however due to the existence of several shogi variations that require other pieces, it is wise to save up some space for future proposals. So, we recommend to make the block 6 rows wide, in the range: 1FC00-1FC5F. Making it that wide is necessary in order to accommodate the most popular variant: Chu Shogi, which includes up to 40 unique extra pieces (including both players). The block could be called “Shogi pieces” or a broader term would be “Chess symbols extended A”.

Characters proposed.

Codepoint and name	Main identifier*	Representative glyph	Notes
1FC00 SHOGI UPWARD HIGH RANK KING	王		Also called “king general”. Should be paired with the downward low rank king.
1FC01 SHOGI UPWARD LOW RANK KING	玉		Also called “jeweled general”. Should be paired with the downward high rank king.
1FC02 SHOGI UPWARD ROOK	飛		
1FC03 SHOGI UPWARD PROMOTED ROOK	龍 or 竜		Also called “dragon” or “dragon king”.
1FC04 SHOGI UPWARD BISHOP	角		
1FC05 SHOGI UPWARD PROMOTED BISHOP	馬		Also called “horse” or “dragon horse”.
1FC06 SHOGI UPWARD GOLD GENERAL	金		
1FC07 SHOGI UPWARD SILVER GENERAL	銀		
1FC08 SHOGI UPWARD PROMOTED SILVER	𨬓		Sometimes expressed as: 全
1FC09 SHOGI UPWARD KNIGHT	桂		Also called “cassia” or “cassia horse”.
1FC0A SHOGI UPWARD PROMOTED KNIGHT	𨬔		Sometimes expressed as: 圭 or 今
1FC0B SHOGI UPWARD LANCE	香		Also called “chariot” or “incense chariot”.
1FC0C SHOGI UPWARD PROMOTED LANCE	𩚨		Sometimes expressed as: 杏 or 仝
1FC0D SHOGI UPWARD PAWN	歩		
1FC0E SHOGI UPWARD PROMOTED PAWN	と		Also called “tokin”. This is the only piece that has a Hiragana character as an identifier. Sometimes expressed as: 个
<unused codepoint>	-	-	
1FC10 SHOGI DOWNWARD HIGH RANK KING	王		
1FC11 SHOGI DOWNWARD LOW RANK KING	玉		
1FC12 SHOGI DOWNWARD ROOK	飛		

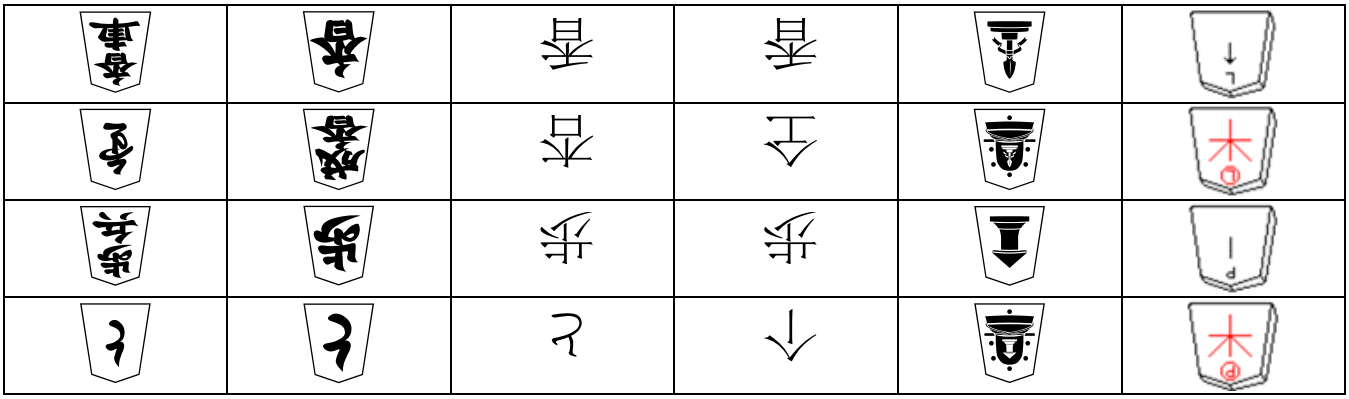
1FC13 SHOGI DOWNWARD PROMOTED ROOK	龍 or 竜		
1FC14 SHOGI DOWNWARD BISHOP	角		
1FC15 SHOGI DOWNWARD PROMOTED BISHOP	馬		
1FC16 SHOGI DOWNWARD GOLD GENERAL	金		
1FC17 SHOGI DOWNWARD SILVER GENERAL	銀		
1FC18 SHOGI DOWNWARD PROMOTED SILVER	成銀		
1FC19 SHOGI DOWNWARD KNIGHT	桂		
1FC1A SHOGI DOWNWARD PROMOTED KNIGHT	成桂		
1FC1B SHOGI DOWNWARD LANCE	香		
1FC1C SHOGI DOWNWARD PROMOTED LANCE	成香		
1FC1D SHOGI DOWNWARD PAWN	歩		
1FC1E SHOGI DOWNWARD PROMOTED PAWN	と		
<unused codepoint>	-	-	

Font style comparison.

Multi-ideographic	Stacked ideographic	Mono-ideographic Diminished*	Mono-ideographic cursive based*	Pictographic	Abstract[2]
		王	王		
		玉	玉		
		飛	飛		
		龍	竜		
		角	角		
		馬	馬		
		金	金		

[2] Hare, Roger. 2003. *Shogi - Japanese Chess*. https://www.bromsgrove-abstract-games.org.uk/shogi.pdf

		銀	銀		
		全	全		
		桂	桂		
		圭	今		
		香	香		
		杏	仝		
		歩	歩		
		と	个		
		王	王		
		王	王		
		龍	飛		
		龍	竜		
		角	角		
		馬	馬		
		金	金		
		銀	銀		
		全	全		
		桂	桂		
		圭	今		



*The main identifiers and the mono-ideographic styles are based on the font [BabelStone Han](), by Andrew West.

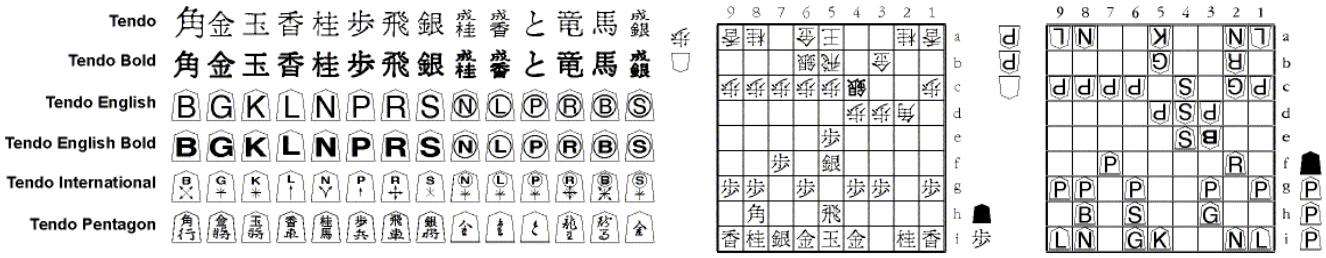


Figure 1. The *Tendo* font family for shogi. https://www.partae.com/fonts/index.php/shop/font-products/product/136-tendo

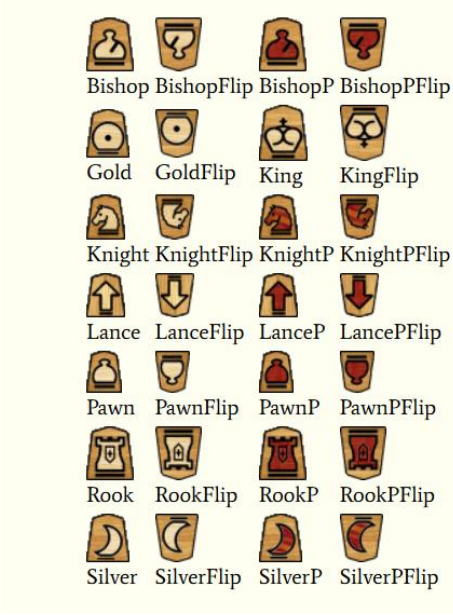


Figure 2. *Motif Shogi Pieces*, a set of Shogi pieces made by Fergus Duniho mainly from Armando Marroquin's Chess Motif font for Chess pieces. http://www.chessvariants.com/graphics.dir/motifshogi/index.html

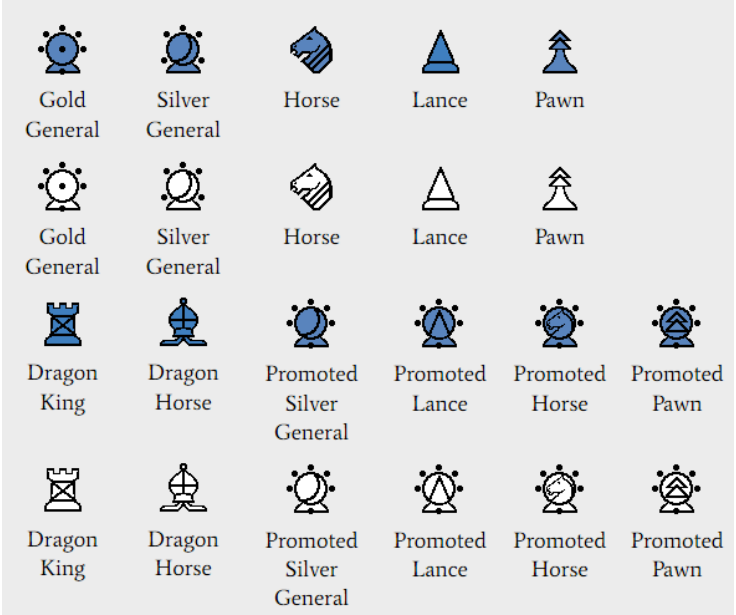
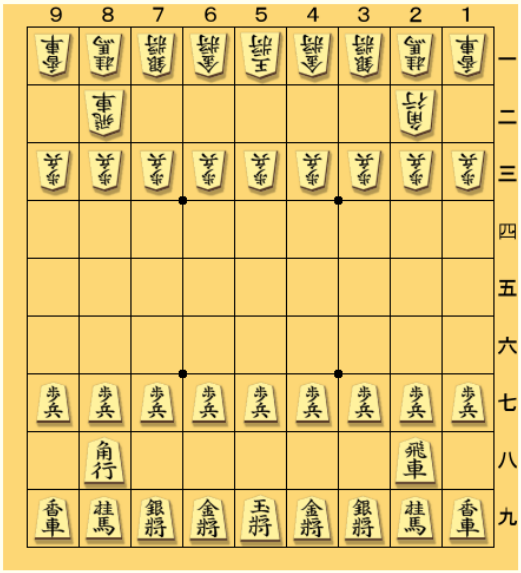
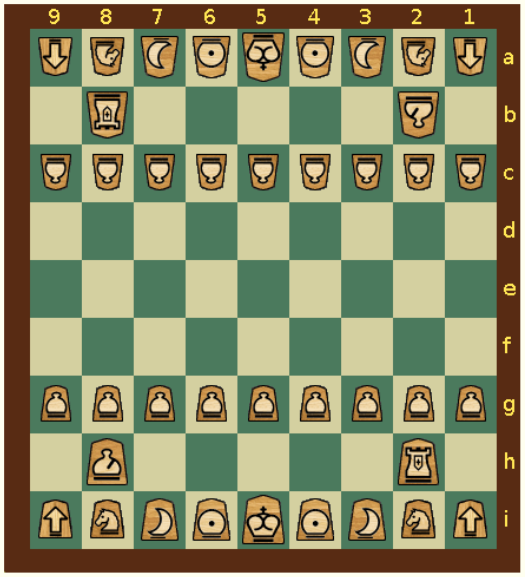


Figure 3. Shogi pieces found in *Alfaerie Variant Chess Graphics* by David Howe. http://www.chessvariants.com/graphics.dir/alfaerie/index.html



Traditional board, pieces, and notation



Checkered board, Chess Motif pieces, and international notation.

Figure 4. Illustrations of the shogi board in the starting setup. http://www.chessvariants.com/shogi.html

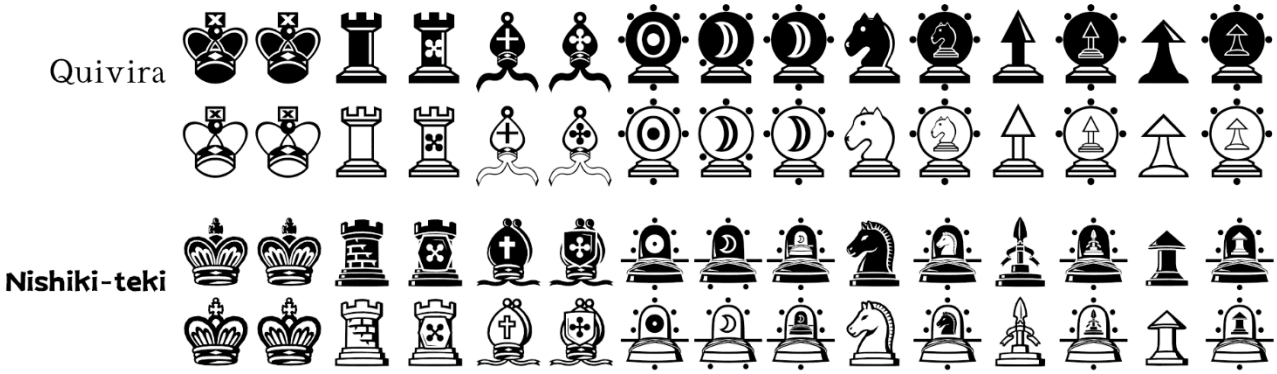


Figure 5. Chess-based shogi pieces contained in the fonts *Quivira* http://www.quivira-font.com/ and *Nishiki-teki* http://hwm3.gyao.ne.jp/shiroi-niwatori/nishiki-teki.htm

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0E01																
0E02																
0E03																
0E04																

These characters represent pieces used in variants of chess, namely Xiangqi (Chinese chess), Janggi (Korean chess), Shatranj, Tamerlane Chess and Japanese Shogi. All characters are western-styled to match those in the Miscellanous Symbols block, although variants using ideographs are more common in East Asia. See http://www.chessvariants.com for details.

Figure 6. The PUA assignments of *Quivira* including glyphs for many chess variants. http://www.quivira-font.com/files/QuiviraPUA.pdf

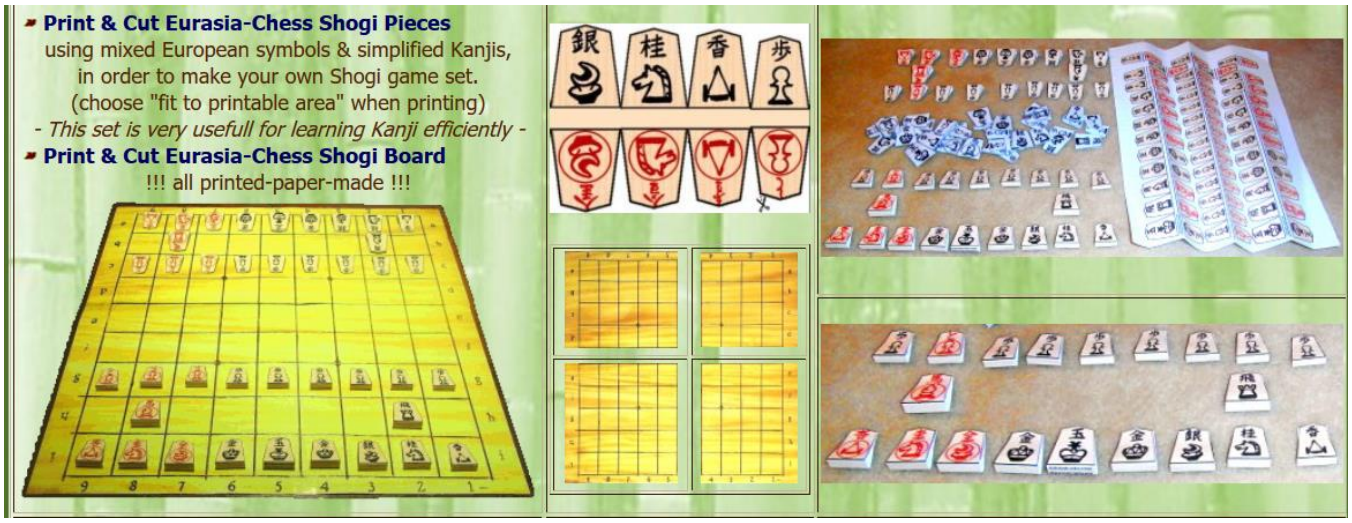


Figure 7. Shogi pieces with a mixed glyph design. http://www.eurasia-chess.com/links_en.php#download

Figure 8. Actual shogi pieces with single or stacked ideographs (called *ichiji-goma* 一字駒).「彫駒／御蔵島黄楊／一字彫駒」『青山碁盤店』 http://www5b.biglobe.ne.jp/~goban/s1go13f.html

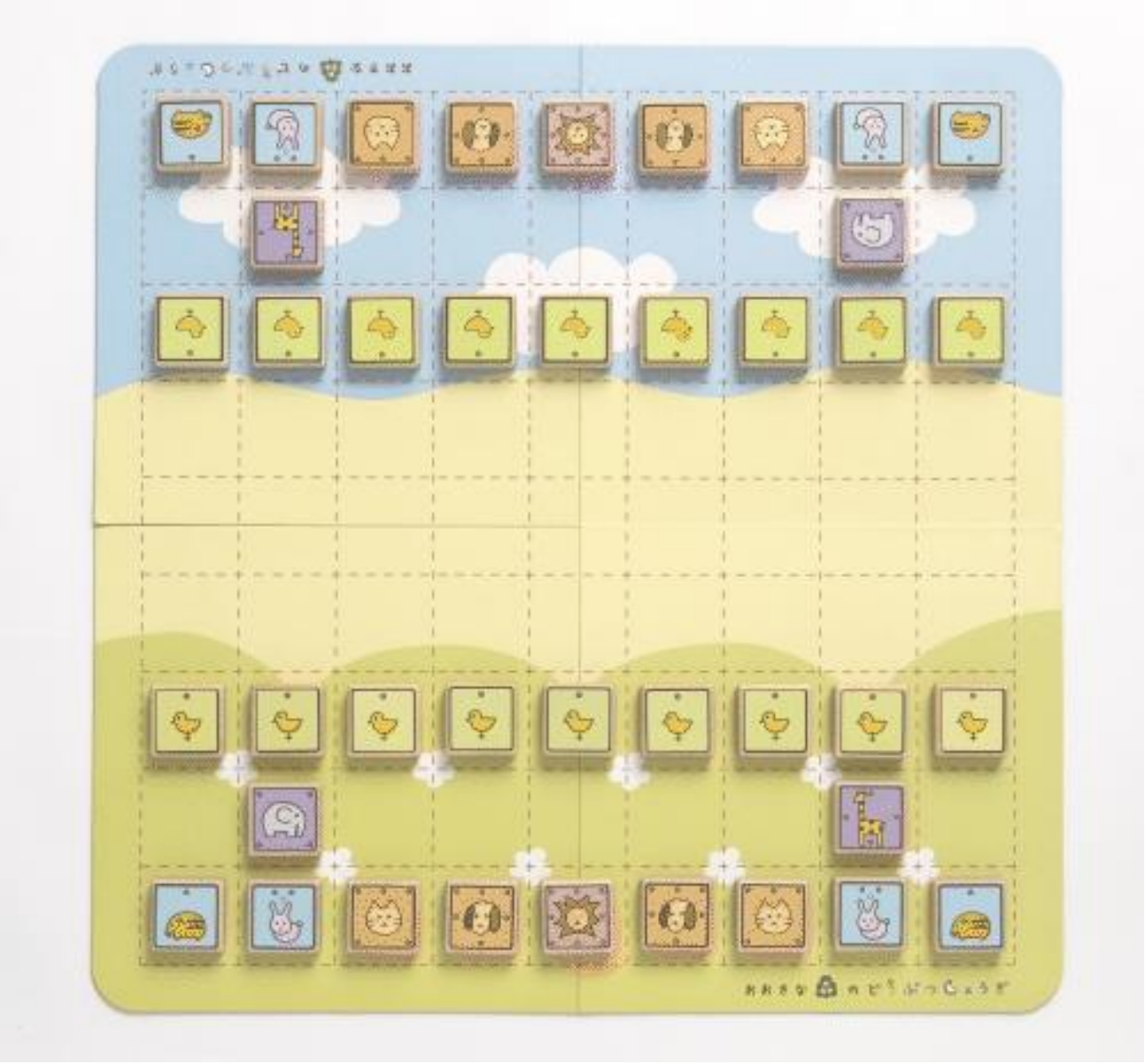


Figure 9. Shogi pieces and board with animal designs (designed for children). 「2017 年 11 月 小学館「おおきな森のどうぶつしょうぎ」発売のお知らせ」『株式会社ねこまど』 http://nekomado.com/entries/5811

Figure 10. Comparison of board diagrams within the same page. Notice the mix of abstract and pictographic glyphs in the second diagram: http://history.chess.free.fr/shogi.htm

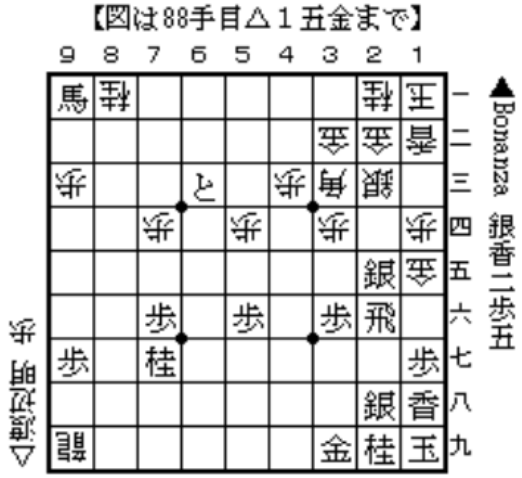


図 4　渡辺竜王 対 Bonanza（局面１）

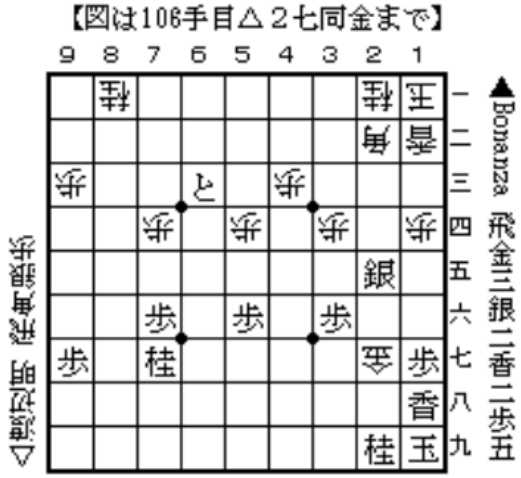


図 5　渡辺竜王 対 Bonanza（局面２）

よるプログラムに解答させたときの結果を示す．なお，評価値はモンテカルロ木探索の勝率を示している．

表 7　モンテカルロ木探索による図 4 の局面の評価

オーダー	指し手	評価値
1（最善手）	▲２七香	0.441
2	▲３七馬	0.407
3	▲３七銀打	0.401
…	…	…

渡辺竜王が最善手として示した▲２七香を選択できていることが分かる．モンテカルロ木探索では，playout が直線的な読みの働きをするため，このような局面では探索と評価関数による手法よりも良い結果が得られることが多い．

王手がかかるかといったことを重視しなければならない．多くの将棋プログラムでは，局面の進行度により評価関数のパラメータの値を変化させるなどの手法をとっているものの，あらゆる局面に対応できる評価関数の設計は不可能といえる．

モンテカルロ木探索では，駒割りや駒の働き，手番や玉の危険度など多くの項目を個別に評価することはなく，シミュレーションの勝率というゲームの知識に依存しない評価指標を用いるため，より汎用性のある局面の評価が可能である．

6. 今後の展望

本論文では，コンピュータ将棋ではモンテカルロ木探索により従来の手法を単純に上回ることは難しいと

Figure 11. Board diagrams in Japanese research on AI. http://www.hpcs.cs.tsukuba.ac.jp/~ysato/gpw08sato.pdf

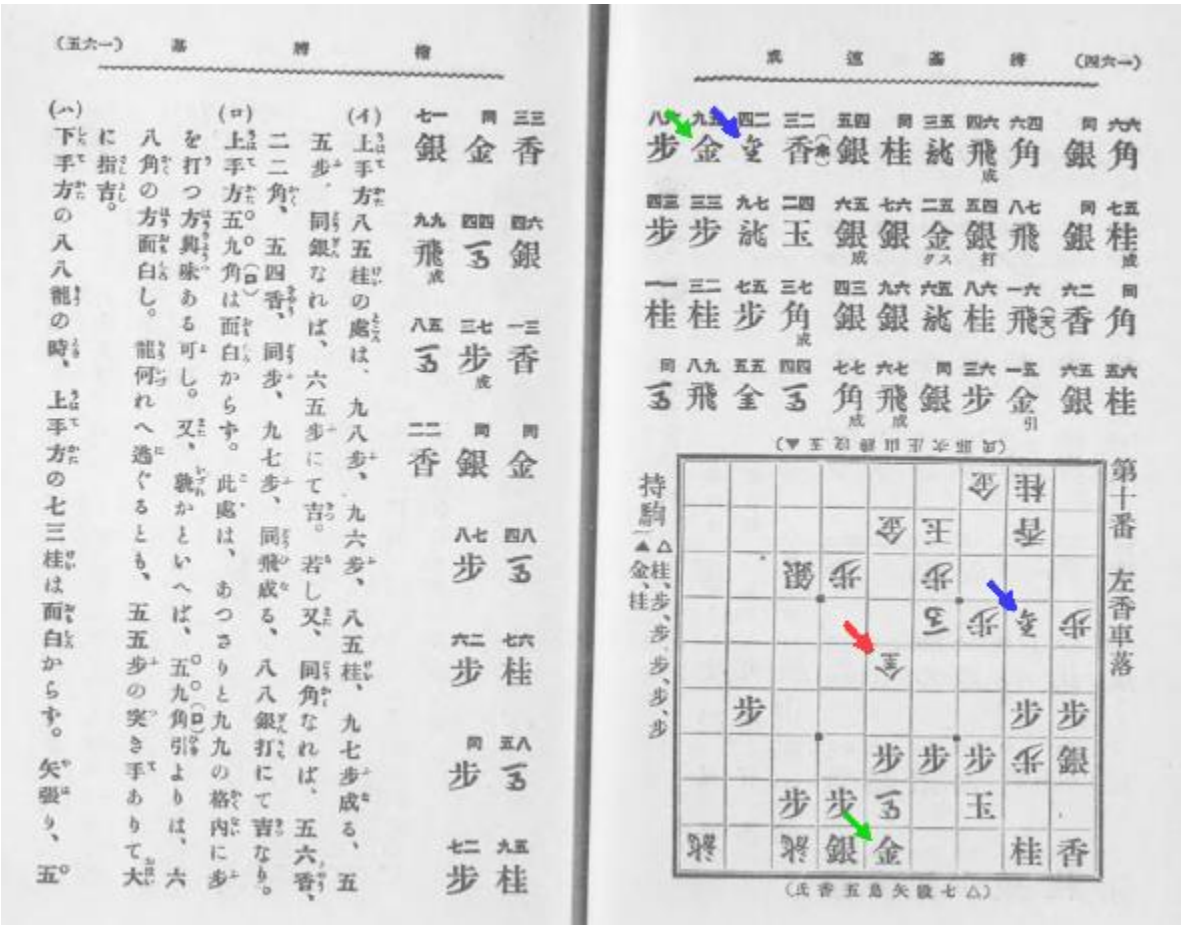
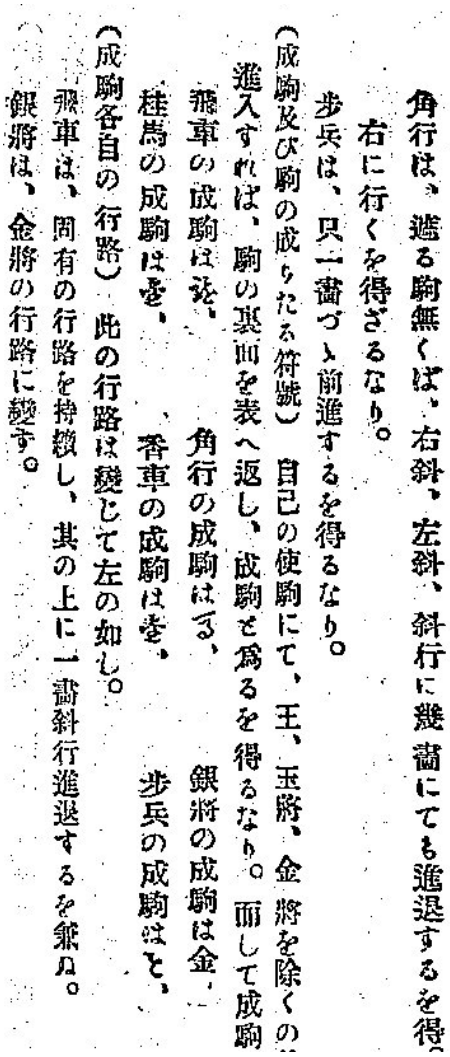


Figure 12. The PROMOTED SILVER (red) and the PROMOTED LANCE (blue) are expressed by different styles of the cursive 金 to distinguish from the ordinary GOLD GENERAL (green), as engraved on actual pieces. The PROMOTED ROOK and the PROMOTED BISHOP are also represented by cursive ideographs. 小野五平 (1913)『小野名人将棊速成』東亜堂書房, pp. 164-5. http://dl.ndl.go.jp/info:ndljp/pid/935899/82



角行は、遮る駒無くば、右斜、左斜、斜行に幾畫にても進退するを得
右に行くを得ざるなり。
歩兵は、只一畫づゝ前進するを得るなり。
（成駒及び駒の成りたる符號）　自己の使駒にて、王、玉將、金將を除くの
進入すれば、駒の裏面を表へ返し、成駒と爲るを得るなり。而して成駒
飛車の成駒は龍、　角行の成駒は馬、　銀將の成駒は金、
桂馬の成駒は圭、　香車の成駒は杏、　歩兵の成駒はと、
（成駒各自の行路）　此の行路は變じて左の如し。
飛車は、固有の行路を持續し、其の上に一畫斜行進退するを兼ね。
銀將は、金將の行路に變ず。

Figure 13. Cursive ideographs indicating each promoted piece in lines of text. 尚文館編輯局・編 (1910)『国民百科全書第四編』尚文館, p. 28. http://dl.ndl.go.jp/info:ndljp/pid/897521/184

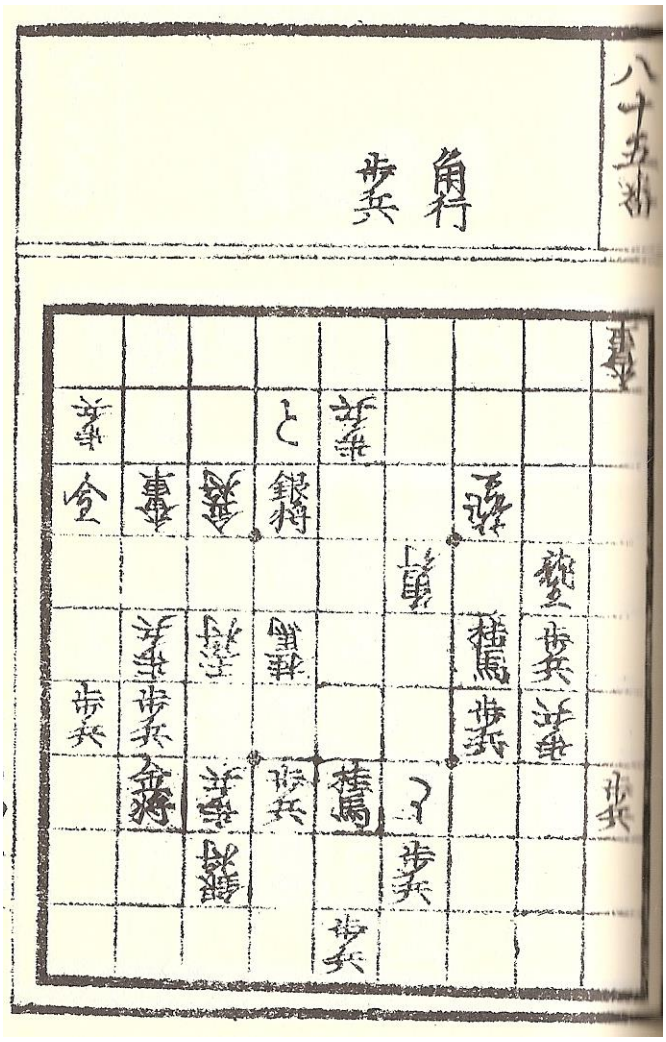


Figure 14. A diagram using multi-ideographic glyphs. 五代大橋宗桂 (1977)『将棋図式』将棋名著古典文庫 9, 東西文献, p. 43.

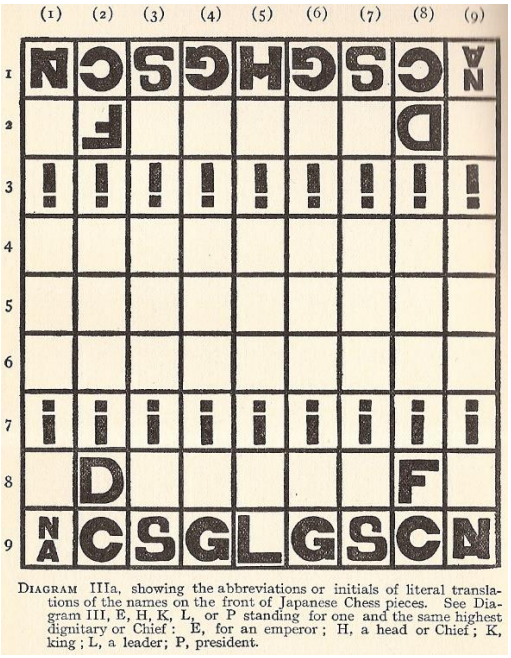
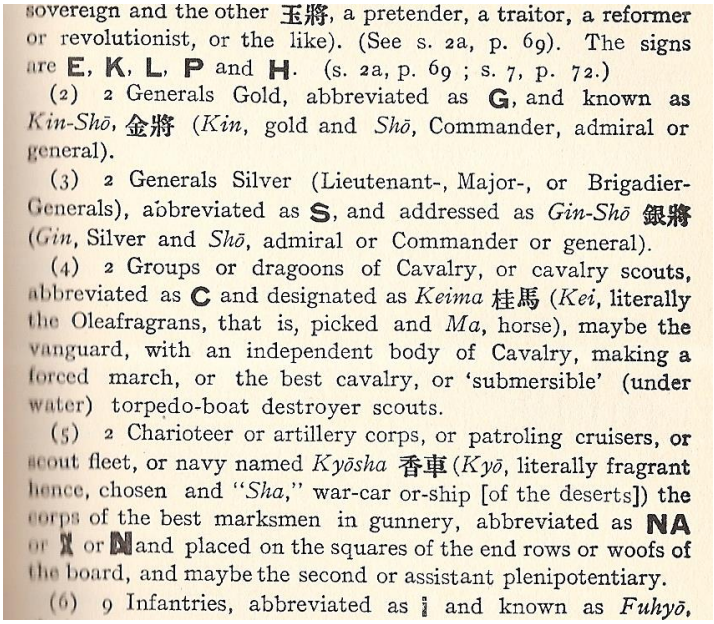


DIAGRAM IIIa, showing the abbreviations or initials of literal translations of the names on the front of Japanese Chess pieces. See Diagram III, E, H, K, L, or P standing for one and the same highest dignitary or Chief: E, for an emperor; H, a head or Chief; K, king; L, a leader; P, president.

Figure 15. A diagram with Latin-based symbols for the pieces. Cho-yo. 1905. *Japanese chess, sho-gi: the science and art of war or struggle philosophically treated*. Press Club of Chicago, p. 64.



sovereign and the other 玉將, a pretender, a traitor, a reformer or revolutionist, or the like). (See s. 2a, p. 69). The signs are **E**, **K**, **L**, **P** and **H**. (s. 2a, p. 69; s. 7, p. 72.)

(2) 2 Generals Gold, abbreviated as **G**, and known as *Kin-Shō*, 金將 (*Kin*, gold and *Shō*, Commander, admiral or general).

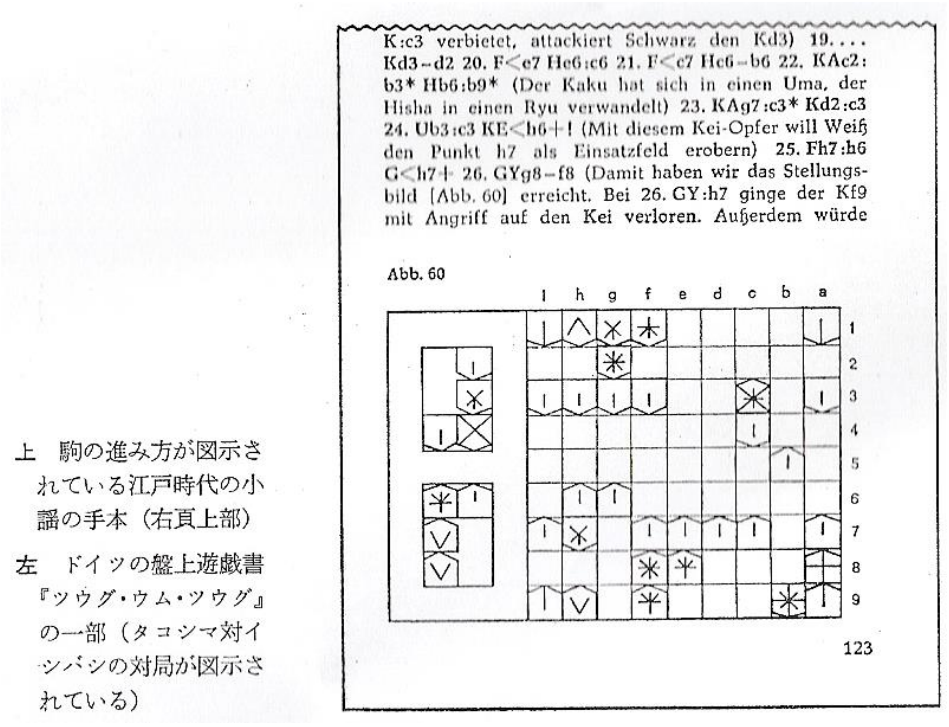
(3) 2 Generals Silver (Lieutenant-, Major-, or Brigadier-Generals), abbreviated as **S**, and addressed as *Gin-Shō* 銀將 (*Gin*, Silver and *Shō*, admiral or Commander or general).

(4) 2 Groups or dragoons of Cavalry, or cavalry scouts, abbreviated as **C** and designated as *Keima* 桂馬 (*Kei*, literally the Oleafragrans, that is, picked and *Ma*, horse), maybe the vanguard, with an independent body of Cavalry, making a forced march, or the best cavalry, or 'submersible' (under water) torpedo-boat destroyer scouts.

(5) 2 Charioteer or artillery corps, or patroling cruisers, or scout fleet, or navy named *Kyōsha* 香車 (*Kyō*, literally fragrant hence, chosen and "*Sha*," war-car or-ship [of the deserts]) the corps of the best marksmen in gunnery, abbreviated as **NA** or **A** or **N** and placed on the squares of the end rows or woofs of the board, and maybe the second or assistant plenipotentiary.

(6) 9 Infantries, abbreviated as **i** and known as *Fuhyō*,

Figure 16. These symbols are also used in lines of text. Ibid., p. 71.



K:c3 verbietet, attackiert Schwarz den Kd3) 19. . . . Kd3–d2 20. F<e7 He6:c6 21. F<c7 He6–b6 22. KAc2: b3* Hb6:b9* (Der Kaku hat sich in einen Uma, der Hisha in einen Ryu verwandelt) 23. KAg7:c3* Kd2:c3 24. Ub3:c3 KE<h6+! (Mit diesem Kei-Opfer will Weiß den Punkt h7 als Einsatzfeld erobern) 25. Fh7:h6 G<h7+ 26. GYg8–f8 (Damit haben wir das Stellungsbild [Abb. 60] erreicht. Bei 26. GY:h7 ginge der Kf9 mit Angriff auf den Kei verloren. Außerdem würde

Abb. 60

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上　駒の進み方が図示されている江戸時代の小謡の手本（右頁上部）

左　ドイツの盤上遊戯書『ツウグ・ウム・ツウグ』の一部（タコシマ対イシバシの対局が図示されている）

Figure 17. A diagram with abstract glyphs found in a book published in Germany. 増川宏一 (1977)『ものと人間の文化史 23-1 将棋 I』法政大学出版局, p. 130.

Figure 18. A typical diagram using mono-ideographic notation. PROMOTED SILVER and the PROMOTED KNIGHT are represented by stacked ideographic symbols. 内藤國雄ほか・監修 (2013)『NHK 杯伝説の名勝負 次の一手』NHK 将棋シリーズ, NHK 出版, p. 185.

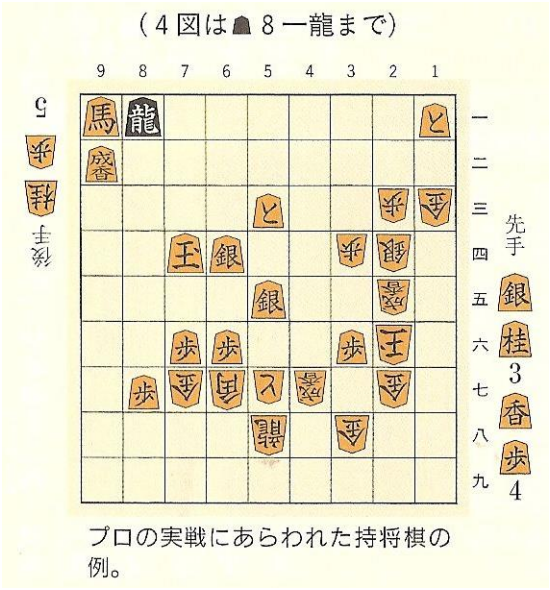

Figure 19 (right). A diagram with enclosed ideographic symbols. Pieces in hand (*mochigoma*, 持ち駒) are also expressed by enclosed ones. 羽生善治 (2015)『羽生善治の将棋入門 ジュニア版』河出書房新社, p. 42.

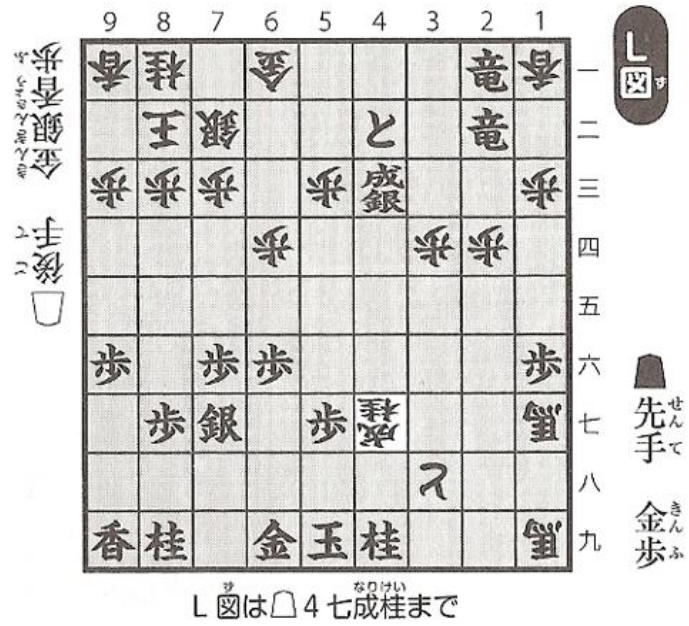

Figure 20. A diagram showing two Kings that are distinguished each other as 王 and 玉. 橋本崇載, 村川和宏 (2015)『マンガでマスター 将棋教室』ポプラ社, p. 159.