Universal Multiple-Octet Coded Character Set
International Organization for Standardization
Organisation internationale de normalisation
Международная организация по стандартизации

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1. Introduction

The orthodox chess pieces have been encoded since Unicode 1.1. Perhaps surprisingly, most currently available chess fonts do not make use of these characters: they either use ASCII and Latin-1 code positions, or they use Private Use Area code positions via the old MS Windows Symbols encoding mapped to U+F000..F0FF. It would appear that the primary reason chess fonts do not use UCS characters is that there is no standardized mechanism to use these characters to prepare chess diagrams, which require chesspieces to be displayed on both light and dark squares. From time to time suggestions have been made regarding encoding a set of chess-characters-on-dark-squares but the response has normally been "use a higher-level protocol". (See §3 below.) No robust and interchangeable protocol of that kind exists, and the older fonts have not been replaced. This document proposes that standardized variation sequences could solve the problem, making chess diagrams interchangeable, permitting the parsing of chess diagram data, and facilitating simple font changes.

2. Current font implementations

There are many chess fonts available and have been since the early 1990s. One repository for these is at http://www.enpassant.dk/chess/fonteng.htm. A variety of different encodings for chessboard notation are used in those fonts. This lack of standardization does not benefit the chess community, and prevents easy interchange of chess problems. Most of the chess fonts used currently do not make use of the characters encoded at U+2654..265F.

The Chess Leipzig font by prolific chess-font designer Armando H. Marroquin is a classic font inspired by a German chess book from the beginning of the 20th century. It uses PUA code positions with the MS Windows Symbols encoding, which maps them (or at least did in older environments) to ASCII characters, so that people could type them easily. Thus a white king on a light square would be "k", a white king on a dark square "K", with the corresponding black kings on "l" and "L", adjacent on the keyboard. Queen is on "q" and "Q" and adjacent "w" and "W"; rook is on "r" and "R" and adjacent "t" and "T"; bishop is on "b" and "B" and adjacent "v" and "V"; knight is on "n" and "N" and adjacent "m" and "M"; and pawn is on "p" and "P" and adjacent "o" and "O".

F06B (k)		F04B (K)		F06C (l)		F04C (L)
F071 (q)		F051 (Q)		F077 (w)		F057 (W)
F072 (r)		F052 (R)		F074 (t)		F054 (T)
F062 (b)		F042 (B)		F076 (v)		F056 (V)
F06E (n)		F04E (N)		F06D (m)		F04D (M)
F070 (p)		F050 (P)		F06F (o)		F04F (O)

The Chess Berlin font by Eric Bentzen is based on the familiar design from the East German "Sportverlag", which published many popular chess books. It does the same thing, but the black bishop, white knight, and black knight are mapped to *different* PUA characters (and ASCII equivalents). A chart set in one of the fonts will be corrupted if the font is changed from Leipzig to Berlin or vice-versa. King is on "k" and "K" and adjacent "l" and "L"; white queen is on "q" and "Q" and black queen on adjacent "w" and "W"; white rook is on "r" and "R" and black rook on adjacent "t" and "T"; white bishop is on "b" and "B" and black bishop on adjacent "n" and "N"; white knight is on "h" and "H" and black knight on adjacent "j" and "J"; and white pawn is on "p" and "P" and black pawn on adjacent "o" and "O".

	F06B (k)		F04B (K)		F06C (l)		F04C (L)
	F071 (q)		F051 (Q)		F077 (w)		F057 (W)
	F072 (r)		F052 (R)		F074 (t)		F054 (T)
	F062 (b)		F042 (B)		F06E (n)		F04E (N)
	F068 (h)		F04E (H)		F06A (j)		F04D (J)
	F070 (p)		F050 (P)		F06F (o)		F04F (O)

Alastair Scott's Chess font, based on a font called Cheq, follows the same encoding that the Chess Berlin font does.

	F06B (k)		F04B (K)		F06C (l)		F04C (L)
	F071 (q)		F051 (Q)		F077 (w)		F057 (W)
	F072 (r)		F052 (R)		F074 (t)		F054 (T)
	F062 (b)		F042 (B)		F06E (n)		F04E (N)
	F068 (h)		F04E (H)		F06A (j)		F04D (J)
	F070 (p)		F050 (P)		F06F (o)		F04F (O)

The Chess Utrecht font by Hans Bodlaender is modern and stylized, with a rather different encoding. White king is on "k" and "l" and black king on "K" and "L"; white queen is on "q" and "w" and black queen on "Q" and "W"; white rook is on "r" and "t" and black rook on "R" and "T"; white bishop is on "b" and "n" and black bishop on "B" and "N"; white knight is on "n" and "m" and black knight on "N" and "M"; and white pawn is on "p" and "o" and black pawn on "P" and "O".

	006B (k)		F06C (l)		F04B (K)		F04C (L)
	F071 (q)		F077 (w)		F051 (Q)		F057 (W)
	F072 (r)		F074 (t)		F052 (R)		F054 (T)
	0062 (b)		F06E (n)		F042 (B)		F04E (N)
	F06E (n)		F06D (m)		F04E (N)		F04D (M)
	F070 (p)		F06F (o)		F050 (P)		F04F (O)

The Chess Kingdom font, also by Armando H. Marroquin, uses the same encoding as his Chess Leipzig.

	F06B (k)		F04B (K)		F06C (l)		F04C (L)
	F071 (q)		F051 (Q)		F077 (w)		F057 (W)
	F072 (r)		F052 (R)		F074 (t)		F054 (T)
	F062 (b)		F042 (B)		F076 (v)		F056 (V)
	F06E (h)		F04E (H)		F06D (m)		F04D (M)
	F070 (p)		F050 (P)		F06F (o)		F04F (O)

The Chess Skak font by Egon Madsen uses actual ASCII characters (not MS Windows Symbol characters), Danish piece names Konge, Dronning, Tårn, Løber, Springer, Bonde inspire the mapping. Thus white king is on "k" and "i" and black king on "K" and "I"; white queen is on "d" and "e" and

black queen on "D" and "E"; white rook is on "t" and "y" and black rook on "T" and "Y"; white bishop is on "l" and "o" and black bishop on "L" and "O"; white knight is on "s" and "w" and black knight on "S" and "W"; and white pawn is on "b" and "g" and black pawn on "B" and "G".

♔	006B (k)	♕	0069 (i)	♚	004B (K)	♛	F049 (I)
♕	0064 (d)	♕	0065 (e)	♛	0044 (D)	♛	F045 (E)
♖	0074 (t)	♖	0079 (y)	♜	0054 (T)	♜	F059 (Y)
♗	006C (l)	♗	006F (o)	♝	004C (L)	♝	F04F (O)
♘	0073 (s)	♘	0077 (w)	♞	0053 (S)	♞	F057 (W)
♙	0062 (b)	♙	0067 (g)	♟	0042 (B)	♟	F047 (G)

The Chess Diagramm Pirat font by Klaus Wolf is encoded using the same PUA range that the MS Windows Symbol fonts are mapped to, but it simply puts them in code-chart order vis à vis ASCII (though there are no graphic characters in the range U+0082..008C).

♔	F072 (r)	♔	F078 (x)	♚	F07E (~)	♛	F087
♕	F073 (s)	♕	F079 (y)	♛	F082	♛	F088
♖	F074 (t)	♖	F07A (z)	♜	F083	♜	F089
♗	F075 (u)	♗	F07B ({)	♝	F084	♝	F08A
♘	F076 (v)	♘	F07C (|)	♞	F085	♞	F08B
♙	F077 (w)	♙	F07D (})	♟	F086	♟	F08C

The 1Echecs font handles the problem in a completely different way. First, the white queen, white rook, and black rook are composed by using left- and right-half pieces (the font has these to construct some characters used in Fairy Chess). Apart from that, there is some mapping to French piece names (Roi, Dame, Tour, Fou, Cavalier, Pion). The shading for dark squares is likewise implemented in two parts, so for the white king, for instance, the sequence F030 + F031 + F072 ♔ is used.

♔	F072 (r)	♔	F030 F031 F072 (01r)	♚	F052 (R)	♛	F030 F031 F052 (01R)
♕	F064 F065 (de)	♕	F032 F033 F064 F065 (23de)	♛	F044 (D)	♛	F032 F033 F044 (23D)
♖	F0E8 F0E9 (èé)	♖	F034 F035 F0E8 F0E9 (45èé)	♜	F0EA F0BF (ê¿)	♜	F034 F035 F0EA F0BF (45ê¿)
♗	F066 (f)	♗	F036 F037 F066 (67f)	♝	F046 (F)	♝	F036 F027 F046 (67F)
♘	F063 (c)	♘	F038 F039 F063 (89c)	♞	F043 (C)	♞	F038 F039 F043 (89C)
♙	F070 (p)	♙	F028 F029 F070 (()xp)	♟	F050 (P)	♟	F028 F029 F050 (()P)

3. Other possible solutions

It has been suggested that "the right way to do this" is for the Chess community to devise some sort of "Chess ML", a specialized markup language which could be used to invoke chess font glyphs in some other way than by using variation selectors. This does not make sense. The heyday of invention of markup languages was the late 1990s. SGML was all the rage for a while, but HTML wasn't a compliant subset of it, and has since been absorbed into XML. If the chess community had wanted some such markup language, they would have long ago been able to settle on one. But it still does not make sense.

- It would take considerable effort to devise Chess ML, and even then the end result would be little more than a complicated mechanism for font presentation—which the chess community already have, though their current font solutions are not readily interchangeable and do not use UCS chess characters. Chess diagrams have been set in type using simple blocks of lead-type glyphs, and latterly simple font glyphs in various ASCII hack fonts as described above. Simple UCS-compliant OpenType fonts are all that is required now.
- The chess community's preferred way of doing it is *already* by means of nothing more than fonts. With the scheme proposed here, the only change needed would be to reconfigure existing fonts to

be compliant fonts which will work in applications which support OpenType substitutions. Then chess diagram data will be useful to UCS-compliant applications.

- Chess ML would be pointless unless software developers and browser developers were to buy into it. Possibly Chess ML could be implemented in browsers. But are browsers the principle place where chess diagrams are to be presented? Will Chess ML be compatible with HTML? Or XML? Or Wiki markup? Will it be supported by word processors? By typesetting programs like Quark XPress and InDesign? By Microsoft Word or OpenOffice? In other applications? Can Chess ML text be copied and pasted into plain-text e-mails and read by the recipient? The answer is "No!" Mathematical markup language requires very specialized software and can't just be pasted into an e-mail or Quark XPress and be rendered. Music markup languages don't seem to use UCS characters much, and that text isn't copy-and-pasteable between them. The scheme proposed here is both simple and useful, so long as a given application can render fonts with simple OpenType substitution sequences. There's no reason that chess diagrams need to fail in environments where markup isn't an option.

In the solution proposed here, a chess diagram is a simple an eight-line paragraph of text with 16 characters per line (or a 10-line paragraph with 20 characters if borders are to be displayed). *That* is a stable data structure which can be reliably parsed for conversion *to* narrative text description, or which can be devised *from* properly structured narrative text descriptions.

A chess diagram is a meaningful paragraph of text.

4. Proposed variation sequences

Standardized variation sequences offer a solution to this glyph-level alignment ambiguity by using one variation selector, VS1 (U+FE00), to indicate pieces on a light square, and another, VS2 (U+FE01), to indicate pieces on a dark square. Pieces for both chess and draughts are given, as are two geometric shapes which are to be used to represent unoccupied board squares, two geometric shapes to represent valid moves for white and black pieces, and eight geometric elements for board borders. A font with an appropriately-built OpenType glyph substitution mapping can enable these distinctions to be shown and preserved in plain text. Below is a complete list of the proposed sequences as they would appear in the StandardizedVariants.txt file.

```
# Chesspiece on light versus Chesspiece on dark variation sequences
25A1 FE00; Chessboard light square; # WHITE SQUARE
25A1 FE01; Chessboard light square with x; # WHITE SQUARE
25A8 FE00; Chessboard dark square with x; # SQUARE WITH UPPER RIGHT TO LOWER LEFT FILL
25A8 FE01; Chessboard dark square; # SQUARE WITH UPPER RIGHT TO LOWER LEFT FILL
2654 FE00; Chesspiece on light square; # WHITE CHESS KING
2654 FE01; Chesspiece on dark square; # WHITE CHESS KING
2655 FE00; Chesspiece on light square; # WHITE CHESS QUEEN
2655 FE01; Chesspiece on dark square; # WHITE CHESS QUEEN
2656 FE00; Chesspiece on light square; # WHITE CHESS ROOK
2656 FE01; Chesspiece on dark square; # WHITE CHESS ROOK
2657 FE00; Chesspiece on light square; # WHITE CHESS BISHOP
2657 FE01; Chesspiece on dark square; # WHITE CHESS BISHOP
2658 FE00; Chesspiece on light square; # WHITE CHESS KNIGHT
2658 FE01; Chesspiece on dark square; # WHITE CHESS KNIGHT
2659 FE00; Chesspiece on light square; # WHITE CHESS PAWN
2659 FE01; Chesspiece on dark square; # WHITE CHESS PAWN
265A FE00; Chesspiece on light square; # BLACK CHESS KING
265A FE01; Chesspiece on dark square; # BLACK CHESS KING
265B FE00; Chesspiece on light square; # BLACK CHESS QUEEN
265B FE01; Chesspiece on dark square; # BLACK CHESS QUEEN
265C FE00; Chesspiece on light square; # BLACK CHESS ROOK
265C FE01; Chesspiece on dark square; # BLACK CHESS ROOK
265D FE00; Chesspiece on light square; # BLACK CHESS BISHOP
265D FE01; Chesspiece on dark square; # BLACK CHESS BISHOP
265E FE00; Chesspiece on light square; # BLACK CHESS KNIGHT
265E FE01; Chesspiece on dark square; # BLACK CHESS KNIGHT
265F FE00; Chesspiece on light square; # BLACK CHESS PAWN
265F FE01; Chesspiece on dark square; # BLACK CHESS PAWN
26AA FE00; Medium white circle on light square; # MEDIUM WHITE CIRCLE
26AA FE01; Medium white circle on dark square; # MEDIUM WHITE CIRCLE
26AB FE00; Medium black circle on light square; # MEDIUM BLACK CIRCLE
26AB FE01; Medium black circle on dark square; # MEDIUM BLACK CIRCLE
26C0 FE00; Draughts piece on light square; # WHITE DRAUGHTS MAN
26C0 FE01; Draughts piece on dark square; # WHITE DRAUGHTS MAN
26C1 FE00; Draughts piece on light square; # WHITE DRAUGHTS KING
26C1 FE01; Draughts piece on dark square; # WHITE DRAUGHTS KING
```

```
26C2 FE00; Draughts piece on light square; # BLACK DRAUGHTS MAN
26C2 FE01; Draughts piece on dark square; # BLACK DRAUGHTS MAN
26C3 FE00; Draughts piece on light square; # BLACK DRAUGHTS KING
26C3 FE01; Draughts piece on dark square; # BLACK DRAUGHTS KING
2581 FE00; Chessboard single border; # LOWER ONE EIGHTH BLOCK
2581 FE01; Chessboard double border; # LOWER ONE EIGHTH BLOCK
258F FE00; Chessboard single border; # LEFT ONE EIGHTH BLOCK
258F FE01; Chessboard double border; # LEFT ONE EIGHTH BLOCK
2594 FE00; Chessboard single border; # UPPER ONE EIGHTH BLOCK
2594 FE01; Chessboard double border; # UPPER ONE EIGHTH BLOCK
2595 FE00; Chessboard single border; # RIGHT ONE EIGHTH BLOCK
2595 FE01; Chessboard double border; # RIGHT ONE EIGHTH BLOCK
2596 FE00; Chessboard single border; # QUADRANT LOWER LEFT
2596 FE01; Chessboard double border; # QUADRANT LOWER LEFT
2597 FE00; Chessboard single border; # QUADRANT LOWER RIGHT
2597 FE01; Chessboard double border; # QUADRANT LOWER RIGHT
2598 FE00; Chessboard single border; # QUADRANT UPPER LEFT
2598 FE01; Chessboard double border; # QUADRANT UPPER LEFT
259D FE00; Chessboard single border; # QUADRANT UPPER RIGHT
259D FE01; Chessboard double border; # QUADRANT UPPER RIGHT
```

The table below demonstrates an actual implementation—using an OpenType chess font with an appropriately-built glyph substitution mapping—that uses VS1 and VS2 as described above for all of the eighteen characters in this proposal. For the use of VS1 and VS2 that produces dotted squares see 5.1.

Code	Char.	VS1	VS2
25A1	□		×
25A8	▨	▨	▨
2654	♔	♔	♔
2655	♕	♕	♕
2656	♖	♖	♖
2657	♗	♗	♗
2658	♘	♘	♘
2659	♙	♙	♙
265A	♚	♚	♚
265B	♛	♛	♛
265C	♜	♜	♜
265D	♝	♝	♝
265E	♞	♞	♞
265F	♟	♟	♟
26AA	○	○	◎
26AB	●	●	●
26C0	⛀	⛀	⛀
26C1	⛁	⛁	⛁
26C2	⛂	⛂	⛂
26C3	⛃	⛃	⛃
2581	▁	▁	▁
258F	▏	▏	▏
2594	▔	▔	▔
2595	▕	▕	▕
2596	▖	▖	▖
2597	▗	▗	▗
2598	▘	▘	▘
259D	▝	▝	▝

5. Game board borders

In order to draw the most common game board borders, a chess font should contain eight Block Element characters, designed to match the width and height of the font's board square. These can draw a border around the diagram. Many of the ASCII chess fonts have characters for both single- and double-rule borders, so this will facilitate mapping of data to be converted to UCS format. To draw a box around a single row of half a chessboard with a knight on one square, the following characters would be used. For the box on the left, each block element character would be followed by FE00 (the sequences shown above the graphic examples); for the box on the right, each block element character would be followed by FE01 (the sequences shown below the graphic examples).

Top line:	2597 FE00 2581 FE00 2581 FE00 2581 FE00 2581 FE00 2596 FE00
Middle line:	2595 FE00 25A1 FE00 25A8 FE01 265E FE00 25A8 FE01 258F FE00
Bottom line:	259D FE00 2594 FE00 2594 FE00 2594 FE00 2594 FE00 2598 FE00
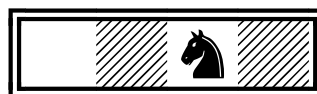
Top line:	2597 FE01 2581 FE01 2581 FE01 2581 FE01 2581 FE01 2596 FE01
Middle line:	2595 FE01 25A1 FE00 25A8 FE01 265E FE00 25A8 FE01 258F FE01
Bottom line:	259D FE01 2594 FE01 2594 FE01 2594 FE01 2594 FE01 2598 FE01

The use of variation selectors enables a compliant font to support both box-drawing and chess. They also map one-to-one to the ASCII and MS Windows Symbol characters used for creating border rules in pre-Unicode legacy fonts. The notes in parentheses below refer to mappings for single-rule borders. See Figure 3.

2581	_	LOWER ONE EIGHTH BLOCK	(maps to LOW LINE _ in the Skak font)
258F	┃	LEFT ONE EIGHTH BLOCK	(maps to ┃ VERTICAL LINE)
2594	▔	UPPER ONE EIGHTH BLOCK	(maps to - HYPHEN-MINUS)
2595	▕	RIGHT ONE EIGHTH BLOCK	(maps to \ REVERSE SOLIDUS)
2596	▖	QUADRANT LOWER LEFT	(maps to) RIGHT PARENTHESIS)
2597	▗	QUADRANT LOWER RIGHT	(maps to 9 DIGIT NINE)
2598	▘	QUADRANT UPPER LEFT	(maps to = EQUALS SIGN)
259D	▝	QUADRANT UPPER RIGHT	(maps to 0 DIGIT ZERO)

6. Valid moves

Valid moves are indicated in two ways in chess notation; these are used in didactic materials. Some boards show an × in squares where a particular piece can move, and some use a black circle to show where black pieces can move, and a white circle to show where white pieces can move. In this scheme, the × notation is handled as a state of the basic light and dark board squares. This gives valuable feedback to the user since otherwise an indeterminate state might arise. Since □ + VS1 = [ ] and ▨ + VS2 = ▨, the alternate forms □ + VS2 = [×] and ▨ + VS1 = ▨ allow the user to know if the wrong VS is being used, or to choose explicitly the one that shows the × within a particular square. Visual feedback will be the mnemonic. In the convention where circles are used, this scheme uses the following sequences: 26AA ○ + VS1 = [○], ○ + VS2 = ▨, 26AB ● + VS1 = [●], ● + VS2 = ▨. Below examples of chessboards using this notation are given, alongside paragraphs of chess-diagram text are given in an OpenType font configured according to this proposal.
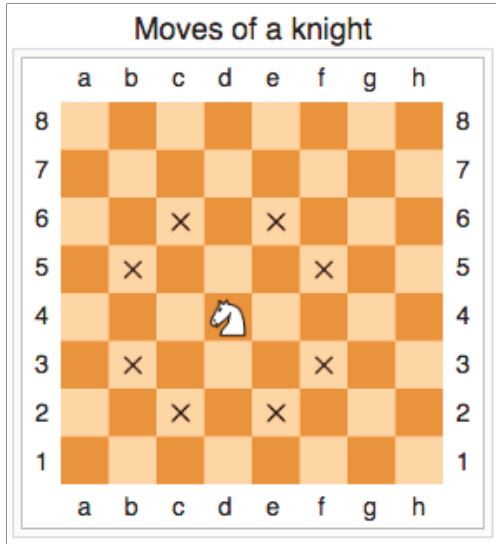
Moves of a knight
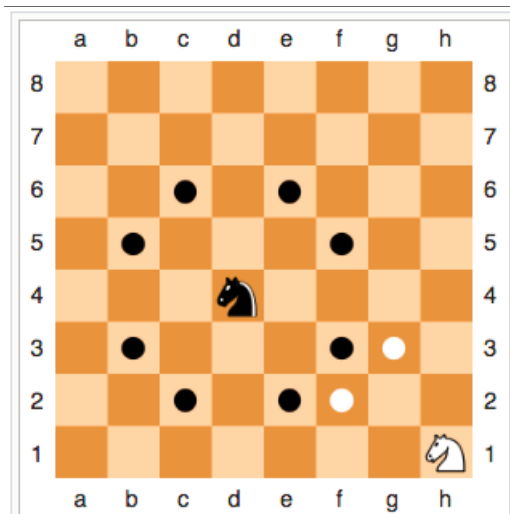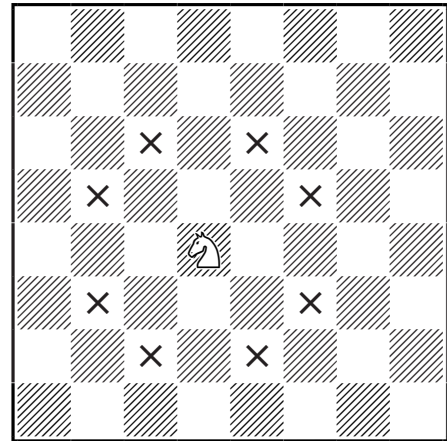
The black knight may move to any of eight squares (black dots). The white knight in this case is limited to two squares (white dots).
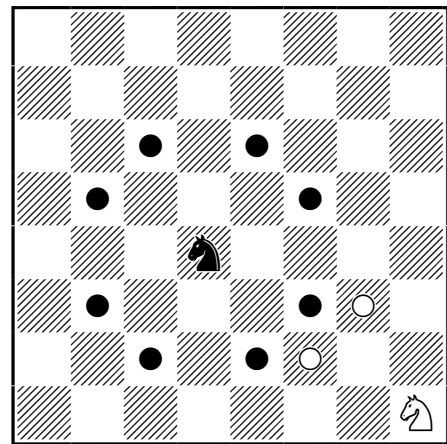
The Black Knight may move to any of eight squares (black dots). The white knight in this case is limited to two squares (white dots).

7. Figures

Figure 1. The example below demonstrates the Chess Condal font using Variation Sequences to represent a chessboard diagram, and also to repres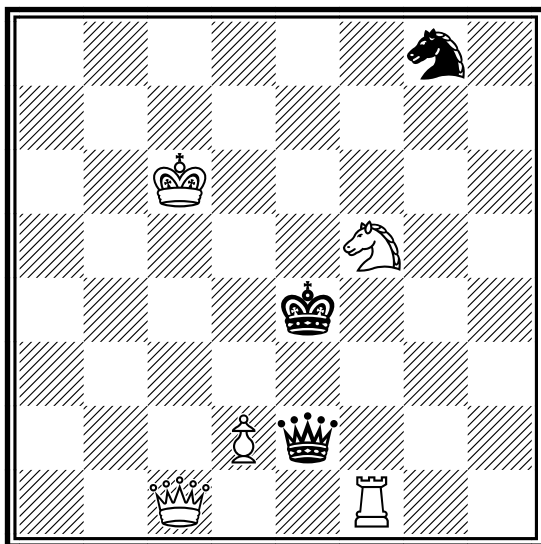ent a passage of text with inline chess characters without any variation selectors. The table itself is set in 24 points on 24-point leading. This is the diagram from the beginning of Lewis Carroll's *Through the Looking-Glass and What Alice Found There*.

White Pawn (Alice) to play, and win in eleven moves.

RED

WHITE

1. Alice ♙ d2 meets Red Queen ♛
2. Alice ♙ d2–d3 (*by railway*)
   ♙ d3–d4 (*Tweedledum and Tweedledee*)
3. Alice ♙ d4 meets White Queen ♕ (*with shawl*)
4. Alice ♙ d4–d5 (*shop, river, shop*)
5. Alice ♙ d5–d6 (*Humpty Dumpty*)
6. Alice ♙ d6–d7 (*forest*)
7. White Knight ♘ f5 x e7 takes Red Knight ♞
8. Alice ♙ d7–d8 (*coronation*)
9. Alice ♙ becomes Queen ♕
10. Alice ♕ d8 castles (*feast*)
11. Alice ♕ takes Red Queen ♛ & wins

1. Red Queen ♛ e2–h5
2. White Queen ♕ c1–c4 (*after shawl*)

3. White Queen ♕ c4–c5 (*becomes sheep*)
4. White Queen ♕ c4–f8 (*leaves egg on shelf*)
5. White Queen ♕ f8–c8 (*flying from Red Knight*)
6. Red Knight ♞ g8–e7+ (*check*)
7. White Knight ♘ e7–f5
8. Red Queen ♛ h5–e8 (*examination*)
9. Queens ♕ ♛ castle
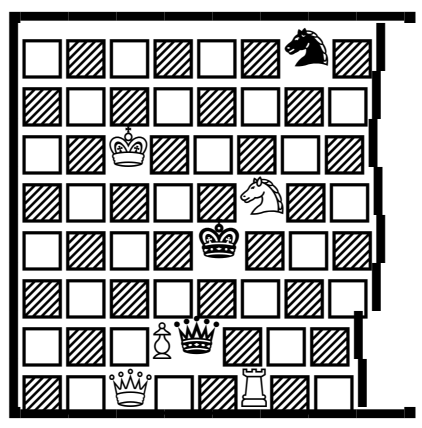10. White Queen ♕ c8–a6 (*soup*)

Figure 2. Examples of the Looking-Glass diagram set various fonts and encodings. Top left is the plain-text version of the ASCII-encoded font Skak (displayed on the left in 14-points Courier on 17-point leading, tracked to give a more square impression; to its right is the same ASCII text displayed in the Chess Skak font in 14p/17p. In the second row the same diagram is set on the left in plain text in Chess Condal (18p/18p), displayed right-justified and encoded without variation selectors on the left; on its right, the same with VS inserted and activated. In the bottom row the text is set in Ludus (20p/22p), on the left force-justified with OpenType features turned off (with the font showing glyphs for the variation selectors) and on the right with OpenType features turned on. The tables set in Condal and Ludus are can still be read in plain text, though the result is not beautiful.
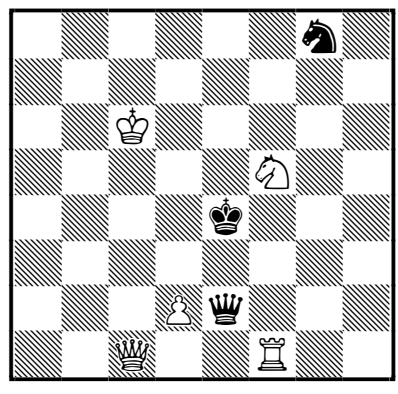
Fallback	Properly rendered
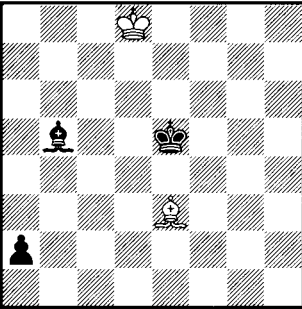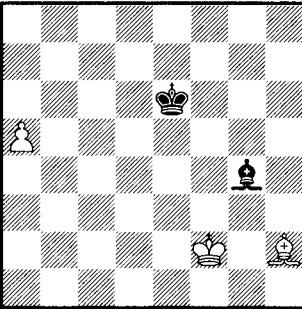
Figure 3. Above, two problems from *Enciklopedija Šahovskih Završnica*, 1993. Below, these have been re-set below using two fonts implementing the Variation Sequences, Ludus on the left (18pt on 18pt leading) and Chess Condal on the right (20pt on 20pt leading).

♘ ♗ 6/a

1327. GRAAFLAND*
Tidskrift 1916

1328. BERGER
1922

1. ?   =   1. ?   =

1327.   **1.** ♗h6 ♔f6 **2.** ♗d2 a1♕ **3.** ♗c3=

1328.   **1.** a6 ♗f5 **2.** ♔f3 [2. ♔e3 ♗h3 3. ♔f3 ♗f1 4. a7 ♗c4 △ ♗d5=] ♗d3! [2... ♔d5? 3. a7 ♗e4 4. ♔e3+−] **3.** a7 ♗c4 **4.** a8♕ ♗d5=

Interchange of data in this format will facilitate font change for presentation, but also provide a regularly formatted plain text which can be analysed; game-play positions could also be reciprocally generated from base data on moves and turns. This would be of great benefit to chess enthusiasts.

Figure 4. Diagram for the initial position in Turkish Draughts (Dama), set in Ludus in 24 points with 26-point leading using Variation Sequences. Below, the same shown without a border.
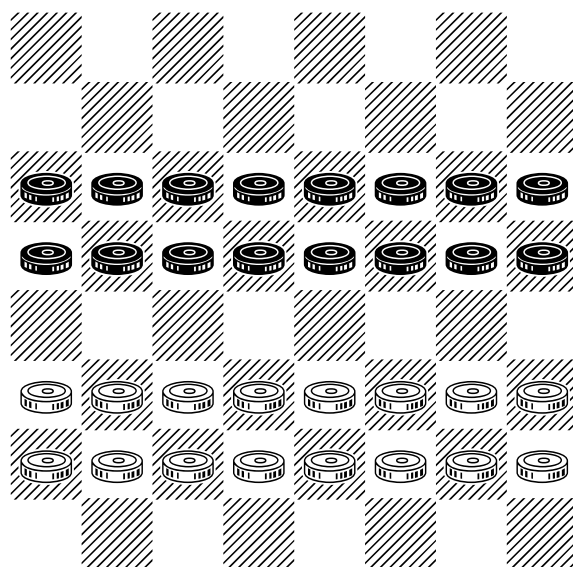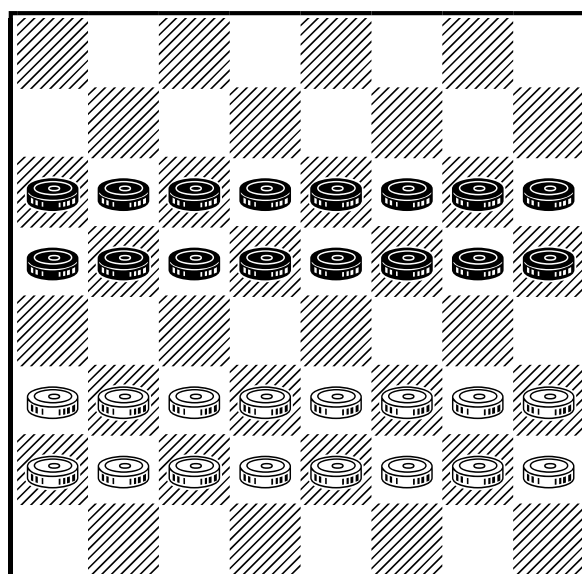
Figure 5. Diagram for a problem in Canadian Draughts. This larger-than-usual board size is no problem to set in plain text, displayed with variation sequences.
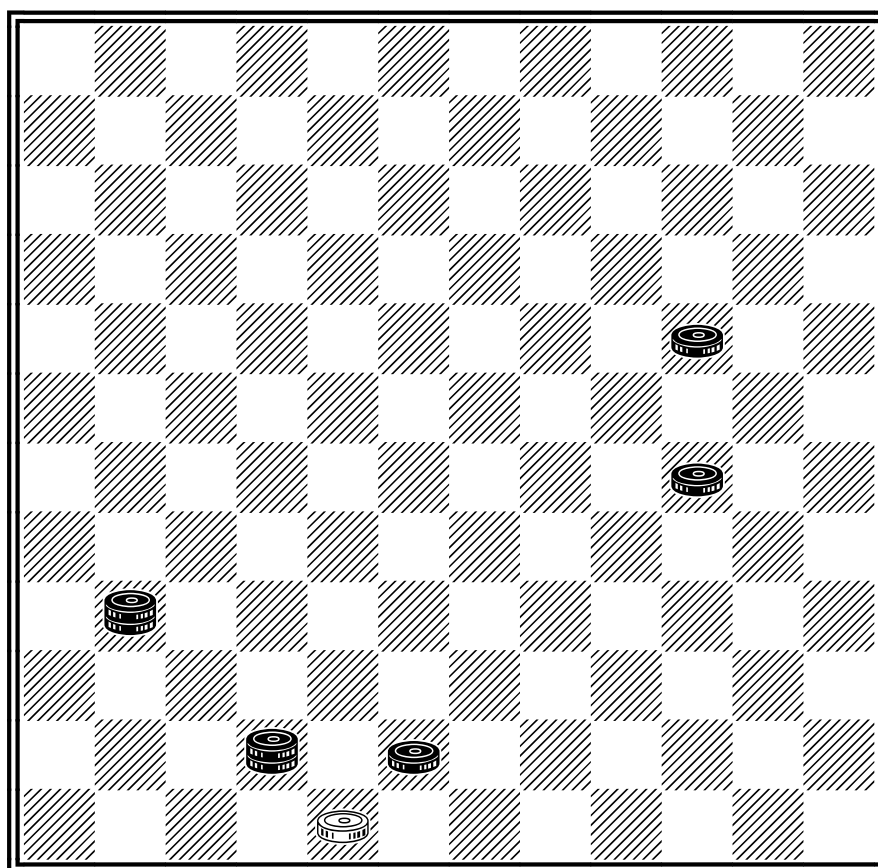
Figure 6. Suggestions have been made that using font ligation rather than variation-selector sequences could be a solution. The problem with this is that it leads to a variation in line length from diagram to diagram depending on how many pieces are on the board and on which row and column they happen to be. A scheme with a regular number of characters is more easily parseable, and more legible even in fallback.

Scheme using ligation between certain characters
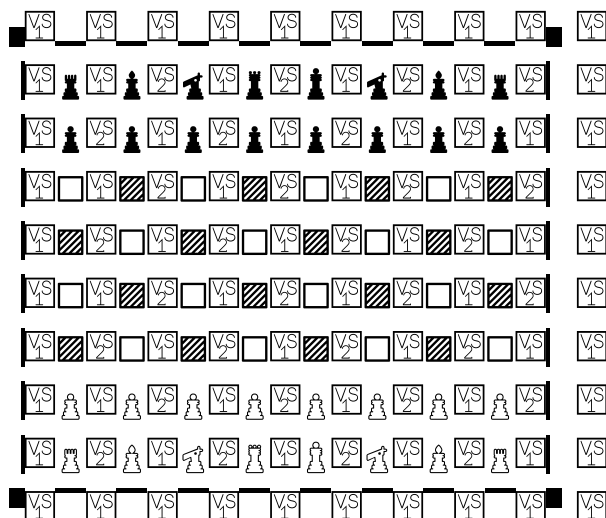
Game starting positions:
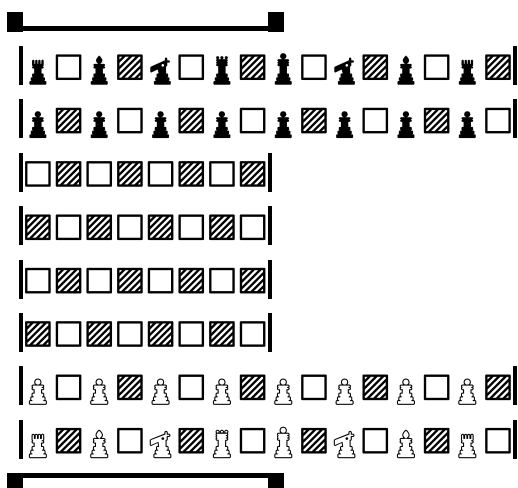
The Looking-Glass problem:
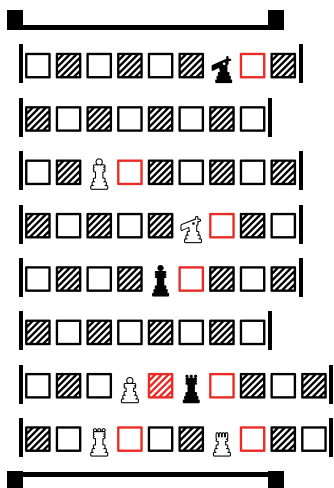
Scheme using variation selector sequences between all characters

Game starting positions:

The Looking-Glass problem: