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 white and black squares. From time to time suggestions have been made regarding encoding a set of chess-characters-on-black but the response has normally been “use a higher-level protocol”. 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 white square would be “k”, a white king on a black 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)
- F071 (q)
- F072 (r)
- F062 (b)
- F06E (n)
- F070 (p)
- F04B (K)
- F051 (Q)
- F052 (R)
- F042 (B)
- F04E (N)
- F050 (P)
- F06C (I)
- F077 (w)
- F074 (t)
- F076 (v)
- F06D (m)
- F06F (o)
- F04C (L)
- F057 (W)
- F054 (T)
- F056 (V)
- F04D (M)
- 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”.

<table>
<thead>
<tr>
<th>White King</th>
<th>Black Queen</th>
<th>White Rook</th>
<th>White Bishop</th>
<th>White Knight</th>
<th>White Pawn</th>
</tr>
</thead>
<tbody>
<tr>
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<td>F072 (r)</td>
<td>F062 (b)</td>
<td>F068 (h)</td>
<td>F070 (p)</td>
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<td>F06A (j)</td>
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Alastair Scott’s Chess font, based on a font called Cheq, follows the same encoding that the Chess Berlin font does.

<table>
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<tr>
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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”.

<table>
<thead>
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<th>White Rook</th>
<th>White Bishop</th>
<th>White Knight</th>
<th>White Pawn</th>
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<td>F06E (n)</td>
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<td>F06F (o)</td>
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<td>F057 (W)</td>
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The Chess Kingdom font, also by Armando H. Marroquin, uses the same encoding as his Chess Leipzig.

<table>
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<tr>
<th>White King</th>
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<th>White Bishop</th>
<th>White Knight</th>
<th>White Pawn</th>
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<td>F062 (b)</td>
<td>F06E (h)</td>
<td>F070 (p)</td>
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<td>F06C (l)</td>
<td>F077 (w)</td>
<td>F074 (t)</td>
<td>F076 (v)</td>
<td>F06D (m)</td>
<td>F050 (P)</td>
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<td>F04B (K)</td>
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<td>F06F (o)</td>
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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”.

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).

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 black squares is likewise implemented in two parts, so for the white king, for instance, the sequence $\text{F030 F031 F072 (01r)}$ is used.

3. Proposed variation sequences

Standardized variation sequences offer a solution to this glyph-level alignment ambiguity by using one variation selector, such as VS1 (U+FE00), to indicate pieces on a white square, and another, such as VS2 (U+FE01), to indicate pieces on a black square. Pieces for both chess and draughts are given, as are two Geometric Shapes which are to be used to represent the board squares. A font with appropriate entries in its Format 14 (Unicode Variation Sequences) ‘cmap’ subtable can enable these distinctions to be shown and preserved in plain text. For some applications “liga” or “rlig” tables may be used, since support for Format 14 tables is not universally implemented. Below is a complete list of the proposed sequences as they would appear in the StandardizedVariants.txt file.

# Chesspiece on white versus Chesspiece on black variation sequences

25A1 FE00; White chessboard square; # WHITE SQUARE
25A8 FE01; Black chessboard square; # SQUARE WITH UPPER RIGHT TO LOWER LEFT FILL
2654 FE00; Chesspiece on white; # WHITE CHESS KING
2654 FE01; Chesspiece on black; # WHITE CHESS KING
2655 FE00; Chesspiece on white; # WHITE CHESS QUEEN
2655 FE01; Chesspiece on black; # WHITE CHESS QUEEN
2656 FE00; Chesspiece on white; # WHITE CHESS ROOK
The table below demonstrates an actual implementation—using an OpenType chess font with an appropriately-built Format 14 ‘cmap’ subtable—that uses VS1 and VS2 as described above for all of the eighteen characters in this proposal.

<table>
<thead>
<tr>
<th>Code</th>
<th>Char.</th>
<th>VS1</th>
<th>VS2</th>
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</thead>
<tbody>
<tr>
<td>25A1</td>
<td>□</td>
<td>—</td>
<td>—</td>
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<tr>
<td>25A8</td>
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<td>—</td>
<td>□</td>
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<tr>
<td>2654</td>
<td>♴</td>
<td>♴</td>
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4. Game board borders
In addition to these characters, 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. A
chess font may draw these as multiple rules if desired. To draw a box around a single row of half a chessboard with a knight on one square, the following characters would be used.

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

The eight Block Elements used for creating chessboard border rules are existing characters and do not require a variation-selector mechanism. They also map one-to-one to the ASCII and MS Windows Symbol characters used for creating border rules in pre-Unicode legacy fonts. 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)

5. Figures

Figure 1. Diagram for the initial position in Turkish Draughts (Dama), set in Ludus in 24 points with 26-point leading using Variation Sequences.
Figure 2. The example below demonstrates the Chess Condal font using Variation Sequences to represent a chessboard diagram, and also to represent a passage of text with inline chess characters without any variation selectors. The table itself is set in 24 points on 24-point leading.

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 ♗ e4–e5 (becomes sheep)
4. White Queen ♗ e4–f8 (leaves egg on shelf)
5. White Queen ♗ f8–c8 (flying from Red Knight)
6. Red Knight ♗ g8–c7+ (check)
7. White Knight ♗ c7–f5
8. Red Queen ♗ h5–e8 (examination)
9. Queens ♗ ♗ castle
10. White Queen ♗ c8–a6 (soup)
Figure 3. Examples of the Looking-Glass diagram set in plain text in an ASCII-encoded font (the display font on the left is Courier in 14 points on 17-point leading, tracked to give a more square impression; on the right the font is Chess Skak in 14 points on 17-point leading). Below them is the same diagram set in plain text in Chess Condal in 20 points on 20-point leading, displayed right-justified and encoded without variation selectors on the left, and with them on the right. And below that is the same again, set in Ludus in 20 points with 22-point leading, 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.

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9 _ _ _ _ _ _ _ _ )
| p F p F p F S F / 
| F p F p F p F p / 
| p F k F p F p F / 
| F p F p F s F p / 
| p F p F K F p F / 
| F p F p F p F p / 
| p F p g D F p F / 
| F p e p F t F p / 
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Figure 4. 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).

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 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.