

On Notations for Describing Chess Games

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Abstract

This paper explains the different types of notations for documenting a game of chess. It covers chess game notations from the 1800s to date. To be able to understand a written chess game one must know the annotation type used and understand the meaning of its symbols.

1. INTRODUCTION

The game of chess is a 2-player adversarial game. Its a warlike game originating from India [9]. The board, is a square board consisting of 64 small squares, colored in a checkered pattern. The columns are called **files** and rows are called **ranks**. Using algebraic notation which will be discussed in Section 4.2 we can label the rows from 1 to 8 and the columns from a to h as show in Figure 1a. The square on the first row and first column can be described as **a1** as in Figure 1a. The classic board consists of white and black pieces, as can be see in Figure 1a, the player with the white pieces has the first turn. At the start of the game, the white pieces are arranged on ranks 1 and 2 and black on ranks 7 and 8. The names and movements of each piece are outlined in Section 2.

2. PIECE TYPES AND MOVES

Pawns Each side has 8 pawns at the start of the game and arranged at the fore-front(the row in front of the other pieces). Provided there are no pieces on its file. The pawn moves 1 square forward or 2 as its first move. Pawns can strike enemy pieces on the diagonal square to its left or right. It can also make a special en passant move, when an opponent's pawn that has just moved two squares forward from its starting position, landing beside the capturing pawn, the capturing pawn then occupies the square behind its victim's former spot. If the pawn gets to the farthest rank (rank 8 for the white and rank 1 for the black) from its start point it can be promoted or exchanged to become a queen, knight, bishop or rook and occupy same spot a

Rooks Each side has 2 rooks at the start of the game placed at the four corners of the board, a1, h1, a8 and h8. Provided there are no same side pieces on its path, on the board, rooks can move any number of squares vertically along columns and horizontally across rows to occupy an empty square or strike (exchange) an opponent on its path, occupying its victim's square.

Knights At the start of the game one knight is placed on the same row next to each rook. Knights move in an L shape direction covering 4 squares from the source to destination squares. It can jump

over pieces on its path and land on blank squares or strike (exchange) an opponent on the destination square.

Bishops In the starting formation of the game, one bishop is placed next to each Knight. The white bishops are placed on c1 and g1, while the black bishops are placed on c8 and g8. If there are no same side pieces on its path, Bishops can move diagonally any number of squares to land on a blank square or strike (exchange) and occupy the square of an opponents piece.

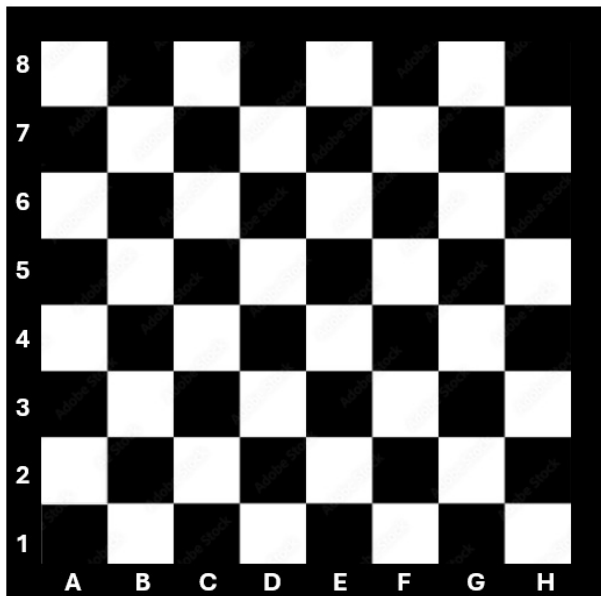
Queen The queen is the most powerful attacking piece on the board. It can move in the manner of a Rook and a bishop. The white queen is placed on e4 and the black queen on e8 at the start of a game.

King The King is the most important piece on the board. At the start of the game the white king is placed on e1 and the black king on e8. It can move one step in all directions. . A king and rook can make a castling move only as their first move in the game. The castling move is a simultaneous move of the king and one of its rooks, provided there are no intervening pieces between them and the path to castle is not in the line of attack from the opponent. There are 2 castling move types. King side and queen side. The king side, castling move involves moving the king one step to the side of the rook closest to the king and moving the rook to the spot formerly occupied by the king. The queen-side castling, involves moving the King to the spot formerly occupied by the queen at the start of the game and moving the rook nearest to the queen to the spot formerly occupied by the king.

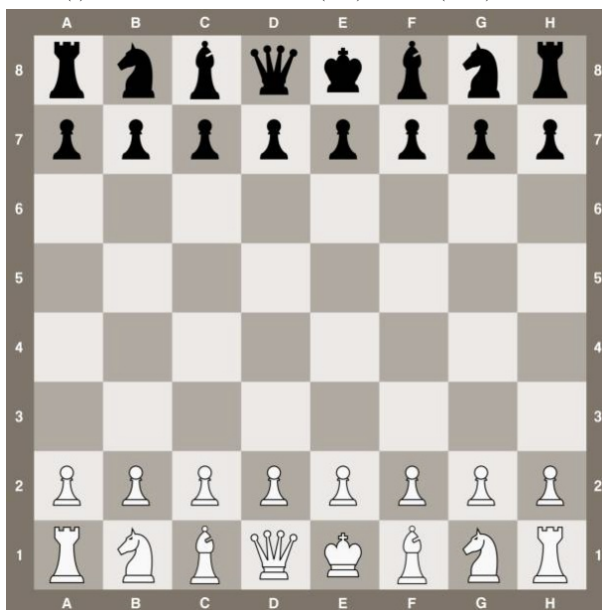
3. RULES OF THE GAME

Modern chess standard rules are set by the FIDE (Fédération Internationale des Échecs translated International Chess Federation) for chess tournaments. There are variations to the rules depending on the type of tournament. At the start of the game the white player i.e. the player controlling the white pieces makes the first move. Determining who takes up the white pieces can be by mutual agreement or by some random action like flipping a coin or rolling a die. The rules outlined in this paper, are obtained from [4]. In describing piece types and moves in Section 2 some of the rules have been covered. The additional basic rules are as follows:

- (1) The game is initialized as shown in Figure 2b and the white player has the first move.
- (2) Each player moves his pieces legally as explained in Section 2.
- (3) The king is said to be **in check** if it is attacked by one or more of the opponent's pieces, even if such pieces are constrained from moving to that square because they would then leave or



(a) Chess board with the columns (files) and rows (ranks) labeled



(b) Chess formation at the start of the game of chess

Fig. 1: The Chess Board and its Start Game Formation

place their own king in check. No piece can be moved that will either expose the king of the same colour to check or leave that king in check.

- (4) If a player's king is in check, its next move must be one to relieve the check. This can be achieved by placing a piece to block the line of attack from the opponent or its king is moved out of the line of attack.
- (5) If a player's king is placed in check and is unable to make any legal move to relieve the check. Then it's a check mate. The game ends. The checkmated player loses and the other wins.

Placing an opponents king in checkmate is the objective of the game.

- (6) The game is drawn when the player to move has no legal move and his king is not in check. The game is said to end in 'stalemate'. This immediately ends the game, provided that the move producing the stalemate position was legal.
- (7) The game is drawn when a position is reached from which a checkmate cannot occur by any possible series of legal moves or if the maximum number of moves per game agreed on has been reached. This immediately ends the game.

4. TYPES OF NOTATIONS

A game of chess can be recorded using notations. The most common notation used today in chess tournaments is the Algebraic notation. However a detailed consideration would be given of different notations for describing the game of chess from the past and present.

4.1 Descriptive Notation

This notation can be found in chess literature written in the middle ages in Europe. It uses sentences in describing the moves made. The squares on the chess board are described from either the perspective of the black player or the white player. The picture in Figure 3a is taken from [11]. Square c4 in algebraic notation can be described as Q.B.'s 4th (Four squares along the file from the start square of the white Queen Bishop i.e the bishop closest to the white Queen) or as Q. B.'s 5th (Five squares along the file from the start square of the black Queen Bishop).

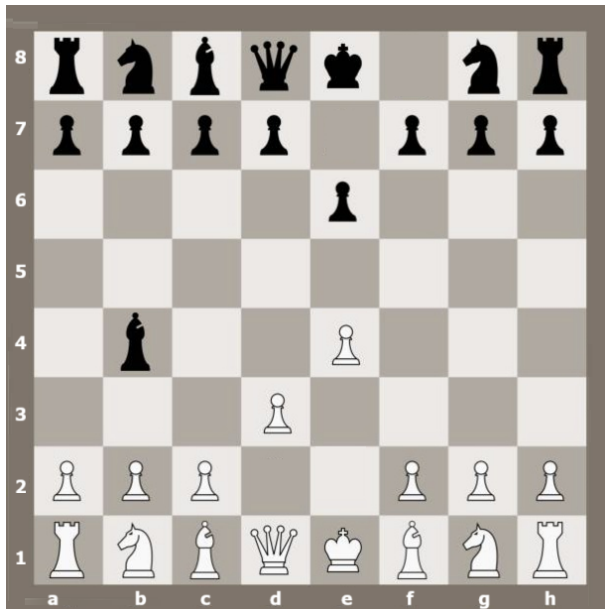
Describing Moves. The moves are listed out in a 2-column table. The first column contains the moves of the white player and the second is the move for the black player. Each move is entered into the tables in exact order in which it is played. The first moves for both players on row 1, second on row 2 etc The **pieces** are recorded using letters as follows:

- Pawns are recorded with the letter P. However at the start of the game, Pawns are uniquely identified by the piece they are placed in front of. The pawn on c2 is annotated as Q. B. P. meaning the Queen's Bishop's Pawn.
- Rooks are recorded with the letter R. and uniquely identified as Q.R. that is the Rook closest to the Queen and K.R. as the Rooks closest to the King.
- Kt. is the symbol for recording Knights. Q. Kt. and K. kt. are the Queen's Knight and King's Knight respectively.
- B. is the symbol for bishop, K.B. and Q.B. are for the King's Bishop and Queen's Bishop respectively.
- K. and Q. are the symbols for the King and Queen.

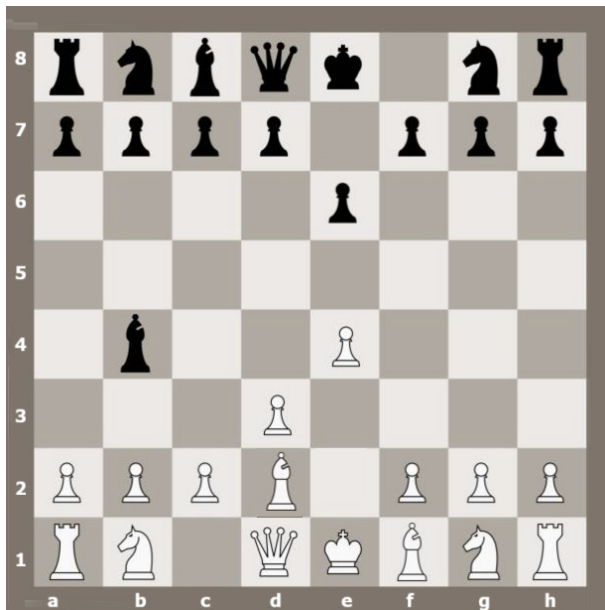
To describe a move the line number starts with the piece and ends with the destination e.g

WHITE	BLACK
1. P. to K's 4th	1. P. to K's 4th
2. K.B. to Q.B.'s 4th	2. K. Kt. to K.B.'s 4th

The first move for both players listed here is Pawn moves to King's 4th this is shown in Figure 4



(a) White king placed in check



(b) White move to relieve check

Fig. 2: Example of a move to relieve a check

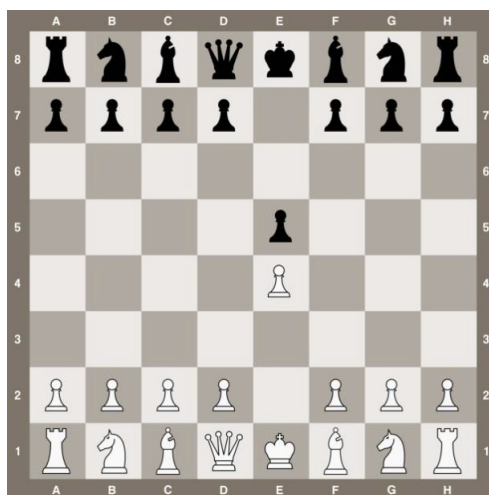
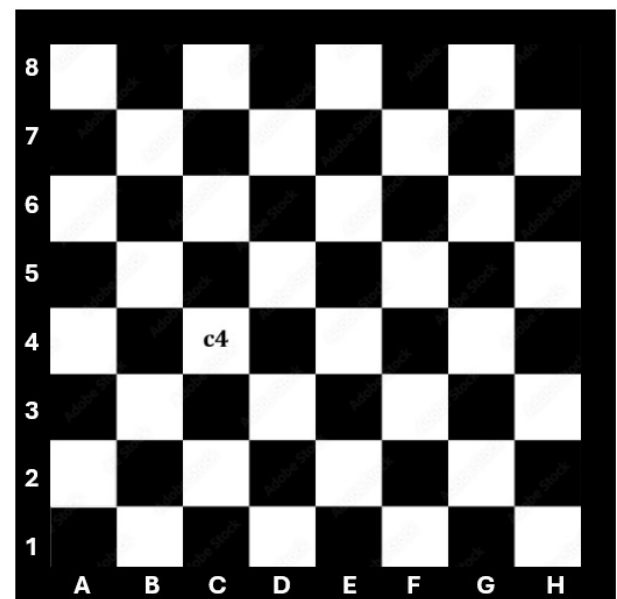


Fig. 4: The moves for : 1. P. to K's 4th
board.

1. P. to K's 4th, shown on



(a) Chess squares using descriptive notation (picture adapted from [11])



(b) Chess board using Algebraic notation.

Fig. 3: Comparing chessboards using Descriptive and Algebraic Notations

The terms used to express tactical moves are expressed in words e.g. takes (when an exchange occurs), castles (when a castling move occurs either of King side or Queen's side), becomes (when a pawn is promoted), (ch.) (when a move checks a king), checkmates (when a checkmate move is made and the game ends). Here is a game known as the scholar's mate [11] written in descriptive notation.

WHITE	BLACK
1. P. to K's 4th	1. P. to K's 4th
2. K.B. to Q.B.'s 4th	2. K. B. to Q.B.'s 4th
3. Q. to K.R.'s 5th	3. Q.P. one.
4. Q. takes K.B.P., giving checkmate.	

Table 1. : Scholar's mate using descriptive notation.

4.2 Algebraic Notation

The algebraic notation is the standard notation for recording chess games, recognized by the International Chess Federation (FIDE). This notation was originally found in German literature for chess games. The squares on the board are identified using the coordinate system described in Section 1. The pieces are annotated using the first letter of the names of the pieces, except for the Knight which is annotated with the second letter N and pawns which have no symbol but their position (destination square) on the board is used to identify each one.

Describing Moves. Each move is described starting with the Symbol for the piece and the destination square except for pawn moves where the destination square is used to annotate its move e.g Qf5 is a move by the queen to f5. If identical pieces can move to same square, then their differing file or rank can be used to distinguish them e.g Nef8 or N7f8 indicating knight on file e moves to f8 or knight on rank 7 moves to f8. Exchanges or captures are indicated with the starting letter of the piece making the move, an x and the destination square where the capture happens. e.g Nxf3 denotes N captures piece on f3. Castling moves are indicated using o-o for castling on the king side and o-o-o for castling on queen side. When a pawn is promoted this is annotated using the destination square where the promotion happens with an equal sign (=) and the symbol for the promotion piece e.g f8R means the pawn is promoted to a Rook on f8. When a king is placed in check the symbol + is used and ++ for a double check. A check mate is indicated with a # or the word "mate".

WHITE	BLACK
1. e4	1. e5
2. Bc4	2. Bc5
3. Qh5	3. d6
4. Q × f7 #	

Table 2. : Scholar's mate using Algebraic notation.

4.3 Koch's Notation

Around 1828 Johann Koch devised a numeric notation system for chess moves, known as the Koch's notation. The chess board squares are identified using a coordinate system similar to the algebraic notation, but the difference is in the labels for the files, which instead of a-h, Koch's uses 1-8 as shown in Figure 5 [11]. A square on the chessboard is identified by a 2-digit number, the first digit is its file and the second its rank. A move is indicated using the symbol of the moving piece, source square followed by a dash(-) and then the destination square e.g. Kt. 71-63 i.e. Knight moves from square 71 to 63. For pawn moves only source and destination squares are indicated. When an exchange occurs the symbol for the exchanged piece is written after the move e.g. 44-33 P. i.e. Pawn moves from square 44 to 33 and exchanges a Pawn. A check is represented using the symbol ×, castling as K.cast., a checkmate can

be left unmarked or marked with the symbol m. Table 3 shows the Scholar's mate in Koch's notation.

8	18	28	38	48	58	68	78	88
7	17	27	37	47	57	67	77	87
6	16	26	36	46	56	66	76	86
5	15	25	35	45	55	65	75	85
4	14	24	34	44	54	64	74	84
3	13	23	33	43	53	63	73	83
2	12	22	32	42	52	62	72	82
1	11	21	31	41	51	61	71	81
	1	2	3	4	5	6	7	8

Fig. 5: Chess board squares in Koch's Notation

WHITE	BLACK
1. 52 – 54	1. 57 – 55
2. B 61 – 34	2. B 68 – 35
3. Q 41 – 85	3. 47 – 46
4. Q 85 – 67 P. m.	

Table 3. : Scholar's mate using Koch's notation.

4.4 Kieseritzky's Notation

This notation uses same chess board squares description as the Koch's notation. However, the men or pieces are identified using alphabets. A, B, C, D, E, F, G, H for the pieces behind the pawns. Lower cases a, b, c, d, e, f, g, h are used to identify the pawns [7]. These can be seen in Figures 6a and 6b. A move is described starting with the piece symbol followed by its destination square. An exchange is shown starting with the attacking piece, its destination square, a dash(-) and the exchanged piece. King side and queen side castling is indicated using o-o and o-o-o respectively. A check is denoted with × and a checkmate with m. A full move i.e the white move and the black's response can be recorded in a 2-column table or like a fraction, with the white move as the numerator and the black as the denominator. The later representation is used in showing the Scholar's mate in Kieseritzky's notation.

8	18	28	38	48	58	68	78	88
7	17	27	37	47	57	67	77	87
6	16	26	36	46	56	66	76	86
5	15	25	35	45	55	65	75	85
4	14	24	34	44	54	64	74	84
3	13	23	33	43	53	63	73	83
2	12	22	32	42	52	62	72	82
1	11	21	31	41	51	61	71	81

(a) Chess squares in Kieseritzky's notation

A	B	C	D	E	F	G	H
a	b	c	d	e	f	g	h
a	b	c	d	e	f	g	h
A	B	C	D	E	F	G	H

(b) Label for the chess pieces in Kieseritzky's notation

Fig. 6: Kieseritzky's chess squares and piece notation

1. $\frac{e54}{e55}$

2. $\frac{F34}{F35}$

3. $\frac{D85}{d46}$

4. $\frac{D67-fm.}{}$

Table 4. : Scholar's mate In Kieseritzky's Notation.

4.5 A Universal notation

This notation type uses the Latin alphabets to represent pieces, in order to provide a more universal notation for the pieces. K for King, L for queen, M for rook, N for Bishop, O for knight and P for pawn [8]. The square descriptions are the same as those of the Algebraic notations. A move is annotated starting with the symbol for the piece making the move, followed by the start square, a dash(-) and the destination square. An exchange is indicated with \times , a check with \neq and checkmate with \neq . Castling moves are same as with the algebraic notation. Scholar's mate using this notation is shown in Table 5.

WHITE

1. P e2-e4
2. N f1-c4
3. L d1-h5
4. L h5xf7 \neq

BLACK

- P e7-e5
- N f8-c5
- P d7-d6

Table 5. : Scholar's mate using Universal notation.

4.6 Abbreviated Descriptive Notation

This was in common use in the 1940s and 1950s. It is simply an abbreviation to the English Descriptive notation. In describing moves It replaces the word "to" with a dash (-), notations such as K's 4th is replaced with K4, "takes" which is used for exchanges is replaced with \times , checks are symbolized with the + sign or written as "ch." and a checkmate is written with the word "mate". This notation type was used in recording all the chess games found in [3]. Table 6 is the notation of the Scholar's mate in Abbreviated Descriptive Notation.

WHITE

1. P - K4
2. KB - QB4
3. Q - KR5
4. Q \times KBP mate

BLACK

1. P - K4
2. KB - QB4
3. QP - Q3.

Table 6. : Scholar's mate using Abbreviated Descriptive notation.

4.7 Figurine Algebraic Notation

This is similar to the algebraic notation but it replaces the letters in algebraic notation with the picture symbols of the pieces. This is a more universal chess language as the piece symbols are easy to

recognize. Table 7 shows the scholar's mate in Figurine Algebraic notation

WHITE	BLACK
1. e4	1. e5
2. c4	2. c5
3. h5	3. d6
4. × f7 #	

Table 7. : Scholar's mate in Figurine Algebraic notation.

4.8 Pure Figurine Notation

This uses only picture symbols and numbers, it has no letters [12]. A full game in this notation can be found in [1]. It is similar to the Abbreviated Descriptive Notation. All letter symbols for pieces and square descriptions are replaced with the picture symbols e.g. P – K4 in Abbreviated Algebraic notation is written as 4. The scholar's mate is rendered in Pure Figurine Notation in Table 8

WHITE	BLACK
1. 4	1. 4
2. 4	2. 4
3. 5	3. 3
4. ×	

Table 8. : Scholar's mate using Pure Figurine Notation Descriptive notation.

4.9 Portable Game Notation

The Portable Game Notation uses Algebraic Notation to record chess games. This notation outlines in a contiguous fashion all the moves, using numbers to identify the move and spaces the white piece move from the black piece move. It includes additional Information e.g. [Event] [Site] [Date] [Round] [White Player's name] [Black Player's name] [Result of the game]. Table 9 is the scholar's mate written in Portable Game Notation without the extra information.

1. e4 e5 2. Bc4 Bc5 3. Qh5 d6 4. Q × f7 #

Table 9. : Scholar's mate using Portable Game Notation.

4.10 Long Algebraic Notation

This form of algebraic notation includes both the start square of the moving piece and the destination square. A pawn move which would have been described in algebraic notation as e4, in Long algebraic notation will be written as e2-e4 or e2e4. Table 10 is the scholar's mate representation in Long Algebraic Notation.

WHITE	BLACK
1. e2-e4	1. e7-e5
2. Bf1-c4	2. Bf8-c5
3. Qd1-h5	3. d7-d6
4. Qh5xf7#	

Table 10. : Scholar's mate in Long Algebraic notation.

4.11 ICCF Numeric Notation

The International Correspondence Chess Federation (ICCF) numeric notation, identifies each square on the chess board in the same manner as the Koch's notation in Subsection 4.3. Each move is recorded using the start square and destination square e.g. the first move in the scholar's mate in algebraic notation in Table 4 e4, is written as 5254 in ICCF numeric notation. 52 is the start square of the pawn move and 54 is the destination. The piece which makes the move is not indicated in ICCF, however when a pawn promotion happens a 5th digit is included in the move to indicate the piece promoted to. The number 1 stands for a queen, 2, for a rook, 3 for a bishop [6]. Castling moves are recorded using the start square and destination square of the king. Since the castling move is the only 2 step move made by the king, the rooks move is inferred. A checkmate is indicated with a plus (+) sign.

WHITE	BLACK
1. 5254	1. 5755
2. 6134	2. 6835
3. 4185	3. 4746
4. 8567 +	

Table 11. : Scholar's mate in ICCF notation.

4.12 Forsyth-Edward Notation

This notation is used to record chess positions, for chess programs. it has six fields separated by spaces. The components of each field is as follows:

- Piece arrangement
- Active color
- Castling availability
- En passant target square
- Halfmove clock
- Fullmove number

Here is an example:

rnbqkbnr/pppppppp/8/8/8/PPPPPPPP/RNBQKBNR w KQkq - 0 1

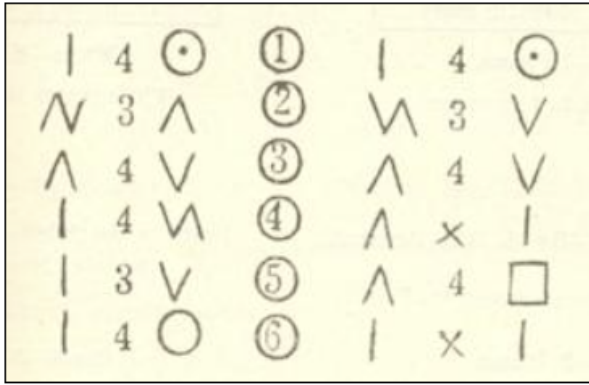
The first field is the board layout

rnbqkbnr/pppppppp/8/8/8/PPPPPPPP/RNBQKBNR

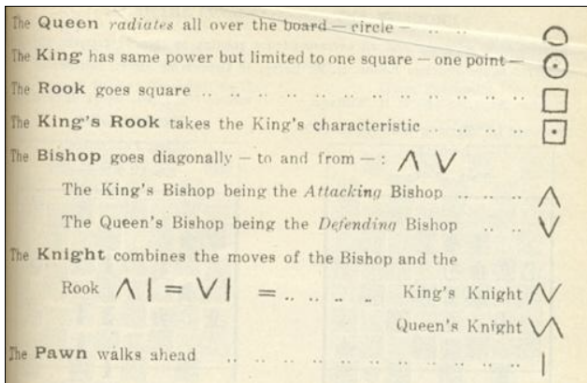
This field displays the board from rank 8 to 1. Each rank is separated from the other using the forward slash symbol(/). The letters are symbols for the pieces similar to the representation in Algebraic notation. However, the upper case letters represent the white pieces and the lower case is for the black pieces. The numbers, are the number of empty squares on the rank.

The next field shows the player whose turn is next. In this example, which shows the game state at the start, w for white is the player to make the next turn. The following field shows sides with castling rights. K for white king side to castle, Q for white queen side to castle, k for black king side and q for black queen side to castle.

The fourth field is the enpassant target square, '-' means there's none. The fifth field is the count of the number of plies after the last pawn move, this is used to enforce the 50-move rule to call a draw. The last field gives the count of full moves, this count is



(a) An opening game in the Prince Notation



(b) An explanation of the Prince Notation

Fig. 7: Prince Notation (adapted from [12])

incremented each time the black player makes a move, at the start of a game it is initialised to 1. The scholar's mate in FEN is shown in Table

```
rnbbkbnr/pppppppp/8/8/PPPPPPPP/RNBQKBNR w KQkq - 0 1
rnbbkbnr/pppppppp/8/8/4P3/8/PPPP1PPP/RNBQKBNR b KQkq - 0 2
rnbbkbnr/pppp1ppp/8/4p3/4P3/8/PPPP1PPP/RNBQKBNR w KQkq - 0 3
rnbbkbnr/pppp1ppp/8/4p3/2B1P3/8/PPPP1PPP/RNBQK1NR b KQkq - 1 4
rnbbk1nr/pppp1ppp/8/2b1p3/2B1P3/8/PPPP1PPP/RNBQK1NR w KQkq - 2 5
rnbbk1nr/pppp1ppp/8/2b1p2Q/2B1P3/8/PPPP1PPP/RNB1K1NR b KQkq - 3 6
rnbbk1nr/ppp11ppp/3p4/2b1p2Q/2B1P3/8/PPPP1PPP/RNB1K1NR w KQkq - 0 7
rnbbk1nr/ppp11Qpp/3p4/2b1p3/2B1P3/8/PPPP1PPP/RNB1K1NR w KQkq - 1 8
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Table 12.: Scholar's mate in Forsyth Edward Notation

4.13 Peculiar Chess Notations

There are some chess notations which use unusual symbols to represent chess pieces and chess moves. One example is the prince notation which appears in [2]. The motivation behind the design was to produce a standardized, international chess notation. Figure 7a shows an opening move in the prince notation while Figure 7b shows the explanation of the symbols, both figures adapted from [2] which appears in [12].

5. NOTATIONS FOR GAME REMARKS

During the play of a game, a player may make certain remarks on his own or his opponents moves. These remarks may assist him make better analysis for future moves. Table 13 is a list of some popular remark symbols drawn from [10, 5] and their meanings.

Table 13.: Modern Chess Annotation Symbols

Symbol	Meaning
!	Good move
!!	Excellent / brilliant move
?	Mistake
??	Blunder
!?	Interesting / risky but possibly good
?!	Dubious move
=	Equal position
∞	Unclear position
±	White slightly better
∓	Black slightly better
+−	White has a winning advantage
−+	Black has a winning advantage
↑	Initiative
→	Attack
↔	Counterplay
○ or ↑↑	Development (a lead in development)
○	Space (more space controlled by one player)
⊕	Time trouble (the player is short on time)
⊙	Zugzwang (forced move that causes disadvantage)

6. SUMMARY AND CONCLUSION

This paper considered 13 different chess annotation types used from the 1800s to date. A good number of the notations have similar notations e.g. the castling notation o-o, o-o-o for king side and queen side is used in Algebraic, Kieseritzky's, Universal, Abbreviated description, Pure Figurine and Long Algebraic Notations. Some similarities can also be observed with the chess board squares description. Kieseritzky's, Koch's and the ICCF notations use same coordinate notation in identifying each square on the board. The Algebraic, Figurine Algebraic, Portable Game and Long Algebraic Notations also share the same notation for the board squares identification. More similarities can be found when comparing notations for identifying pieces and moves as well. Although the Prince Notation employs unusual symbols, careful observation reveals that each symbol is an encoding of the moves of its respective piece. The notation types considered in this paper does not exhaust the annotation types in this era, however a knowledge of these annotations can help one decipher with ease any chess game text written during this era.

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