SUPERCHESS

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ABSTRACT

Superchess is a natural and flexible extension of chess. It contains additional pieces which results in additional possibilities in game playing. One of the advantages definitely is that (so far) theoretical knowledge, in particular of the opening phase, is subaltern. Until now chess is one of the most satisfying and successful thinking games in the world of games. To some extent the chess pieces and their movements are chosen in an arbitrary process of historical development; the same holds for the initial position of the pieces on the board. In chess different pieces have different movements. This observation may lead to the scientifically intriguing question of the optimality of chess. Can we imagine chess-like games that are equally well or even more satisfying than chess? If the answer is affirmative, then the question arises, how can we determine such games?

The note briefly discusses various aspects of optimal games and possible modifications of chess. In particular, the benefits of superchess are advocated: new pieces possessing new movements in combination with (a part of) the generally accepted chess pieces. The new movements introduce fascinating new tactical combinations, whereas the character of chess is essentially preserved. Opening theory plays no role in practice because of the large number of different initial positions. The players' freedom to select a different set of pieces in each new game constitutes another appealing feature. Finally, the most challenging task is, of course, to transform the current chess-playing programs into superchess-playing programs of considerable strength.

1. INTRODUCTION

Chess is undoubtedly one of the most popular and successful games among all games one can imagine. Its status in the Western world is unrivalled, and this is not only according to its devotees. Even laymen and politicians use chess in their metaphors. Today chess constitutes an integral part of our culture. What is the secret of this success? And are modifications possible that make the game even more interesting and satisfying? Or in less diplomatic terms: is it possible to improve the game of chess? Only posing that last question is almost a blasphemy to some aficionados.

In chess we see two armies of equal strength, symmetrically arranged opposite each other, consisting of different pieces possessing different properties. Some pieces have "long-range" movements (Queen, Rook, and Bishop), other pieces have "short-range" movements as they can move at most two squares per move. The King, Rooks, and Pawns possess special functions: the King is the commander-in-chief, either Rook can assist the King in taking shelter by means of the castling move, and any Pawn can change into a more powerful piece at its promotion.

In practice the pieces work well together, yielding a balanced game with an "almost infinite" variety. However, there exists no well-founded reason for this particular choice of chess pieces and movements. Some other pieces with different movements may turn out to play equally well as the chess pieces. Especially during the last century a large variety of so-called chess variants was invented in which all kinds of new pieces participate. The new pieces are to varying degrees "chess-like" pieces.

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1.1 The course of the note

Chess originated presumably in the sixth century A.D. in India or Persia and spread into different directions. Therefore different versions of the game evolved, for example, Chinese, Japanese, and Arabic chess (see Murray, 1913). The birth of modern (Western) chess was in the late 15th century and meant a revolution since the preceding Arabic chess was much slower (see Section 2). So, changing the rules is not new at all.

The challenging question now is: which combination of pieces, with each piece having its own characteristic movement, would be "best" or in some sense "optimal"? Of course, "optimal" cannot be a purely objective qualification, as the players' preferences will not always match. One can only hope that the degree of subjectivity will not be too high to reach some form of agreement. In Sections 3 and 4 we briefly discuss the concept of optimal games and how to determine such games in principle.

The main purpose of this note is to advocate in particular the merits of a new, chess-like game called *superchess*, introduced by Van Haeringen (1993a,b). It is a natural *extension* of chess. New pieces with new movements participate in combination with (a part of) the ordinary, classical chess pieces (see Sections 5 and 6).

Contemplating extensions of chess in general, it seems sensible to impose certain criteria on the new pieces in order to achieve that the new game will be at least as interesting and satisfying as chess. In particular, the character of chess should essentially be preserved (see Section 7). Admittedly, such criteria are partly subjective but the chances to reach a consensus will likely be improved by formulating adequate restrictions. Hence, the large number of possible new movements will be reduced, facilitating the workload of the players who experiment with the new pieces and of the programmers who have to implement new evaluation functions.

Many chess-players, not only professionals, consider the "obligation" to keep up with the modern chess opening theory a growing burden. Forms of randomized chess such as "Chess960" offer a way to abolish effectively the opening theory in practice, while maintaining the set of classical chess pieces (Chess960/Fischer Random Chess, www). Superchess offers a completely different way (see Section 8). Superchess extends chess by superadding a large number of new, chess-like pieces to the classical chess pieces. In Section 9 we list some general classifications of chess-like pieces that play a role in the defining rules of the superchess pieces.

The arguments and considerations discussed so far led us to the main subject of this note, superchess (see Section 10). The game is played analogous to chess. The structure of the initial position remains unaltered: the (more) important pieces are lined up behind a row of protecting pawn-like pieces. However, the players can (and in general will) use different subsets of the great army of superchess pieces in their games. Superchess avoids (the obligation of studying) the opening theory in a practical and convenient way: either player determines a part of the initial position by selecting some new pieces to replace some of the chess pieces in the ordinary starting position of chess. After this so-called *prelude*, the game continues like a chess game.

In Section 11 we discuss some existing variants of superchess-playing programs in the framework of the Zillions of Games 2.0 program. Moreover, we provide some considerations on possible changes of the evaluation functions and some ideas on other chess-like pieces.

Superchess is not necessarily meant to be an "improvement" of chess. Rather, it deserves a place next to chess as an interesting new game possessing essentially the same character as chess but offering more variety and flexibility, and the advantage of the abolition of the opening theory. In Appendix 14.1we provide an example of "Regulations of a Superchess Tournament". The given procedure clarifies how superchess can be played in human practice, and in computer-superchess tournaments too. Finally, we present eight examples of superchess problems in four diagrams.

2. THE CHESS REVOLUTION OF THE LATE 15TH CENTURY

The origin of chess is generally considered to be in Northern India or Persia, sometime in the sixth century A.D. The immediate predecessor of modern chess, called Shatranj by the Arabs, entered Western Europe through the Muslims, who learned it from the Persians in the seventh century. Shatranj, or Arabic Chess,

differed from modern chess mainly in the different movements of two pieces: the Queen (Firzan, or vizier, minister) moved only one square diagonally and the Bishop (Fil, or elephant) moved two squares diagonally; at its move the Fil was allowed to cross an occupied square. These differences are crucial as they imply that Shatranj was much slower than modern chess. The Pawn (Baidaq, or foot-soldier) moved and captured as the modern Pawn does, with the difference that it possessed no power of moving two squares for its first move.

Modern chess was born in the late 15th century. The introduction of the new, modern moves of Queen and Bishop meant a revolution in the chess world, completely altering the method of play in chess. The increase in force made the new chess game more active and enhanced the penalties of mistakes. Opening theory and tactical combinations became (much) more important.

Murray (1913) placed the introduction of the new movements in Italy or Spain at the end of the 15th century but not before 1485 (p. 778). The new chess spread rapidly through (Western) Europe. "In Italy and Spain the old game was obsolete (…) by 1510." (Murray, p. 779). In France and England the new game had been generally accepted by 1550. It is interesting to note that, as Murray writes, "(…) the new game was the invention of the player, not the problemist" (ibid., p. 778).

In connection with early chess variants it is interesting to note that a piece moving as the modern Bishop, called Courier, was already present in the medieval Courier chess. This game of unknown origins (probably of the 12th century) survived until the start of the 19th century in the village of Ströbeck (Germany). It was played upon a chequered 8 × 12 board with two Couriers, one Counsellor (moving as the King), one Schleich (moving one square orthogonally), and four Pawns, in addition to the Arabic chess pieces (Murray, 1913, pp. 483-485; Pritchard, 1994, pp. 73-74).

3. OPTIMAL GAMES

Taking a very general, theoretical point of view, we can imagine that games are represented by points in an abstract, multi-dimensional space of games. A distance measure can be defined by attributing numbers to the "distances" between different games (or different versions or variants of a particular game). Some games are better than others, where "better" is defined as "preferred by humans". Hence we can define an evaluation function measuring the preference, which should be based upon the ratings to be assigned to the games under consideration by a sufficient number of players (assuming, in an ideal case, that such an experiment is executable). We may expect that the evaluation function will possess local maxima. These determine the points of optimality, or optimal games. Any optimal game is "better" than any other game in its immediate neighbourhood. Examples of possibly optimal games are chess, Chinese chess (xiangqi), Japanese chess (shogi), Go (weiqi) and bridge.

One of the important subjects of contemporary game research should be: finding (other) points of optimality, or at least approximating such optimal games. To this end certain criteria must be formulated, in particular for the pieces: how they move and capture; of course the criteria will be somewhat subjective. In Section 7 we list a small number of criteria for new, chess-like pieces.

4. SEARCH FOR OPTIMAL GAMES

For chess the important questions are: (1) to what extent is the choice of the chess pieces with their specific movements the best possible choice? and (2) if chess is an optimal game in its direct neighbourhood, why is this so? By "optimal" we mean "resulting in the most satisfying game in practice".

At the dawn of chess (in the sixth century A.D.) and again at the time of the chess revolution (in the late 15th century), it is inevitable to assume that many people have experimented with and tried out a variety of different movements and different starting positions. However, any written reports of scientific research on such experiments in those ancient times are not available; they seem to be non-existent. Even more, *any* report of scientific investigations on the best possible choice of the pieces in chess-like games seems to be non-existent. Remarkable but true, this is also the situation today for potential investigators. A satisfactory and sufficiently complete study is possible only with the support and cooperation of many (thousands of) intelligent players who should be open-minded, and preferably experienced in game playing. Unfortunately, it turns out that a

majority of the experienced chess players is not interested, unwilling as they are to experiment with changes of the rules. It is said that chess players have a conservative attitude towards their game. (In contrast, aficionados of games of various different types seem to be less conservative and more open-minded.) It might be that the skill and experience acquired by playing chess in so many years tend to block one's mind. Presumably, the considerable amount of time and energy invested in the study of theoretical aspects of chess (in particular, the opening theory) also plays a role. The obvious fears are that much of one's knowledge and experience would become subordinate when the rules were to be changed. However, as Gardner (2002) rightly argued, "It isn't a requirement that one quit playing chess to play variants!" Pritchard (2002) raised the objection that "A new chess variant (…) lacks the infrastructure that chess players enjoy – the clubs, tournaments, national and international events, and the vast library of information and literature that has grown over the centuries." Although true enough, should it keep a new game from becoming popular? After all, chess once began without an extensive infrastructure, too. Gardner (2002) remarks on this point: "It is worth examining the attitudes of chess players. They mostly don't know about or shun variants (…)." (Gardner, 2002).

The degree of a person's open-mindedness depends on his/her personality and character but also, and more distinctly, on his/her age. This is a well-known fact, especially when it comes to handling computers and similar new electronic devices requiring new procedures and routines. When getting older, people find it more difficult to study and evaluate new ideas. The aging brain appears to become less flexible and less inquisitive. For example, only the young brain is capable of learning *any* language perfectly. Moreover, the young brain achieves this without much (noticeable) effort and in a shorter period of time than the adult brain does. The advantage of being a native speaker is undeniable. Young mammals are generally inquisitive and use to play as a matter of development. For chess in particular, the achievements of (very) young players are increasingly impressive. During the last few years, the chess world saw a considerable decrease of the age of its youngest grandmasters. In conclusion, we shall need the cooperation and enthusiasm of the younger (chess) players in our search for optimal (chess-like) games.

5. CHESS VARIANTS AND EXTENSIONS

The first fundamental characteristic of chess is the special position of one particular piece, the King. Each player's goal is to capture the opponent's King with the help of various other pieces, all of them having different movements. The second fundamental characteristic is the structure of the starting position: powerful and important pieces are lined up behind a row of protecting Pawns which are less powerful.

The first obvious way that comes to mind is to extend chess by increasing the size of the board, i.e., the number of squares (cf. Iida, Takeshita, and Yoshimura, 2003). As a first criterion, let us restrict ourselves to the ordinary 8×8 board and as a second criterion, let us maintain the set-up of the more important pieces behind a row of Pawns or pawn-like pieces.

Chess is played with pieces of six different types, i.e., it knows six distinct movements. From a theoretical point of view many more movements are conceivable and indeed, many have been conceived. Pieces with new movements are sometimes called *heterodox* as opposed to the *orthodox* pieces of chess. Any variant of chess using such new pieces is often called *fairy* chess. During the last two centuries hundreds, probably thousands, of chess variants have been invented; see, for example, Boyer (1951, 1954), Brace (1977), Cazaux (2000), Reysset and Cazaux (2000) and, in particular, Pritchard (1994). Moreover, we refer to Van Haeringen (1993a, b; 1999).

In any chess variant with new pieces, maintaining the set-up of 32 pieces on the 8×8 chessboard implies that some chess pieces cannot take part in the game. Fortunately, this is not an insurmountable item. For (chess) players with interest in chess variants it appears to be satisfying to *extend* chess in a logical way by superadding new pieces to the chess pieces and to offer the players the option to choose in their games whatever subsets of the total army of the available pieces.

6. NEW PIECES COMBINED WITH CHESS PIECES

The conventional choice of the chessmen is only partly explained by tradition. It is an undeniable fact that in practice the chess rules proved to be satisfactory and appealing to all players. Each one of the chessmen does

well in the game and the interaction between the pieces yields a convenient, balanced game. However, there is no compelling evidence that the choice of the conventional chess set and rules is the best possible choice.
Not unexpectedly, pieces that combine the movements of different chessmen have been popular for a long time. For example, the combination of Queen and Knight (appropriately called Amazon: "lady on horseback") and the combination of Bishop and Knight (called Princess, Janus or …; see Pritchard (1994), under "Pieces") seem to play precisely as well as the Queen, in their relation to the other chess pieces. So, why not include these pieces in the game? The same holds for at least a number of other pieces having different movements that are not combinations of ordinary chess pieces.

As stated in Section 5, the design and structure of the starting position is fundamental to the character of chess: the King and valuable powerful pieces are lined up behind the row of protecting Pawns. We can maintain this structure by simply replacing some chessmen by new pieces with new movements. The actual, precise number of new pieces is not really important, provided the players can make their own choice, possibly different in different games, out of a sufficiently large supply of suitable authorized pieces. Of course, the movements of the new pieces should satisfy certain criteria (see Section 7).

In this way we obtain a natural, logical, and flexible extension of chess, which at the same time essentially preserves its character. Moreover, an immediate consequence of the large number of possible variations is the abolition of the opening theory. This is superchess in a nutshell.

7. CRITERIA FOR NEW PIECES

New pieces will have to prove their value and suitability in practice. The game including a particular new piece should be at least as interesting and satisfying as chess. In an optimistic scenario, a community of experimenting players would set up a rating list and attribute marks to the selection of suitable new pieces. Of course, anyone's verdict on the suitability of a certain piece will to some degree be subjective. Nevertheless, in an ideal case one might be able to reach a consensus of opinion on which pieces are approved of and included in a new chess-like game.

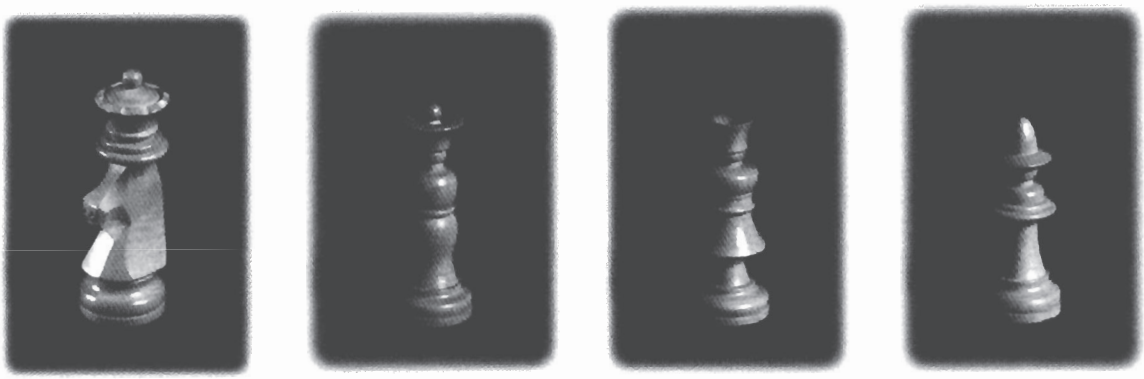
Without imposing any restriction, the number of possible new movements would be too large. For practical reasons the selection of pieces to be tested should have an acceptable and workable size. To achieve this, we impose some, in our opinion, reasonable conditions or criteria for new pieces. Below we formulate two sets of such criteria, viz. a set of "objective" criteria (a to c), and a set of more subjective criteria (d to f).

a. Each piece has to be *well playable*: the (average) player should be able to imagine the position that would arise after a number of moves (depending, of course, on the player's skill and level or rating), just as in chess.
b. Apart from the specific movement of a piece, its *interaction* with the other pieces is important. Ideally, any possible configuration of the pieces together should harmonize in such a way that the game will be sufficiently balanced, like chess.
c. The potential influence of any piece should be meaningful *without being too dominant* or decisive. For example, an "atomic bomb" having the power of annihilating half the opponent's army in a single move, is not suitable since it would upset the balance too much.

These criteria seem to be reasonably objective, as one of us (Van Haeringen) has experienced in discussions with many chess players. It may be more difficult to reach consensus on the criteria of a subjective nature. Below we mention the three most important ones of them.

d. New pieces should *harmonize in their physical shape*. That is, the new models should be stylized in the same style as the Staunton pieces (see Figure 1), which have proved their suitability in practice. Their figurines should fit the chess figurines (see Figure 2).
e. The game should *reflect a battle* in the real world (of long ago) or at least it should be reminiscent of such a battle. After all, the inventors of the early chess-like game(s) were most likely inspired by the battles of their time.
f. Pieces having new movements, as well as new rules, should *not affect the character* of chess too much. Hence, the problem is how to define or describe the character of chess.

In summary, each (new) piece should be well playable, promote a well-balanced game, and harmonize with the other pieces in its movements as well as in its physical shape; it should not be too dominant and not basically affect the character of chess. The game should preserve its character of being reminiscent of a battle in the real world.



The Amazon The Empress The Princess The Veteran

Figure 1: The Four New Pieces.

Figure 2: The Figurines of the Four New Pieces.

8. OPENING THEORY

From a scientific point of view the theory of any element of chess is interesting in its own right. The study of opening variants, the middle game, the endgame, chess problems, special compositions, etc. is valuable and useful for enhancing and improving one's understanding of the game. A particularly fascinating problem is how to "solve" a game (e.g., chess) weakly or strongly (Allis, 1994). Hereafter we provide the question for a strong solution: will a computer program ever be able to find in any position of the game under investigation the best move, or more precisely, a move in "the class of best moves"? As yet this appears to be an intangible goal for chess. It is expected to remain one of the principal – if not the major – challenge(s) in the field for a long time to come.

Satisfaction in scientific research is not the same as pleasure in playing games. During the last few decades the significance of the opening theory of chess in games, matches, and tournaments has considerably increased; this trend will continue, presumably at an accelerated pace. Some opening systems have been analysed in great detail, for example the Sicilian and the Ruy Lopez system. As to the readers' information it is assumed that the late 15th century Göttingen manuscript contains the earliest report of these two opening systems (Murray, 1913, p. 782). In present-day tournaments it is not uncommon to play the first 25 moves of a popular almost-exhaustively analysed opening "from the book". So it may happen that the first new move to be thought on behind the board is played not until far in the middle game. An important novelty, even at this stage, may very well decide the outcome of the game. An unpleasant consequence for all chess players is that they have to spend much time on studying opening variants. An increasing number of players find this obligation a growing burden. Memorizing (as opposed to analysing) variants is not very exciting if compared to the challenge to beat one's opponent on the chessboard. A game should be an adventure rather than a test for the quality of one's homework. It is supposed to be a contest between the players' wits and ingenuities, not their memories.

It is obvious that a relatively weak move in the opening may have serious consequences for the rest of the game. Endgame theory is not unimportant altogether, but it will often be irrelevant: without a sufficient, solid knowledge of the opening variants one may not even reach the endgame. A well-prepared player, especially in the opening theory, will almost certainly beat his/her unprepared opponent of otherwise comparable skill and ingenuity.

Still, not everyone is prepared to admit that the opening theory nowadays constitutes a problem. When inquired about their opening preparation many players use to keep a stiff upper lip. It is customary to state that "one does almost nothing on opening theory". At the same time, many adhere to their personal repertoire of opening variants, since (1) it was carefully built up over the years, and (2) it has proven to be a practical and reasonably safe method to "survive the opening" in a match. Consequently keeping abreast of the novelties in the opening theory in general constitutes only a part of the chess-players' duties: a thorough study of, in particular, the opponent's specific opening repertoire before each game is highly recommendable since this will often pay off.

Here, we may conclude that there exists a growing need for liberating chess (as played in practice, in matches etc.) from the burden of the opening theory. The emphasis on and importance of the opening theory will certainly remain increasing, so the arguments in favour of its abolition will become more persuasive every year.

In our opinion, the time appears to be ripe for the introduction of a new, chess-like game that preserves the playing character of chess but in which the opening theory will effectively play no significant role. A possible candidate for such a game is any form of "randomized chess", for example, Chess960 (also called Fischer Random Chess). However, superchess is a more interesting and attractive candidate (in our opinion) because the new pieces with new movements introduce many new and interesting tactical combinations into the game. The large number of different initial positions effectively implies the abolition of the opening theory. An additional pleasant feature concerns the flexibility that superchess offers: the "distance" between classical chess and superchess is variable as it depends on the number and nature of the new pieces used.

9. GENERAL CLASSIFICATIONS OF CHESS-LIKE PIECES

Superchess introduces a large number of new, chess-like pieces (Van Haeringen, 1993a,b, 1999, 2004a,b). In general one can classify chess-like pieces in various different ways by distinguishing different qualities and movement lengths. Below we list a number of such classifications that play a role in the defining rules of the superchess pieces. The classification according to the range of movements is a quartering classification; the remaining classifications consist of dichotomies.

1. Range classification: (we distinguish:)
   a. Long-range pieces. These can move in a straight line in at least one direction (diagonally, horizontally, or vertically) over any number of squares (either with or without the restriction of moving over vacant squares only, see point 9 below). Examples: Queen, Rook, and Bishop.
   b. Short-range pieces. These can move at most two squares in at least one direction, *including* the well-known Knight's move. Examples: Knight, King (only when castling), and Pawn (only at its first move).
   c. "One-square-range" pieces. These can move only one square in at least one direction. Examples: King (except when castling) and Pawn (except for its first two-step move).
   d. "Zero-range" pieces. Examples are: the so-called Zero which stays on its square at each move, and the immobile pieces which cannot make any move.

Next we have five dichotomies with respect to some different qualities (the qualities are clear from the enumeration):

2. Pawn-like pieces and others,
3. Promotable and non-promotable pieces,
4. Promotion pieces[1] and others,
5. Pieces possessing special functions (for example, King and Rook) and others, and

[1] Promotion pieces are the pieces that are available for a player to choose after a Pawn has reached the last rank.

6. Pieces that capture in the same way as, or different from, the way they move without capturing.

Further we have ten dichotomies distinguishing pieces as to whether or not possessing a particular attribute:

7. the capacity to (be) change(d) into a different (more powerful) piece (either with or without restriction(s); for example, it is possible only on the last rank like the Pawn in chess),
8. the capacity to move backwards,
9. the power to jump, i.e., cross one or more occupied square(s),
10. the power to capture one of the opponent's pieces,
11. the power to capture two (or more) pieces in one move,
12. the possibility to be captured (with the distinction of temporary versus permanent "immunity"),
13. the quality of being "colour-fast" like the Bishop,
14. the quality of changing the colour of the occupied square at each move like the Knight,
15. the quality of occupying two or more squares, and
16. the "royalty quality" such as the King possesses. Losing this piece (with this quality) means losing the game.

10. SUPERCHESS

Superchess is a challenging new game, designed to be a natural *extension* of chess in a purely logical sense (apart from a few details). Consequently chess is just one of the many possible ways in which superchess can be played; in other words, *chess is just a variant of superchess*. The "distance" between chess and superchess is variable as it may be different in different games. One can gradually increase the distance, piece by piece, by incorporating additional new pieces in ensuing games. This flexibility constitutes one of the appealing features of superchess.

A game of superchess begins with the *prelude*: in the well-known starting position of chess, both players replace a few chessmen by new pieces with new movements, following a simple procedure. The number and nature of these new pieces will be prearranged by the players or prescribed by the rules and regulations of a particular tournament. The new initial position is again symmetric so that both armies are equally powerful. After the prelude the game is continued like chess.

Each player determines the starting position (mainly) on his/her right half of the board; White acts on the King's wing, Black on the Queen's wing. In addition Black is allowed to interchange a few pieces in order to neutralize (partially) White's advantage of having the first move. Thus none of the players knows the actual initial position in advance. Hence, opening theory will not play any role in practice, at least not in the beginning, simply because the number of different initial positions is too large. For comparison, the randomized version of chess called "Chess 960" has (only) 960 different initial positions, whereas in superchess this number can be much larger, depending on the number of new pieces to be used.

As noted before, superchess introduces a large number of new pieces, which are simply superadded to the chess pieces. At first sight this huge army might seem overwhelming and intimidating. However, on second thought the actual number of new pieces appears to be irrelevant. One should use only a few new pieces, especially in the beginning when playing the first few games. In fact, playing superchess is just as easy (or difficult) as playing chess.

Some readers might consider the transition from chess to superchess to be a too radical step. However, the chess revolution of the late 15th century was of the same order of radicalness. Then, in the world of chess players (not the chess problemists) the "old" chess virtually disappeared remarkably fast, since it was too slow compared to the "new" chess. In this respect the proposed "superchess revolution" is less radical.

Furthermore, the arguments in favour of playing superchess as stated in this note do not imply a call to abandon classical chess. On the contrary, chess is and hopefully will remain a very popular game possessing its special appealing features, including the opening theory. Superchess could perfectly well achieve a place as an interesting new game next to chess (cf. Pritchard, 2002, 2003; Bij de Weg, 2002). Chess players who in particular love the opening theory may adhere to classical chess or decide to play either game. After all, many game enthusiasts use to play bridge, Go, etc. next to chess.

10.1 New pieces

Recently two sets of new superchess pieces became available, beautifully and appropriately stylized in the same style as the "standard" Staunton models. Four of these pieces are depicted in Figure 1. The corresponding figurines are given in Figure 2. For the specific movements of these pieces, we refer to point 1 of Appendix 14.1. Moreover, please see www.superchess.nl.

Appendix 14.1 shows an example of the "Regulations of a Superchess Tournament" for beginners. The described procedure gives a clear illustration of how superchess can be played in practice (cf. Van Haeringen, 2004a, b). The reader can easily adapt these regulations to be suitable for playing with other superchess pieces, different in number and/or nature from the four pieces listed in point 1 of Appendix 14.1. Similar regulations will be used in the First Dutch Open Superchess Championship, January 24, 2004.

11. A SUPERCHESS COMPUTER PROGRAM

In the eight Computer Olympiads organised so far no competition of superchess programs has been held. The authors are aware of the website http://www.zillions-of-games.com/features.html, where over 350 board games, puzzles, and variants can be found. Among the games and features of the games one can find the new pieces Amazon, Empress, and Princess. This means that there are programs available that can play superchess with three new pieces. We have no idea of the playing strength of these programs. Fred Kok has used "Zillions of Games" to confirm that the solutions of six of the eight problems given in Appendix 14.2 are correct.

Solving superchess problems is a task which demonstrates the effectiveness of the programs and may show the correct implementation of the movements. Playing superchess involves strategic considerations and evaluations. For a competition of superchess programs one can envisage the same road as the game of chess has followed in the last fifty years. This implies the construction of adequate evaluation functions, the tuning of parameters, the identification of preferred squares, and the ideal squares for the new pieces in blocked positions as well as in open positions. There are many more features to be discussed and to be discovered.

The four new pieces mentioned in Appendix 14.1 are closely related to the ordinary chess pieces. Designers of new games have introduced many more pieces with different movements or even pieces with no movement at all. We do not advocate to introduce the whole set of pieces in the competitions of the Computer Olympiad but we believe that the current four pieces are a challenge for chess programmers. It may turn them into superchess programmers.

12. ACKNOWLEDGEMENTS

We are grateful to Wim Vriend for many interesting and valuable discussions about the richness of superchess and the significance of the great army of superchess pieces. Wim provided the diagrams and assisted in analysing most of the problems displayed on the website. Moreover, we would like to recognise Marion van den Bol for providing the figurines and maintaining the website www.superchess.nl on which much information can be found. Fred Kok provided us with the information on the program "Zillions of Games". Fred also checked six of the eight problems of Section 14.2 (those without the Veteran) by using this program. Tom Dingjan made the photographs of the four new pieces.

13. REFERENCES

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14. APPENDIX

Below two appendices are given. In Appendix 14.1 we see an example of the regulations of a superchess tournament and in Appendix 14.2 eight examples of superchess problems are presented.

14.1 An Example of Regulations of a Superchess Tournament

1. The starting position is the well-known *symmetric* arrangement of the 32 ordinary chess pieces on an ordinary 8 × 8 chessboard. On the fourth and fifth rank, 4 white and 4 black new superchess pieces (determined by the Tournament Organisation) are temporarily lined up. These are:
   - the Amazon (A, moves as Queen or Knight),
   - the Empress (Es, moves as Rook or Knight),
   - the Princess (Ps, moves as Bishop or Knight), and
   - the Veteran (V, moves as King or Knight; please note: it cannot be checked or mated).

   Some of these pieces will be deployed in the *prelude*, see point 3.

2. Before the beginning of the game the players experience the movements of these new superchess pieces. Each player demonstrates his/her opponent the movements of the new pieces as far as necessary.

3. The game begins with the prelude. During this prelude the chess clock will be used in the same way as during the rest of the game.

   Prelude

   a. White replaces on the King's wing (rank 1) one piece (i.e., Bishop, Knight, or Rook) by a new superchess piece; the King remains on its square.
   b. Next Black replaces on the King's wing, on rank 8, the corresponding piece by the same (black) superchess piece, in such a way that the position becomes symmetric again. Subsequently, Black replaces on the Queen's wing, on rank 8, one piece by a new superchess piece. Finally Black is allowed to exchange the two new superchess pieces on rank 8.

c. Next White replaces (and exchanges) the corresponding white piece(s) on his/her half of the board, such that the position becomes symmetric again.

After this prelude White makes the first move and the game is continued as a chess game, except for the rules for promotion, see point 4. Castling is possible only with a Rook, precisely as in chess.

4. At the promotion of a Pawn the player must choose one of the (at that moment) *available* pieces. These are, with the exception of the Amazons[1], the Pawns, and the pieces that have been deployed again via promotion:

   a. the replaced chess pieces,
   b. the not-deployed new superchess pieces, and
   c. the captured pieces.

   These available pieces must be arranged next to the board as from White's first move.

5. Except for the above rules the tournament will be played under the FIDE regulations.

An advice for beginning superchess players is: check whether all Pawns are well-defended in the initial position created by the prelude.

14.2 Four Diagrams with Eight Problems

Below we present eight problems in which the aforementioned superchess pieces Amazon A, Empress Es, Princess Ps, and Veteran V participate, together with ordinary chessmen. Four diagrams illustrate the problems. In each of the four positions shown, White to move can mate in a few moves, but also Black to move can mate in a few moves. This information will help in finding the solutions. It is likely that the player to move will have to check since otherwise he/she might be quickly mated him/herself. The solutions are not particularly hard to find. The main variants are given at the end of this section. A part of the solution complex is left to the reader as an exercise. Please note that Kt is used as indication for Knight. The reason is that N has been reserved for Nymph.

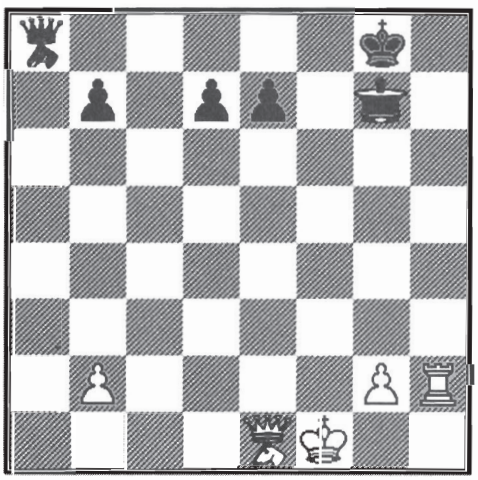

Diagram 1:
White: Kf1, Ae1, Rh2, b2, g2 (3+2 pieces)
Black: Kg8, Aa8, Esg7, b7, d7, e7 (3+3 pieces)
Problem 1: White to move mates in 6.
Problem 2: Black to move mates in 5.

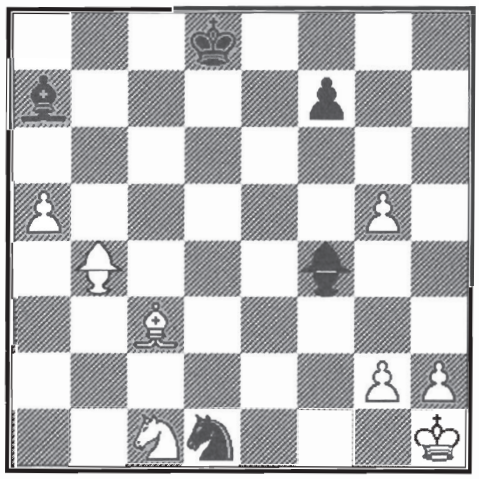

Diagram 2:
White: Kh1, Vb4, Bc3, Ktc1, a5, g2, g5, h2 (4+4 pieces)
Black: Kd8, Vf4, Ba7, Ktd1, f7 (4+1 pieces)
Problem 3: White to move mates in 5.
Problem 4: Black to move mates in 6.

[1] A Pawn cannot promote to an Amazon, since that piece is considered to be too powerful. Such a promotion might decide the game at once. Then the characteristic of being a balanced game would be disturbed (see the remark on the "atomic bomb", Section 7, criterion c).

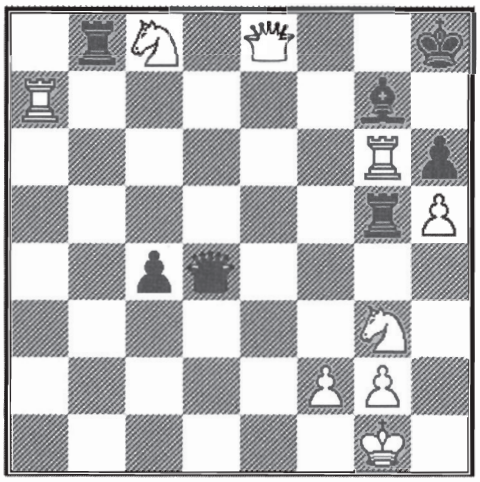

Diagram 3:
White: Kg1, Pse8, Ra7, Rg6, Ktc8, Ktg3, f2, g2, h5 (6+3 pieces)
Black: Kh8, Psd4, Rb8, Rg5, Bg7, c4, h6 (5+2 pieces)

Problem 5: White to move mates in 8.
Problem 6: Black to move mates in 6.

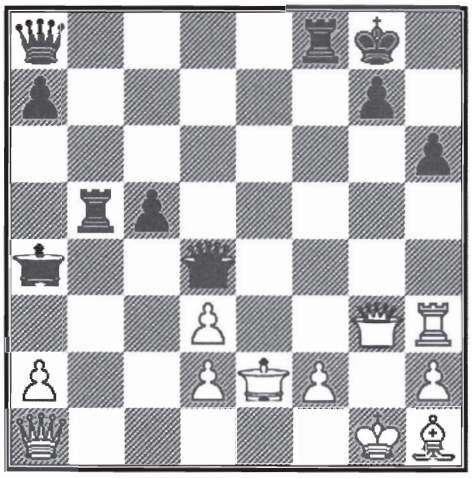

Diagram 4:
White: Kg1, Qa1, Ese2, Psg3, Rh3, Bh1, a2, d2, d3, f2, h2 (6+5 pieces)
Black: Kg8, Qa8, Esa4, Psd4, Rb5, Rf8, a7, c5, g7, h6 (6+4 pieces)
Problem 7: White to move mates in 8.
Problem 8: Black to move mates in 3.

SOLUTIONS

Solution to problem 1
1. Rh2-h8† Kg8×h8 2. Ae1-h4† Kh8-g8 3. Ah4-h6† Kg8-f8 4. Ah6-h8† Esg7-g8 5. Ah8-h7† Kf8-e8 6. Ah7×g8† mate

Solution to problem 2
1. … Esg7-f5† 2. Kf1-g1 Aa8-b6† 3. Kg1-h1 Esf5-f2† 4. Kh1-g1 Esf2-d1†! 5. Kg1-f1 Ab6-f2† mate
Also nice (but not mate in 5) is 4. … Esf2-e2 (or f3 or h3)† 5. Kg1-h1 Ab6-g1† 6. Ae1×g1 Ese2-g3† mate

Solution to problem 3
1. Vb4-c6† Kd8-c8 2. Vc6-d6† Kc8-b8 3. Vd6-d7† Kb8-b7 4. a5-a6† Kb7×a6 5. Vd7-c7† mate

Solution to problem 4 (main variants)
1. … Ktd1-f2† 2. Kh1-g1 Ktf2-e4† (A) 3. Kg1-h1 Kte4-g3†! 4. h2×g3 Vf4×g3† mate (B) 3. Kg1-f1 Vf4-e3† 4. Kf1-e1 Ve3-f2† mate (The mate in 6 originates from the possibility of interposing the Veteran and the Bishop, respectively).

Solution to problem 5
1. Pse8-f7† Kh8-h7 2. Rg6×h6†! Bg7×h6 3. Psf7-g6†! Kh7-g8 4. Ktc8-e7† Kg8-g7 5. Kte7-f5† Kg7-f6 6. Ktg3-e4† Kf6-e6 7. Ktf5×d4† Ke6-d5 8. Ra7-d7† mate

Solution to problem 6
1. … Rb8-b1† 2. Kg1-h2 Rb1-h1† (A) 3. Ktg3×h1 Rg5×h5† 4. Kh2-g3 Psd4-e2† mate (B) 3. Kh2×h1 Psd4×f2† 4. Kh1-h2 Psf2×g3† 5. Kh2-h3 Psg3-f2† 6. Kh3-h2 Rg5×h5† mate

Solution to problem 7
1. Ese2-e7† Kg8-h7 2. Bh1-e4† Qa8×e4 3. Psg3×e4† Rf8-f5 4. Rh3×h6†! Kh7×h6 5. Ese7-g8† (A) 5. … Kh6-h7 6. Esg8-f8† Kh7-h6 7. Esf8-h8† mate (B) 5. … Kh6-h5 6. Esg8-h8† Kh5-g4 7. h2-h3† Kg4-f4 8. Esh8-g6† mate

Solution to problem 8
1. … Qa8×h1† (A) 2. Kg1×h1 Psd4-f3† mate (B) 2. Psg3×h1 Psd4×e2† 3. Kg1-g2 Esa4-f4† mate

Finally, we take pleasure in informing the reader that about 60 problems involving the A, Es, Ps, and V can be found on www.superchess.nl under Dutch Championship. The problems were composed by Henk van Haeringen with the main purpose of giving the reader the opportunity to acquire experience with these four pieces. The same four pieces will be used in the First Dutch Open Championship Superchess which will be played as part of the well-known Corus Chess Tournament in Wijk aan Zee, The Netherlands, on January 24, 2004.