**Quote of the Day!**

“Repeating moves in an ending can be very useful. Apart from the obvious gain of time on the clock one notices that the side with the advantage gains psychological benefit.” - Sergey Belavenets

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**Computer Chess**

I found an amazing resource, Chess Programming Wiki, [https://chessprogramming.wikispaces.com/Home](https://chessprogramming.wikispaces.com/Home).

Today I will cover article from there talking about Corresponding Squares (as we just talked about triangulation on a2z-21).

[https://chessprogramming.wikispaces.com/Corresponding+Squares](https://chessprogramming.wikispaces.com/Corresponding+Squares)

and from Wiki:


I will just bring (part of it) almost verbatim here, with some of my comments.

**Corresponding Squares**

Corresponding Squares, also called Co-ordinate Squares, is a concept to analyze pawn endgames. Using retrograde analysis (=method in game theory to solve for optimal solution by backward induction. Analyzing backward from the desired position), Zugzwang positions and Critical Squares are found. Corresponding Squares Systems were one of the first human attempts of finding formulas and finally solving certain chess positions. This concept is only possible due to the limited mobility in pawn endgames. King-oppositions and Zugzwangs are the main motives arising.

**Theory**

To get an idea, the concept is described using an example position by Charles Dealtry Lockock, 1892:

![Chessboard Diagram](https://example.com/chessboard.png)

**Finding Critical Squares**

In the presented position there exist [two critical squares. First](#) when the white king reaches d4, white threatens 1. e5 dxe5 2. Kxe5 (threatening attacking both Pd7 and Pg4 in the next move). To defend this threat the black king must be able to move to f6 after Kd4. Secondly when the white king reaches e3, white threatens 1. Kf4 ... 2. Kxg4. In order to avoid this the black king must stand on g5.

To summarize, the two critical squares (for White) are e5 and f4. The according corresponding squares

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where both sides have mutual zugzwang are Kd4 - Kf6 and Ke3 - Kg5.

Constructing Corresponding Square System
This particular example, where two Corresponding Squares are connected diagonally and there is enough space for a 3x3 square, Averbakh called the eight-square system. The construction of this Corresponding Square System starts with numbering the first two Corresponding Squares 1 and 2 accordingly. (You number only legal-move squares). The square connecting the two receives the number 3. The outer squares of the 3x3 field receive the numbers 4 to 8. Further outside the numbering can continue by using the number of a square exactly two squares away either diagonally, horizontally or vertically. This is NOT a unique numbering system, and it seems to me it might (!!) matter when computing where to go. The image below should exemplify this process.

The way to take advantage of the Corresponding Square System is easy now. White must move towards the critical squares, never stepping on squares the black king can defend.

1. Kb1! (BZ: steps on 3, the black king can not reach any 3-squares <-- This is NOT a Distant opposition!! Distant opposition would be ka2.) Kg7
2. Kc1 (steps on the same number as the black king: 5) Kg6

(1) by Charles Dealtry Lockock, - 1892
Corresponding squares theme, 13.09.2014
[Baharav,Zachi]

Using the Corresponding Square System
The numbers tell us that if the white king manages to step on a square with the same number as the square on which the black king is standing, he automatically wins the fight for the critical squares.
Computer Chess Implementation

First of all it must be noted that the concept of Corresponding Squares was designed to give the human chess player a tool to efficiently analyze a complex pawn endgame. Computers can very easily solve such positions using their Transposition Tables. Just as an example it takes Computers only a couple of seconds to reach a depth 20 in the Lasker-Reichhelm position, also referred to as Fine #70 [2] and thus find the opponent's Zugzwang. Nevertheless Computers also have some disadvantages. The main problem is the point where the chess engine has to decide whether to enter a certain pawn ending or not. Usually these positions offer a lot more mobility, thus conducting a deep enough search seems infeasible.

The first attempt of tackling Corresponding Squares with a computer chess engine was made by Rafael B. Andrist and his chess program Wilhelm [3] [4].

More recent research was done by Edmund Moshammer.

.. and now they delve into programming this.

Okay, let’s look at this as well:

The Lasker-Reichhelm Position, composed by World Champion Emanuel Lasker and Gustavus Charles Reichhelm in 1901, is most famous to solve with the method of corresponding squares. It is also a test-position for the efficiency of search tables, most notably the transposition table, where most of today’s programs find the only winning move Kb1 with an appropriate (winning) score in less than one second. However, it is not recommended to tune replacement schemes purely based on this position.

The Lasker-Reichhelm position, elaborated in 1932 by Vitaly Halberstadt and Marcel Duchamp in L’opposition et les cases conjuguées sont réconciliées (Opposition and Sister Squares are Reconciled) introducing corresponding squares , was
further mentioned 1941 in Reuben Fine’s Basic Chess Endings and is therefore well known as Fine #70.

http://en.wikipedia.org/wiki/Corresponding_squares#Lasker-Reichhelm_position

1. Kb1 Kb7
2. Kc1 Kc7
3. Kd1 Kd8
4. Kc2 Kc8
5. Kd2 Kd7
6. Kc3 Kc7
7. Kd3 Kb6
8. Ke3

and White wins by penetrating on the kingside. Each of White’s first seven moves are the only one that wins (Müller & Lamprecht 2007:193–94).

The corresponding squares in these cases need to be with regard to the TWO key points, as it is always a threat to go there as well. So you number them with relation to the TWO squares.

============== END ==============

This issue: Computer chess, Corresponding squares, end game, Fine #70.