

# Appendices

## Appendix A: Glossary of Chess Terminology

The following is a list of chess-specific terminology used by this report. Terms defined by other entries are denoted by *italics*.

### Capture

The act of moving a piece onto a square occupied by a piece belonging to the opponent (a player may not capture his own pieces). The captured piece is removed from the board. Note the special case of *en-passant*.

### Castling

A special move that may be played a maximum of once per game by each player. It consists of moving the king two squares towards a friendly rook, then moving the rook to the square on the other side of the king. It may only be executed if the following conditions hold:

- The king and the rook have not yet moved.

- There are no pieces (of either colour) between the king and the rook.

- The king is not in *check*.

- The king would not pass through check (i.e. if it had moved only one square toward the rook).

- The king would not be in check after castling is finished.

### Check / Checkmate

A move gives check when it places the enemy king under attack. A king that is in check is obligated to escape the check, either by moving to a safe square, placing a piece in-between the king and the attacker (interposing) or capturing the attacking piece. If none of these are possible, the king has been checkmated, losing the game immediately.

### Doubled pawn

Two pawns of the same colour stood on the same *file*, typically considered a weakness due to their reduced freedom of movement. Tripled pawns, etc. are similarly defined.

### Elo rating

A number corresponding to playing strength. The difference between the Elo rating of two players serves as a prediction of the score if they play each other. A difference of 200 points corresponds to an expected score of 75% for the stronger player.

### En-passant

A special type of *capture*. When a pawn makes its initial double move, if an opposing pawn could have captured the pawn if it had moved only one square, the pawn may be captured as if it had done just that. An example would be a white pawn on d2 moving to d4 when a black pawn is stood on c4. Since the black pawn

could have captured the white pawn had it moved to d3, the black pawn may capture the white pawn en-passant by moving to d3. En-passant is only possible on the move immediately following the pawn's double move; if some other move is played, the privilege is lost.

#### En-prise

A piece is en-prise if it is undefended. En-prise pieces are liable to be *captured* if possible, as there is no way to recapture the attacker.

#### Endgame

The endgame comes about when *material* has been greatly reduced. The characteristics of the game change significantly in the endgame; the king is no longer a liability to be defended but instead an active attacking piece, and the focus is often on *promoting* a pawn.

When discussing endgames, notation such as KBPKP is often used. This particular example denotes an endgame where one side has a bishop and pawn remaining and the other side has only a pawn.

#### Fifty-move rule

One of many ways for a game to be drawn. If at least fifty moves by each player (one hundred *ply*) pass without a pawn move or *capture* taking place, either player may claim a draw.

#### File

Vertical columns of squares. Files are lettered left-to-right from White's perspective; the leftmost file is the A-file, the rightmost the H-file.

#### Initial position

The standard layout for the pieces at the start of a game of chess.

#### Insufficient material

One of many ways for a game to be drawn. If neither player possesses enough *material* to deliver checkmate, the game is immediately drawn. Specifically, the game is drawn when any of the following *endgames* occur:

KK

KBK

KNK

KBKB with both bishops on the same colour square

#### Isolated pawn

A pawn without any pawns of the same colour on adjacent *files*, typically considered a weakness due to its inability to be defended by a pawn. A piece is forced to take up the role instead, potentially preventing it from doing something more useful.

#### Kingside

The E-, F-, G- and H-*files*, so-called because the king starts the game on this side of the board.

#### Material

The pieces available to each side. One may be said to have a material advantage if they have more pieces than the opponent. See also: *insufficient material*.

### Middlegame

The phase of the game between the *opening* and the *endgame*. Pieces have been developed and the fight proper has begun, but the issue of king safety is still relevant.

### Opening

The first phase of the game, where players are primarily concerned with developing their pieces, getting them to good squares.

### Passed pawn

A pawn which cannot be prevented from *promoting* by enemy pawns. For example, a white pawn on d4 is considered passed if no black pawns stand on the c5-c8, d5-d8 and e5-e8 squares. Generally considered an advantage, especially in the *endgame*.

### Ply

A single move by either player.

### Promotion

A pawn that reaches the far side of the board (eighth *rank* for a white pawn, first rank for a black pawn) will be promoted. The pawn is removed from the board and replaced with the player's choice of queen, rook, bishop or knight. Promotion is compulsory; a player cannot leave the pawn unpromoted on the last rank. Promotion to queen is by far the most common; indeed, promotion is often referred to as "queening a pawn".

### Queenside

The A-, B-, C- and D-*files*, so-called because the queen starts the game on this side of the board.

### Quiet move

A move that does not *capture* a piece or give *check*.

### Rank

Horizontal rows of squares. Ranks are numbered bottom-to-top from White's perspective; the closest rank is the first rank, the furthest the eighth rank.

### Stalemate

One of many ways for a game to be drawn. Stalemate occurs when the player to move has no legal moves (as in checkmate), but is not currently in *check*.

### Threefold-repetition

One of many ways for a game to be drawn. If identical positions occur three times throughout a game, either player may claim a draw. To be considered identical, the three positions must have the same player on move and unchanged *castling* and *en-passant* rights.

### Time control

Many games of chess, especially in tournaments, have a time limit associated with them. Each player is given a certain amount of time to complete some/all of the moves, and overstepping this time limit results in immediate forfeit of the game. There is an exception to this rule; if the opponent does not have sufficient material to deliver *checkmate* (see *insufficient material*) when the player's time runs out, the game is instead declared a draw.

### Variation

A sequence of moves. In the context of computer chess, the principal variation is the sequence of moves that the engine expects to be played from the current position.

### Zugzwang

A situation in which the player to move cannot do so without weakening their own position. Zugzwang is a factor in many *endgames*, especially when a pawn is involved, although zugzwang in the *middlegame* or even the *opening* is not unheard of. If both players would be in zugzwang if it were their move, the situation is one of reciprocal zugzwang.

## Appendix B: Installation & User Guide

This section is a step-by-step guide to installing and playing against Zephyr in the Arena GUI. Arena was selected due to its relative ease of use compared to other freely available GUIs, but there are nevertheless a few things that take getting used to. There are three steps to the process, as follows:

- Step 1: Installing Arena
- Step 2: Installing Zephyr
- Step 3: Installing an opening book

### Step 1: Installing Arena

Arena is freely available from its website<sup>1</sup>. At the time of writing, the latest version is Arena 3.0, compatible with Windows XP and higher or Linux running Wine 1.0 and higher.

In the Downloads section, choose "Arena 3.0 setup". When the file has downloaded, run the executable and follow the on-screen instructions.

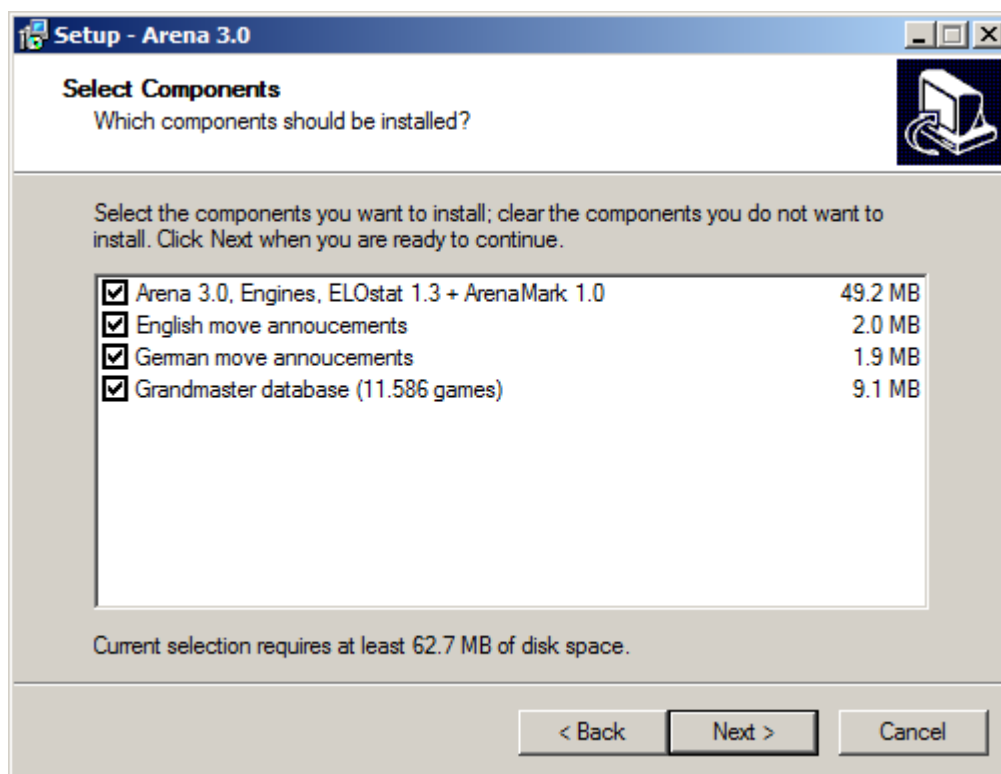


Fig. 23: Part of the Arena installation wizard.

On the screen shown in Figure 23, only the first item is required for Arena to run; all others are optional. Move announcement is a disability-access feature that reads moves aloud using the chessboard coordinate notation, such as "Bishop, f8, g7", while a grandmaster

<sup>1</sup> <http://www.playwitharena.com/>

database is a collection of games which more serious players may wish to study. Select the features you wish to include in the installation, and continue through the installation procedure.

Once Arena has been successfully installed, run the program. After a brief splash screen, you should be presented with the following window:

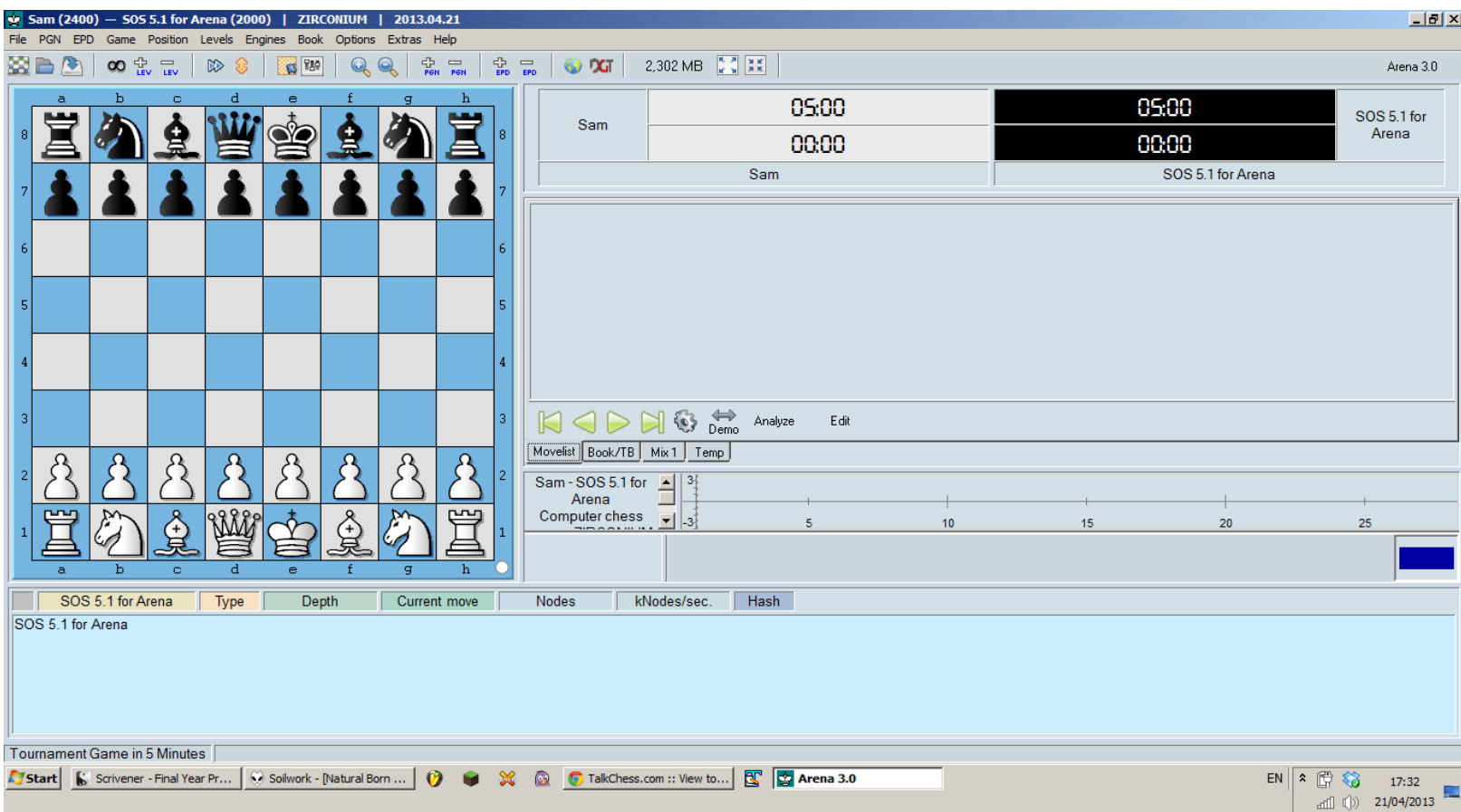


Fig. 24: Arena main window.

Several engines come packaged with Arena by default, including SOS 5.1 as depicted here. By default, each side has five minutes for all of their moves and the engine plays Black. Play commences by simply making the first move for White, dragging a piece to the desired square. Playing as Black is unfortunately a little awkward at first; the board is flipped manually using the vertical two-way arrow on the toolbar (shortcut key F12). The engine must then be forced to move instead of the player. The easiest way to achieve this is pressing the spacebar.

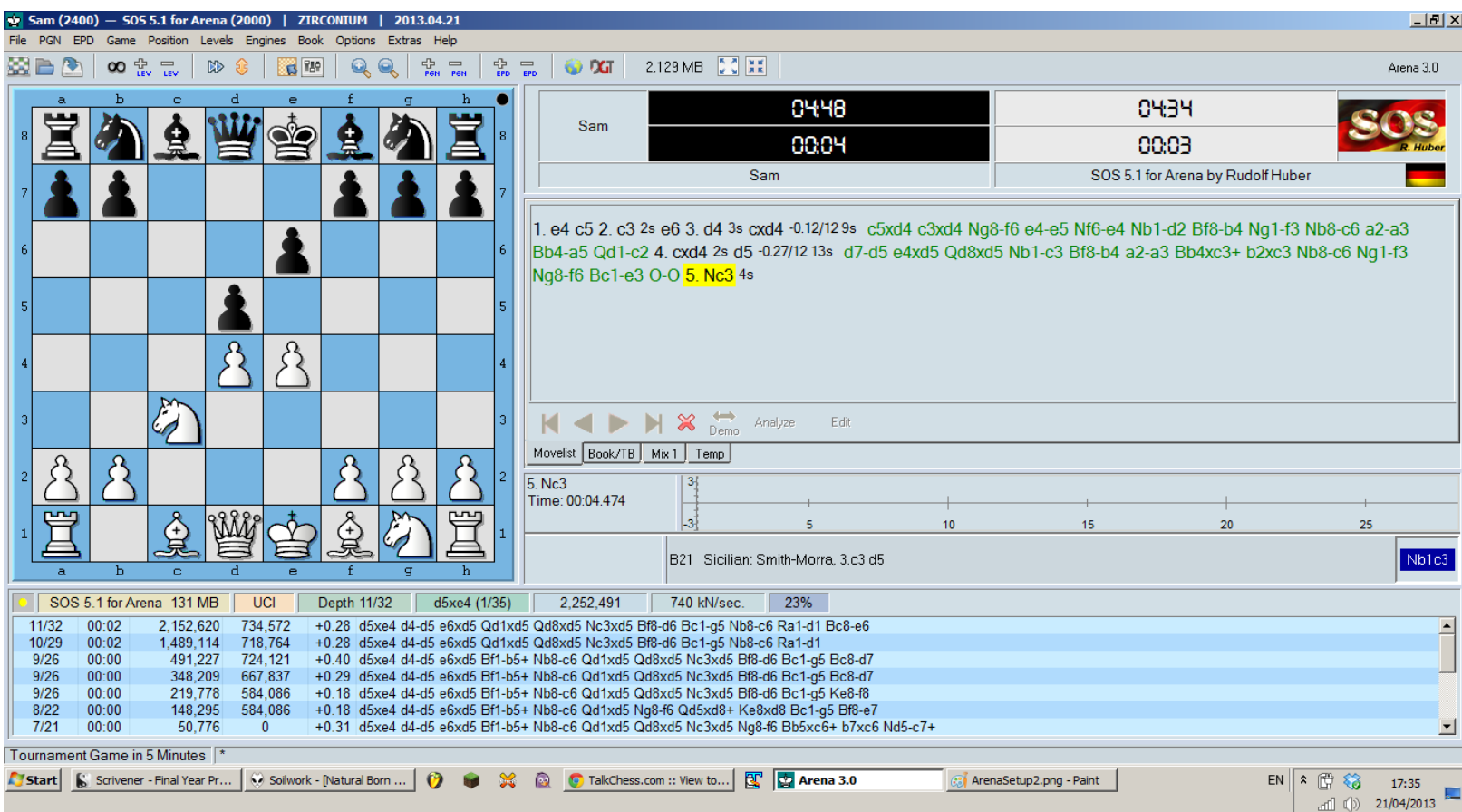


Fig. 25: Playing a game as White against an engine.

## Step 2: Installing Zephyr

To install Zephyr (or indeed any new engine), at the top of the screen select "Engines" followed by "Install New Engine...", and navigate to the location where Zephyr's files are stored. As Zephyr is a Java program, it is run using a batch file rather than an executable, so it will be necessary to change "Files of type" from .exe to .bat as in Figure 26.

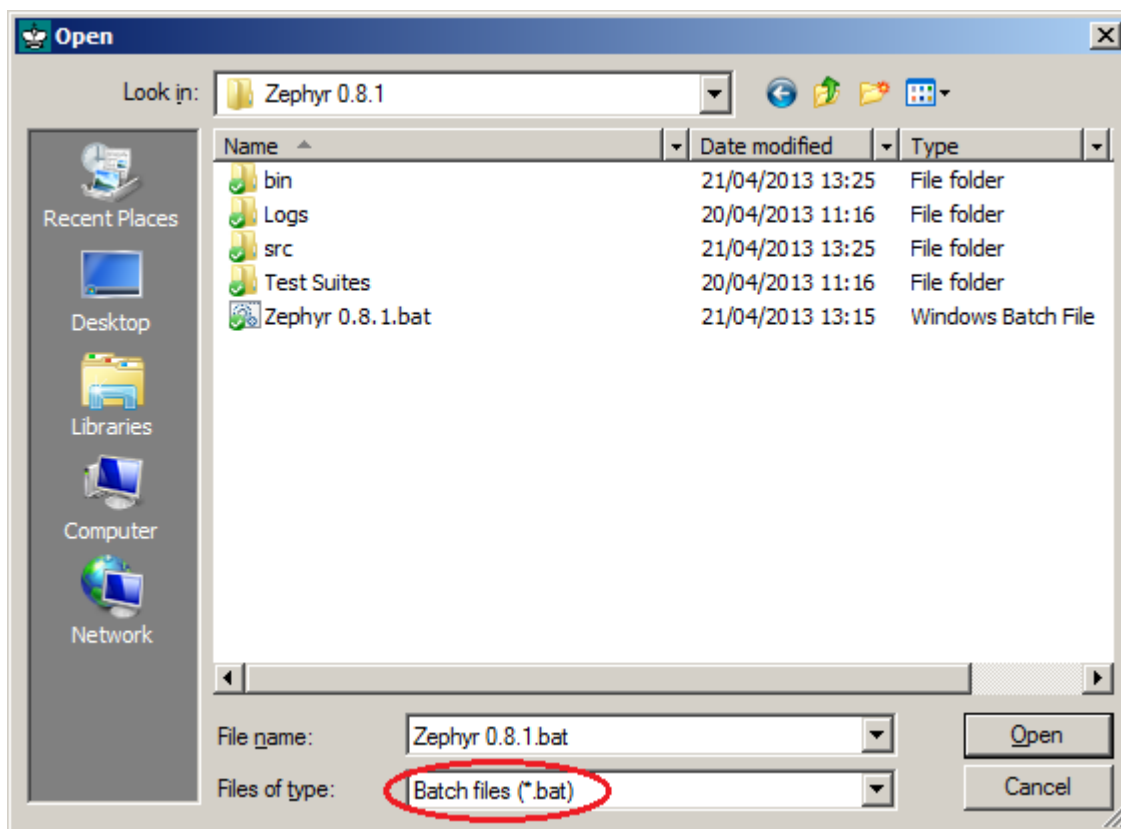


Fig. 26: Selecting the engine to install. Be sure to switch "Files of type" from .exe to .bat when installing a Java-based engine such as Zephyr.



The next window prompts the user for the protocol used by the new engine, as shown in Figure 27. Zephyr is a WinBoard engine, so select this option and click OK. If UCI is accidentally selected instead, the engine will fail to load correctly and it will be necessary to manually edit the protocol being used in the Engine Management window (covered in step 3).

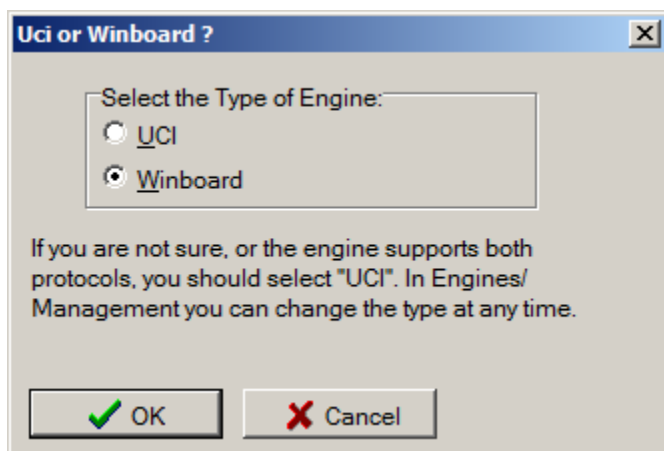


Fig. 27: Selecting the protocol used by the engine.

You will then be asked whether to start up the engine immediately. Select Yes, start a new game and the engine will be ready to play against, in exactly the same manner as SOS 5.1 in the previous step.

### Step 3: Installing an Opening Book

While functional, the engine as it stands becomes a little boring to play against after a few games; assuming the time control remains the same, the engine will almost always play the same move in a given position. The solution to this problem is an opening book, which allows the engine to choose randomly from moves considered reasonable by modern opening theory. A few basic opening books are included with Arena, but Zephyr comes with a more expansive one based on the opening book of the powerful Rybka chess engine. Opening books compatible with Arena are in the .abk file format.

Installing a new opening book is similar to installing a new engine. Using the menus at the top, select Book followed by Manage. Ensure that the checkbox labelled "Use Arena mainbook" is marked, then click Load. Locate and select the Zephyr-Rybka.abk file.

Next, we must allow Zephyr to use this opening book. Close the Book Management window, then using the menus at the top select Engines followed by Manage. Click on the Details tab and select Zephyr from the list of installed engines. This window primarily contains information about each engine, such as its name, the author, which protocol it uses and so on. However, under the Books sub-tab, it is possible to select the opening book used by this engine. Since we set up Zephyr-Rybka.abk as the Arena mainbook, we need only ensure the checkbox labelled "Use Arena mainbooks with this engine" is marked; see Figure 28.

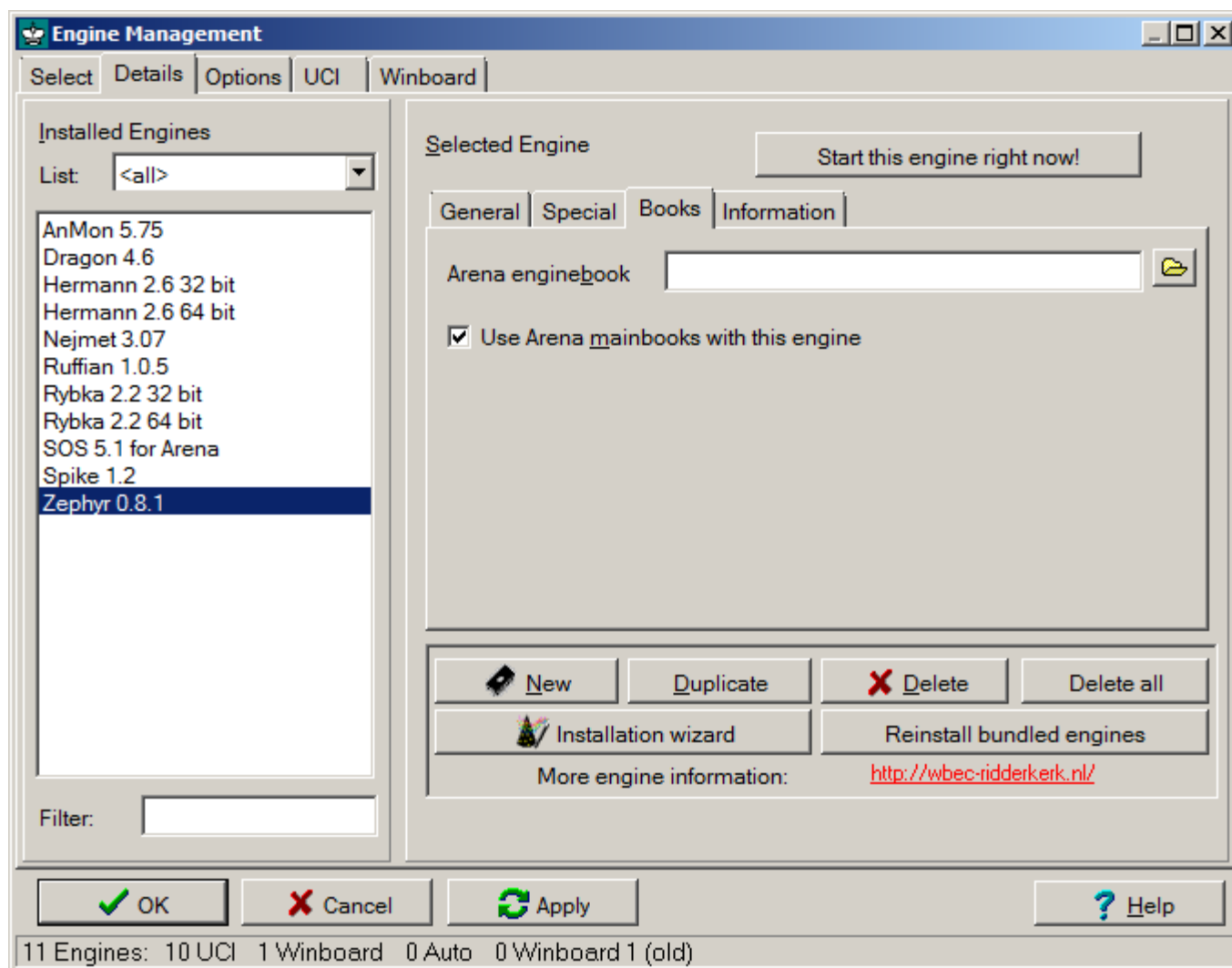


Fig. 28: Enabling the opening book for Zephyr 0.8.1. Note that the "Arena enginebook" field remains blank.

Click Apply, then close the window by clicking OK. Zephyr is now ready to play with the new opening book, providing a much more varied and interesting challenge.