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15233 VENTURA BOULEVARD, SUITE 1118, SHERMAN OAKS, CALIFORNIA 91403 (818) 986-4885

MYCHESS
Chess Playing Program
by Dave Kittinger

CP/M Version 2.3
MSDOS Version 1.0
May 1984

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1. INTRODUCTION

MYCHESS is a championship microcomputer chess playing program, winner of the Fifth West Coast Computer Faire (1980) tournament, and the top finisher among microcomputers in the 10th ACM North American Computer Chess Championship (1979). MYCHESS has a U.S. Chess Federation ranking of 1568 when playing on a 4 MHz Z80 under tournament time limits.

If you have an IBM PCjr or a PC with color/graphics display adaptor, a Heath/Zenith computer or terminal, an Osborne 1, or a Xerox 820-II, you can run MYCHESS with a graphics board display. There is also a configurable version with an ASCII graphic display for the monochrome IBM PC, Kaypro, DEC Rainbow 100, and other 80 by 24 terminals with cursor positioning, and a scrolling display for other terminals. All require either an MSDOS system and 128K of RAM, or a Z80 processor and 48K of RAM. (MSDOS is called DOS on IBM PC systems, and ZDOS on Heath/Zenith systems.)

The skill level of MYCHESS may be varied by altering the ply level, or number of half moves which the program looks ahead. By setting the appropriate ply level, players from beginner to expert can make MYCHESS a reasonably well-matched opponent.

The program offers considerable flexibility in setting up and playing the game. MYCHESS can play a game from the beginning, playing either white or black. Or a position may be set up and the game continued from that point. You can also save a game in progress and resume it later.

At any move, the player can switch pieces with MYCHESS, and begin to play the opposite side. This can be done on every move, so that MYCHESS plays both sides of a game.

The moves can be recorded automatically on a line printer as the game is played. Or, at the end of the game, you can save a listing of the moves on a text file for later viewing or printing.

And if you grow impatient waiting for MYCHESS to move, it can be forced to stop thinking at any point and play the best move it has discovered thus far.

We hope you will enjoy having a ready chess opponent always available.

2. HOW TO PLAY A GAME

We will first describe how to play a normal game, and then return to cover the other options in setting up the game.

Before playing MYCHESS for the first time, the prudent computer scientist will place a write protect label on the MYCHESS distribution disk, and make a backup copy of MYCHESS on another disk. To copy your disk, you can use a system utility such as DISKCOPY on MSDOS or DUP on Heath/Zenith CP/M. You can just run the program and follow the prompts, or see your computer's manual for instructions.

2.1. Which Version to Use.

Depending on which disk format you use, your distribution disk will contain one or more of the following programs:

MYCHESS	Graphics version, configured for IBM PC or Zenith Z150 (MSDOS disk), Osborne 1 (Osborne format disk), Kaypro with pixel graphics (Kaypro disk) or Heath/Zenith computers and terminals (all other formats).
MYCHESSX	Graphics version for Xerox 820-II computer.
MYCHESSN	ASCII version for all other Z80 systems; comes configured for DEC Rainbow (on DEC format disks) or Kaypro (other formats).
MYCONFIG	Configuration program for MYCHESS.

Choose the proper version for your system. If you do not have one of the computers named above, try using MYCHESSN. It may well run on your computer. However, if the display is garbled, you will need to use the MYCONFIG program to configure MYCHESSN, as described in Section 7.

The MSDOS version of MYCHESS comes configured to use a high resolution black and white board display for the IBM PCjr, the PC with color/graphics display adaptor, and completely compatible computers such as the Zenith Z150 or Z160.

If you are running MSDOS on a Zenith Z100, or an IBM PC in a different hardware configuration, you will need to configure MYCHESS. Also, MYCHESS has several color board displays available for the PC and PCjr, which you can select by configuring MYCHESS. See Section 7 for instructions.

To run MYCHESS, mount a disk containing MYCHESS in your B: drive and type B:MYCHESS. If you are using MYCHESSN or MYCHESSX, type that name instead.

On HDOS, use SY1: instead of B:.

On a single disk system, copy file MYCHESS.COM (on HDOS, MYCHESS.ABS) to a system disk, boot the system disk, and type MYCHESS.

2.2. Starting the Game.

The program starts off by asking a number of questions which determine the parameters of the game. For now, just type the RETURN key after each question. The one question that can not be answered this way is "Skill level (1-9)?" Type 1 for a very fast game, 2 for a rapid game, 3 for a moderate game (a minute a move), and 4 for a slow game (4 minutes a move). The more time MYCHESS has to think, the better it will play.

MYCHESS will make the first move and display the board. (You can make the first move by answering Y to "Do you want white?") At this point you should enter a command, or enter your move.

3. HOW TO TYPE IN YOUR MOVE

MYCHESS types and accepts chess moves in a form called algebraic notation. This notation identifies each square on the board by two coordinates: a letter and a number. The coordinates are shown on the board display - rows 1 through 8, and files A through H. For example, the white king always starts on square E1. (On the Osborne, the letters are shown to the right of the files they refer to.)

To type a move, simply type the square from which you are moving, a dash, and the square to which you are moving. MYCHESS, playing white, might move king's pawn to king four. This would be described as E2-E4. To reply with the symmetric move, you would type "E7-E5", and press RETURN.

To castle, type "O-O" or "O-O-O" (letter O, not number 0) for castling king's side or queen's side, respectively. When a pawn is promoted, the move should be followed by an equals sign or space, followed by the letter of the piece to promote to. For example, to move a pawn from F2 to F1, promoting to queen, type F2-F1=Q. (Due to its internal representation of pieces, MYCHESS does not allow more than one queen per player.)

To rub out mistakes in the line being typed, use the DELETE key or the BACKSPACE key. Use the left arrow key on the Osborne.

MYCHESS will not accept illegal moves. Whenever an illegal move or unacceptable command is typed, MYCHESS beeps and repeats the question.

When MYCHESS types "YOUR MOVE", in addition to a move it will also accept one of the following commands:

- Q Quit; end the game. You can save a listing of the game, and save the game itself for later resumption. See "Saving and Resuming a Game" below.
- P Change the search ply setting.
- M Lets you make a move without MYCHESS making a move in reply.
- R Reverse the board. This lets you switch positions with MYCHESS, so that you begin playing its position and vice versa. Should the board display become garbled, executing the R command twice in succession will refresh the display, and return the pieces to the correct position.
- GO Makes MYCHESS move, even if you have not entered a move.
- S Turns on self play mode. MYCHESS will make the moves for both sides, until the game is over or until you type in another command. You may have to wait for MYCHESS to complete the move it is working on before it performs your command (except GO, which is accepted immediately).

When MYCHESS is thinking, it will accept the GO command. This will force it to move immediately, making the best move it has been able to think of up to that point.

4. OPTIONS FOR SETTING UP THE GAME

Before the beginning of the game, MYCHESS asks a number of questions and sets itself up accordingly.

SET UP A POSITION? To play a normal game, answer N. Setting up a position is discussed further below.

RECORD MOVES ON PRINTER? Responding Y causes the moves to be written to a hard copy device. On HDOS, this is device LP:, on CP/M it is LST:, and on MSDOS LPT1. Remember that you can also save the moves after the game is over, or when you quit using the Q command.

WHAT IS YOUR NAME? MYCHESS asks for the name of its opponent so the board can be properly labeled.

TIME CONTROLS? If time controls are to be specified, MYCHESS asks first for the number of moves, then the number of minutes, for the first time control, and then for the second time control. Typical time controls are 40 moves in 120 minutes, then 20 moves in 60 minutes. Under time controls, MYCHESS will set the depth of search at four plies, and drop to three when under time pressure. MYCHESS will trust the player to keep time and will occasionally ask how much time it has remaining.

On CP/M systems, MYCHESS assumes it is running on a 4 MHz. computer, except for the ASCII (MYCHESSN) and Heath/Zenith graphics versions which assume 2 MHz. If you are running the Heath/Zenith version on a 4 MHz machine, or the non-graphics version on a 2 MHz machine, see the Configuration section.

SKILL LEVEL (HALF MOVES OF LOOK AHEAD) (1-9) If time controls are not specified, MYCHESS asks for the ply depth, or number of half moves to look ahead. The higher this number, the slower and better MYCHESS will play. At a depth of three, MYCHESS will take about 60 seconds a move (longer on 2 MHz machines and the PCjr), and will play about six times slower for each additional ply. As the number of pieces on the board is reduced, MYCHESS will increase its ply depth and continue to move in roughly the same amount of time.

DISPLAY BEST VARIATION? For a normal game, this question should be answered N. If the answer is Y, every time MYCHESS makes a move it will print out what it thinks the best continuation, or next few moves, ought to be. The number of moves printed indicates how far ahead MYCHESS is looking. Nothing is displayed during the first few moves, as long as the game is in the "book" of standard openings built into MYCHESS. If Skill Level 1 has been specified, MYCHESS will not ask this question.

DO YOU WANT WHITE? Typing Y will allow you to make the first move. If you type anything else, MYCHESS will take white and make the first move.

If you elect to set up a board position, MYCHESS displays the board set up for the beginning of a game, and then accepts any number of moves to set the board up. The moves need not be legal, as long as the destination square is unoccupied. To remove a piece from the board, simply type the name of its square.

When the board has been set up as desired, type a blank move (i.e., just a RETURN). MYCHESS will ask for the castling status of each side, and the move number. Play then begins at the designated position and move number.

5. SAVING AND RESUMING A GAME

When you enter the Q command ("Quit"), MYCHESS allows you to save the game for later playing, and/or a listing of the moves. You can also save the listing when the game terminates. You will be asked the following questions:

SAVE GAME? (Y=yes) If you answer "Y", MYCHESS asks for the name of a file on which to save the game. Remember that the file will be placed on the logged in disk (usually A: in MSDOS and CP/M; SY0: in HDOS) unless you specify another disk in the file name. Be sure that there is at least 5K of space available on the disk for the game file.

To resume a saved game, run MYCHESS with the command

MYCHESS filename

where "filename" is the name of the saved game file.

SAVE GAME LISTING? If you answer "Y", MYCHESS asks for the name of a disk file on which to write a listing of the moves of the game. You can view this file later using the TYPE command, or a text editor such as PIE or WordStar. Or you can copy it to your printer for a permanent record of the game.

MYCHESS uses the computer's memory to store the game listing. If your computer has 64K of memory or more, there will be plenty of room for any game. If you have less memory, there may not be room for longer games, especially if you select the display of best variations. When MYCHESS runs out of room, it truncates the listing.

6. HISTORY AND ANATOMY OF MYCHESS

Since 1949, when Claude Shannon presented a monograph entitled "Programming a Computer for Playing Chess." the idea of a strong computer chess player has captured the imagination of programmer and layman alike. Shannon introduced two methods for finding the 'best' move in a given chess position.

His type A strategy, or brute force technique, examines all legal moves to a predetermined depth, and then uses a minimax algorithm to determine which move would give the computer the best position while giving the opponent the worst position. Minimax simply means assuming the opponent will make the best choice in any situation, and making the move which presents him with a situation in which his best move is as bad (for him) as possible. The number of half moves which a program looks ahead is called the "ply depth".

Shannon's type B strategy, rather than checking all possible

alternatives the same number of moves ahead, decides which moves are more plausible and searches further ahead for the more likely alternatives. Of course, if the plausibility algorithm is not extremely intelligent, a program using this strategy will miss good lines of play.

Virtually all modern chess programs use the type A search strategy. The large number of positions which must be analyzed is made more manageable by several techniques. Newell, Shaw and Simon introduced the most important improvement around 1958 in a program called CP-1. This is the alpha-beta pruning algorithm which, simply stated, means that if a sufficiently good countermove has been found for a given move then there is no need to look for better countermoves.

Looking at capture moves first has proven valuable for reducing the number of positions to analyze. Another technique is the 'killer' heuristic: saving a short list of the best countermoves at each ply. J. J. Scott (1969), J. Gillogly (1972), and David Slate and Larry Atkins (1973) all independently discovered that an iterative search also saved computation time. An iterative search does a one ply search first, then a two ply, and so on. It would seem that this is a duplication of effort, since a two ply search duplicates a one ply search. But each iteration can use the best variation predicted by the previous iteration as the first sequence of moves to analyze. This technique also leads to effective play under time pressure, since the best move of the previous iteration is always in hand and can be played immediately.

MYCHESS uses an iterative type A search, with alpha-beta pruning as well as the killer and capture heuristics. It will predict its opponent's best move, and start analyzing replies while the opponent is still thinking. One extra ply is examined before backing up from a best variation if the side to move can have anything captured.

The desirability of a possible position is "scored" on the basis of material strength, using a "swap off" evaluator to resolve situations where something is under attack. If a decision can not be made using this score, then a secondary positional score is generated, which takes into account such features as pawn structure, piece placement, and mobility. When a possible position is found which is better than the current best variation, it is saved in the ply table; otherwise it is discarded.

Moves are generated serially and only as necessary, to save time. The possible moves from a position are examined in the following order:

1. Best variation from previous iteration.
2. Winning or even captures.
3. Castle moves.
4. En passant captures.
5. Killer moves.
6. Two best regular moves from ply one.
7. Losing capture moves (sacrifices).
8. Other moves.

Pawn promotions are handled by the capture routines or regular pawn move routine, depending on whether the capture is made while promoting. Regular moves are generated piece by piece, starting with the king's rook pawn and ending with the king.

7. CONFIGURING MYCHESS

Each version of MYCHESS can be configured for several options. Depending on the version, you may be able to:

- o Select among several board displays
- o Choose the colors used in your display
- o Configure for your terminal
- o Turn bell on or off
- o Select full screen or scrolling display
- o Set for 2 MHz or 4 MHz CPU

You do this using the MYCONFIG program on your MYCHESS distribution disk. (HDOS versions are not configurable and MYCONFIG is not included with them.)

You may not need to configure MYCHESS if the settings it comes with are acceptable. On MSDOS, MYCHESS comes configured for a black and white display and can run on all IBM PC and PCjr systems except the PC with monochrome display adaptor. On CP/M, MYCHESSN is set to the Kaypro cursor-positioning sequences. MYCHESSN and Heath/Zenith MYCHESS are set for 2 MHz; all other versions are set for 4 MHz. All versions come with the bell turned on, so that it sounds when MYCHESS moves and when you enter an incorrect move.

If you want to change one of these settings, run MYCONFIG. When it asks for the program to change, type the name of your version of MYCHESS (or hit the RETURN or Enter key to accept the default of MYCHESS on MSDOS, or MYCHESSN on CP/M). You may need to preface the name with a disk letter (e.g., B:MYCHESSX) if it is not on the current drive. As a matter of prudence, you should make changes only to a copy, never to your original distribution disk.

MYCONFIG operates differently on MSDOS and CP/M. If you are using MSDOS (IBM PC, Z100, etc.), continue with Section 7.1. If you are using CP/M, continue with Section 7.2.

7.1. Configuring on MSDOS.

On MSDOS, MYCONFIG will display the system for which MYCHESS is presently configured, and ask if you want to change it. If you type "Y" (for yes), you will be able to select the type of display MYCHESS uses. If you type "N" (for no), the previous display setting will remain unchanged, but you will be able to configure the bell, and colors if available.

Note: If you choose to select the type of display, the default color settings for that display will be used. If you have made any changes to colors, your changes will be lost, even if you select the same display type as MYCHESS is currently configured for. To preserve any changes you have made previously, when MYCONFIG asks if you want to change the display type, you must answer "N".

If you choose to change the display type, MYCONFIG offers you the following menu:

MYCHESS DISPLAY SELECTION

- A: Non-Graphics (for any MS-DOS system)
- B: PC Text Mode (Monochrome or Color)
- C: PC Medium Resolution, 4 Color
- D: PC High Resolution, Black & White
- E: PCjr Medium Resolution, 16 Color
- F: PCjr High Resolution, 4 Color
- G: Zenith Z-100 (Monochrome or Color)

- X: Exit without making any changes.
- Y: Make changes to program MYCHESS.COM.

If you have a Z100 computer, type G and hit the RETURN key. If you have an IBM PC with a monochrome adaptor, type A or B and press the Enter key. If you have an IBM PC with color adaptor, or a Zenith Z150 or Z160, you can select any of A through D. For a PCjr, you can select any of A through F. The nicest displays are C, D, E and F.

If you want to exit from MYCONFIG without making any changes, type X.

When you have made your selection, MYCONFIG will ask you to confirm it by typing "Y" for yes. If you do, you will then be presented with a menu of all the things you can change on the display you have selected.

If you want to make any changes, type the letter corresponding to

the item you want to change, and press RETURN or Enter. For the bell, this will simply select the other choice: Off, if it is on, or on if it is off. For the other options, all your choices will be displayed, and you can choose one of them by typing the corresponding letter.

When you have finished making changes, select option Y to make the changes in the MYCHESS program. If you change your mind, you can select option X to exit from MYCONFIG without changing MYCHESS.

The things you can configure vary from display to display. You should read the menu MYCONFIG displays at this point to see what you can change on the display you have selected.

On each display, you can select whether the bell sounds during play. On the monochrome and PC black and white displays, this is the only thing you can configure.

On the color versions, you will be allowed to change the colors of many of the parts of the display. On the four color versions, you can change the color of the board labels, the writing color used to print out the moves, and the screen background color.

The board itself is displayed using a palette of four colors. On the PC, there are only two palettes available. Palette 0 contains red, yellow and green. Palette 1 contains cyan, magenta and white. Your only choice for the board display is to select one of these palettes, and the background color. The background color may be any of the 16 available colors. But the writing and label colors must be one of the three colors in the palette you have selected.

On the four color PCjr version, you will be able to select separately the colors used to draw and to shade the black pieces and the white pieces. Your choice of these colors determines the colors of the rest of the display.

On the Z100 and the 16 color PCjr version, you can change the colors of many different parts of the display and pieces. Each can be selected from any of the 8 (Z100) or 16 (PCjr) available colors. The MYCONFIG menu describes the majority of the display.

On the Z100 and the 16 color PCjr version, you can change the colors of many different parts of the display and pieces. Each can be selected from any of the 8 (Z100) or 16 (PCjr) available colors. The MYCONFIG menu describes the majorure it to display in a contrasting color like magenta or bright red, and see what shows up in that color when you run the program.

7.2. Configuring on CP/M.

On CP/M, MYCONFIG will display the following menu:

MYCHESS CONFIGURATION:

A: CPU Clock Speed: 4 MHz.
B: Bell Sounds: ON
C: Full Screen Display: YES
D: Cursor Positioning (11 bytes): 1B59FF20FE20
E: Initialize String (10):
F: Exit String (10):
G: Clear Line (28): 202020202020202020202020
H: Number of Columns (Osborne only): NOT AVAILABLE

X: Exit without making any changes.
Y: Make changes to program MYCHESSN.COM.

(Some non-Osborne versions of MYCONFIG may not contain the "Number of Columns" option, which only applies to Osborne computers.)

To change one of the settings, type the corresponding letter and press RETURN. Option C, Full Screen Display, is only meaningful in MYCHESSN. If you select NO, MYCHESSN will use a simple board display with no cursor positioning. This is for use on dumb terminals, or terminals with fewer than 80 columns.

Options D through G specify control sequences for your terminal. When you select one of these options, MYCONFIG requests a string of hexadecimal bytes, typed with no intervening spaces.

In Option D, the terminal's cursor positioning sequence, the byte FF is interpreted as the row number plus the value of the following byte. FE is the column number plus the value of the following byte. For example, 1B59FF20FE20 specifies the cursor positioning sequence

1B 59 (row + 20 hex) (column + 20 hex)

Options E and F allow you to specify any sequences to be sent to the terminal on entering and leaving MYCHESS, respectively. Option G is the sequence to clear the remainder of the terminal's line. It is initially a string of blanks. If the board display is garbled at the left due to wrap-around, you may need to change this to the escape sequence supported by your terminal.

Option H is used only on the Osborne computer, to switch between 52 column and 80 column displays. On the Executive, the 80 column display must be selected as the 52 column option will not display correctly.

When you have selected the configuration you want, type Y to change MYCHESS and exit. You can exit without changing anything by typing X.

8. IN CASE OF DIFFICULTY

8.1. Bell "Sticking".

On many Osborne 1 computers, the bell will occasionally "stick" on and keep sounding when MYCHESS is waiting for you to make a move. This is due to a bug in the ROM program in the computer.

If this occurs, the bell can be turned off by pressing RETURN. MYCHESS will turn off the bell and continue waiting for you to move. If you find the bell very annoying, you may want to configure MYCHESS not to use the bell at all; see Section 7 for instructions.

8.2. Promoting.

The most common problem people have with MYCHESS is in pawn promotion. Remember that when promoting a pawn, you must tell MYCHESS what to promote it to. For example, to move a pawn to E8 and make a queen, type

```
e7-e8=Q
```

When promoting, remember that MYCHESS won't let you have more than one queen, so you may have to take something else instead, such as a rook.

8.3. "Bad Load"

When you run MYCHESS on CP/M, you may get the error message "Bad Load". This means that CP/M did not have enough memory space to load MYCHESS. It does not mean there is anything wrong with the disk.

MYCHESS requires at least 48K of memory to load and run. If your system does not have that much, you can not run MYCHESS.

Even if you do have 48K or more, CP/M may have to be configured in order to be able to use it. When you first "boot up" CP/M, it will tell you how much memory you have. If it says "32K", for instance, it will only use 32K of memory, even if you have more than that. In such a case, you will need to generate a larger CP/M system to run MYCHESS. To do this, use MOVCPM and SYSGEN according to the directions in your CP/M manual.

8.4. "Terminal Freezing"

If the terminal "freezes" and refuses to accept any input, you may have accidentally entered a control sequence such as ctrl-S, which halts terminal output and effectively stops the program.

8.4. "Terminal Freezing"

If the terminal "freezes" and refuses to accept any input, you may have accidentally entered a control sequence such as ctrl-S, which halts terminal output and effectively stops the program. On Osborne computers, some system disks will configure the left-arrow key to enter ctrl-S, so that hitting the left-arrow key may freeze the terminal.

If this happens, you can proceed by typing ctrl-Q (hold down the CTRL shift key and type Q).

9. DISPLAY ADJUSTMENT

Having the nicest possible display will increase your enjoyment of MYCHESS.

When using a PCjr with a television display, remember that the television is a low resolution monitor and can not display all the colors and detail that would be seen on an expensive high resolution color monitor. Using the MYCONFIG program (Section 7), choose the display option that looks best on your television. Then adjust the color, tint, brightness and contrast controls for the most pleasing display.

On Heath/Zenith Z89 computers and Z19 terminals, you may wish to adjust the vertical size control inside the machine so that the displayed chessboard is approximately square. This will result in a better appearance for most graphics displays, and you will find that displayed text characters are less grainy and more readable.

On Osborne computers, adjust the brightness and contrast controls for the best differentiation between white and black pieces. You may find that the squares differ slightly in width from one side of the board to the other; this is a normal property of the display.