CP/M®MYCHESS

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CP/M MYCHESS

Chess Playing Program

by Dave Kittinger

INTRODUCTION

MYCHESS is a championship microcomputer chess playing program, winner of the Fifth West Coast Computer Faire Tournament (1980), 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 four megahertz Z80 under tournament time limits.

This version of MYCHESS runs on a Heath/Zenith H/Z-89 computer with at least 48K of memory. Two versions are available: one for HDOS version 1.6, and one for Heath/Zenith CP/M version 2.2 (or compatible ORG 0 CP/M). This program will also run on a 40K H-8 computer that has been modified to use the Z80 CPU and that has an H-19 terminal.

You may vary the skill level of MYCHESS by altering the ply level, or number of half moves that the program looks ahead before making its move. By setting the appropriate ply level, players from beginner to expert can make MYCHESS a reasonably well-matched opponent.

This program offers you considerable flexibility in setting up and playing the game. You can play a game against MYCHESS from the beginning, playing either white or black, or you can set up a position and continue the game from that point. At any point in the game you can switch pieces with MYCHESS and then begin to play the opposite side. You can do this on every move, so that MYCHESS plays both sides of the game. The game moves can be automatically recorded on a line printer. And if you grow impatient waiting for MYCHESS to move, you can force it to stop thinking at any point and play the best move it has discovered so far.

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, we recommend that you place a write-protect tab on the MYCHESS distribution disk and then make a backup copy of MYCHESS on another disk.

To run MYCHESS:

Put the MYCHESS disk in drive B:.

Type B:MYCHESS and press RETURN.

To run MYCHESS on a single-drive system:

Copy the file MYCHESS.COM to a CP/M system disk.

Boot the system disk.

Type MYCHESS and press RETURN.

The MYCHESS program begins by asking a number of questions that determine the parameters of the game. For now, just press the RETURN key after each question. The one question that you cannot answer this way is "Skill level (half moves of look ahead)? (1 — 9)". Type 2 for a rapid game, 3 for a moderately fast game (a minute per move), and 4 for a slow game (4 minutes per move). Be sure to terminate your entry by pressing the RETURN key. If you want to go first, respond Y and press RETURN to the message `"Do you want white?"`. MYCHESS will then print the board on the terminal screen. At this point, you can enter either a command or a move.

HOW TO ENTER YOUR MOVE

MYCHESS types and accepts moves in a form called algebraic notation. This notation identifies each square on the board by means of a letter and a number. The coordinates are printed within each square on the board. The vertical coordinates range from 1 through 8, and the horizontal coordinates from A through H.

To enter a move, simply type the coordinates of the square from which you are moving, then a hyphen, then the coordinates of the square to which you are moving, then press RETURN. For example, MYCHESS, playing white, might open by moving king's pawn to king four. This would be described as E2-E4. To reply in kind, you would type E7-E5 and press RETURN.

To erase mistakes within the line being typed, use DELETE (not BACKSPACE).

MYCHESS will not accept illegal moves. Whenever it detects an illegal move or unacceptable command, MYCHESS beeps and repeats its prompt.

Castling

To castle to the king's side, type 0-0 and press RETURN. To castle to the queen's side, type 0-0-0 and press RETURN.

Promoting Pawns

To promote a pawn, type the move, then a space or equals sign, and then the initial letter of the piece to which you want to promote the pawn. For example, to move a pawn from F2 to F1, promoting to queen, type:

```
F2-F1=Q
```

or

```
F2-F1△Q
```

Due to the nature of its internal representation of pieces, MYCHESS does not allow more than one queen per player.

MYCHESS COMMANDS

When the MYCHESS prompt "YOUR MOVE" is being displayed, MYCHESS will accept either a move or any of the commands described below. All of these commands should be terminated by pressing the RETURN key.

Q

Quit; end the game.

P

Changes the skill level (ply level). After you have entered this command, MYCHESS responds:

```
Skill level? (1-9)
```

To change the skill level, enter a number between one and nine and then press RETURN.

M

Allows you to move without MYCHESS making a move in reply.

R

Reverses the board. This enables you to switch positions with MYCHESS, so that you begin playing its position and vice versa. If the board display ever becomes garbled, executing the R command twice in succession will refresh the display and return the pieces to the correct position.

GO

Forces MYCHESS to move, even if you have not entered a move. MYCHESS will accept the best move it has been able to think of so far. MYCHESS will accept this command when it is thinking. By alternately typing R and GO, you can make MYCHESS play a game against itself.

S

Turns on self-play mode. MYCHESS will make moves for both sides until the game is over or until you enter another command. You may have to wait until MYCHESS has completed the move it is currently working on before it acts on your command.

OPTIONS FOR SETTING UP THE GAME

Before beginning the game, MYCHESS asks a number of questions and sets itself up accordingly. This section describes the prompts that appear at the beginning of the game and the possible responses.

```
SET UP A POSITION?
```

To play a normal game, answer N and press RETURN. If you want to set up a position, enter Y and press RETURN.

If you have elected to set up a position, MYCHESS displays the board set up for the beginning of the game. The program will accept any number of moves necessary to position pieces. The moves need not be legal so long as the destination square is unoccupied. To remove a piece from the board, simply type the coordinate of its square.

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

```
RECORD MOVES ON PRINTER?
```

Responding Y and pressing RETURN causes the moves of the game to be printed on a hard copy device. Under CP/M, this is logical device LST:.

```
WHAT IS YOUR NAME?
```

MYCHESS asks for the name of the opponent so that it can label the board.

```
TIME CONTROLS? (Y=YES)
```

If you want to impose time control restrictions, type Y and press RETURN. MYCHESS will first ask for the number of moves, then the number of minutes for the first time control, and then the number of moves and minutes for the second time control. Typical time controls are, for example, 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 you to keep time and will occasionally ask how much time it has remaining.

```
SKILL LEVEL (HALF MOVES OF LOOK AHEAD)? (1-9)
```

If you have not specified time controls, MYCHESS asks for the ply depth, or the number of half moves to look ahead. The higher this number, the more moves MYCHESS will examine before making a move, and the slower and better it will play. At a ply depth of three, MYCHESS will take about 40 seconds per move. The program will play about six times slower for each additional ply. As the number of pieces on the board decreases, 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 and RETURN. 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. MYCHESS will not display any variations during the opening moves, provided that the opening is contained within MYCHESS' internal list of opening moves. If you specify skill level 1, MYCHESS will not ask this question.

```
DO YOU WANT WHITE?
```

Typing Y and pressing RETURN will allow you to make the first move. If you type anything else, MYCHESS will take white and make the first move itself.

HISTORY AND ANATOMY OF MYCHESS

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

Shannon's 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 presupposing that the opponent will make the best choice in any situation, and, based on this assumption, making the move that presents the opponent with a situation in which his best move is as bad for him as possible. The number of half moves that a program looks ahead is called the ply depth.

Instead of checking all possible alternatives that lie the same number of moves ahead, Shannon's type B strategy decides which moves are plausible at present and then searches further ahead for more likely alternatives. Of course, if the plausibility algorithm is not extremely intelligent, a program that utilizes this strategy will overlook good lines of play.

Virtually all modern chess programs use the type A search strategy. The large number of positions that the computer must analyze is made more manageable using 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 also proven valuable for reducing the number of positions to analyze. Yet another technique, the "killer" heuristic, involves 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 discovered independently that an iterative or repetitive search was also effective in saving 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 discovers some of the same alternatives as a one-ply search. But each iteration can begin analyzing with the best alternative discovered during the search at the previous ply level. This iterative technique also leads to effective play under time pressure, since the best move of the previous iteration is always at hand and can be played immediately.

MYCHESS uses an iterative type A search, alpha-beta pruning, as well as the killer heuristic. MYCHESS will predict its opponent's best move and start analyzing replies while the opponent is still thinking. If the player whose turn it is to move can have any of his pieces captured, the program examines one extra ply before using its best alternative.

The desirability of a possible position is "scored" on the basis of material strength, using a "swap off" evaluator to determine the relative utility of losses and gains where a piece is under attack. If MYCHESS cannot make a decision based on its evaluation, then it generates a secondary positional score which takes into account such factors as pawn structure, piece placement, and mobility. When MYCHESS finds a position that is better than the current best variation, it saves that variation in the ply table; otherwise, the variation is discarded.

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

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

Pawn promotions are handled by a capture routine or a normal pawn move routine, depending on whether the promotion is made while capturing. MYCHESS generates regular moves by considering the utility of moving each piece, starting with the king's rook pawn and ending with the king.

TERMINAL ADJUSTMENT

Although it is not crucial to your enjoyment of MYCHESS, you may wish to adjust the vertical size control on your H/Z-19 or H/Z-89 so that the chessboard display is approximately square. This will result in a better appearance for most of the graphic displays, and you will find that displayed text characters are less grainy and more readable.