GNU Chess Help Index

This index list all GNU Chess help topics

To learn how to use Help choose "Using Help" from the Help menu or press F1.

How to Play

To move a piece, place the mouse cursor over the piece, click the left mouse button once, move the cursor to the desired square and click again.   To enter a move using the keyboard enter F2.   A dialog box will be displayed.   Enter the move in algebraic notation.   To castle enter o-o, for a queen side castle enter o-o-o.   To promote a pawn onto the last rank enter the move followed by the first letter of the piece to promote to.   (ie q for queen, r for rook, b for bishop, n for knight.) To abort a move or change your mind about what piece to move click on the square the piece was originally at.

When the computer is calculating its move you can abort the look ahead and force it to immediately take a move by entering Control C.

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GNU Chess menu commands

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GNU Chess Menu Commands

All the commands to control actions of the game are controlled via menus.   Select the specific menu item you require help on.

<u>File</u>	Save and restore a game
<u>Edit</u>	Change board setup
<u>Options</u>	Adjust game options
<u>Skill</u>	Adjust the degree of difficulty of the game
<u>Side</u>	Choose what side to have to computer play
<u>Colors</u>	Sets up screen colors
<u>Hint</u>	Provides a suggested move
Help	Enters the help system

File Menu

The File menu allows the saving and restoring of games.   Specific functions available are:

New   Starts a new game.

Save   Saves an in progress game.   A dialog box will be opened to enter a file name

Open   Loads a saved game. A dialog box will be opened to enter a file name

List   Lists the moves of a game in print-out format.   A dialog box will be opened to enter a file name.

Exit   Exit the game.

Edit Menu

The Edit menu allows the board setup to be changed and moves to be taken back.

Setup Board   Choosing this command places the game into setup mode.   A new board setup is provided.   You adjust the setup by selecting a piece with mouse and placing it on the desired square.   To remove a piece from the board pick it up a blank square and place it on the piece to be removed.

Undo   Removes the last played move

Remove   Removes the last complete move (Basically 2 undo's)

Force   Toggles manual mode.   Lets user enter moves for both sides or allows use by two players as an electronic chess board.

Options Menu

The Options menu allows adjustment of the behavior of the game.

Tone When checked the computer beeps after taking a move.   To make the game silent select this option, the check mark will be removed.

Coordinates When checked the algebraic notation will be printed along the edge of the board

Search Stats When checked a status box will display the moves GNU chess is evaluating for use.

Test This selects a speed test.   The numbers presented in the results box can be compared to other versions of GNU chess.

Hash Enables internal move hashing

Book When checked GNU chess uses its opening book

Both Auto Play mode.   Choose any square to abort.   Sometimes after aborting autoplay the game will perform a bogus move.   Use UNDO or REMOVE to cancel.

A Window Sets an internal move generator value

B Window Sets an internal move generator value

Contemp Sets an internal move generator value

Skill Menu

Adjusts playing ability of GNU Chess.

Time   Presents a dialog box to choose the time limits for the game.

Random   This cause GNU chess to randomly select among equally rated moves.

Easy   When checked this enables "easy" mode, where the computer not allowed to think
                 while the user takes a move.   To have GNU Chess play a stronger game uncheck
                 this option.   The look ahead is aborted when the mouse is clicked.

Depth   Presents a dialog box to set the maximum number of moves to look ahead.

Side Menu

Allows the user to choose which side the computer will play

     Reverse   Rotates board 180 degrees.

     Switch   Switch sides with the computer. (If computer is black it becomes white)

     Black   Computer plays black

     White   Computer plays white

Colors Menu

Allows the colors of the screen to be set.   The color settings are saved in the file CHESS.INI in the windows directory.   Choosing "Default Colors" restores color settings to program defaults.

Hint Menu

The Hint menu provides a suggested move.   The hint is based on GNU chess's projection of what move the user will take when calculating its look-ahead.   The quality of the hint is dependent on the amount of time GNU chess has to think.

Background on GNU Chess

GNU Chess
by Stuart Cracraft
Copyright 1987,1988,1989,1990 Stuart Cracraft

GNU Chess is a communal chess program. Contributors donate their time and effort in order to make it a stronger, better, sleeker program. Contributions take many forms: interfaces to high-resolution displays, opening book treatises, speedups of the underlying algorithms, additions of extra heuristics. These contributions are then distributed to the large user-base so that all may enjoy the fruits of our labor. The original and continuing purpose of this project is to permanently end   the rampant hoarding of computer chess software that has been the   case for the past 20 years.

Many people have contributed to GNU Chess. Their contributions have improved the program from being a patzer (weak program) to being a grandpatzer (decently strong program). In its growth since initial release, GNU Chess has gone from approximately class D to strong master strength. It beats the Fidelity Mach 3 (USCF 2265) rather handily when run on a Sparc-1 (RISC). Since these types of RISC chips are becoming fairly common, the age of "master chess in your computer lab" is now a reality. From there, it will be a short hop to master chess in your home with FSF software.

GNU Chess's structure is a hybrid of the Shannon Type-A and Type-B methods. It conducts a full-width search to a fixed-depth and then continues with a quiescence search for many more ply. This quiescence search helps the program find positions which can be safely evaluated and which are not too turbulent. If a terminal position is too turbulent, the evaluation will be highly inaccurate. Additional searching by investigating series of captures, checks, and other potentially imbalance-producing moves is quite helpful.

GNU Chess will sacrifice pieces in order to reach known winning endings. Also, it uses a trade-down bonus to encourage the stronger side to trade off certain types of pieces thus reaching a more simplified and therefore ostensibly "clearer" position.

GNU Chess has certain types of knowledge regarding easier endgames.   This allows it to play these endings somewhat better than might be expected.

GNU Chess has time heuristics that it uses to improve its handling of time-controls and hasten its making of "obvious" moves. It also thinks on the opponent's time.

GNU Chess is interfaced to the SUN Windows and X Windows display protocols and can display its pieces in elaborate format, similar to chess diagrams.

GNU Chess has an opening book which consists of many variations from MCO (Modern Chess Openings), and some from ECO.

For comparison purposes, GNU Chess running on a VAX 8650 is stronger than the famous Chess 4.5 running on a CDC 6400. On a Sparc-1, GNU 1.55 (or later) is probably about 2350-2400 strength (USCF rating estimated).

We wish to acknowledge the contributions of the following individuals: (in alphabetical order) Jim Aspnes, Wayne Christopher, Steve Dougherty, David Goldberg, Richard Greenblatt, Larry Kaufman, David Kittinger, Hans-Erik Sandstrom, Richard Stallman, John Stanback, Ken Thompson.

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MA 02139.

Article: GNU Chess Experiences Learned with Communal Sharing

GNU Chess: Experiences Learned
with Communal Sharing
by Stuart Cracraft
(and contributors to the GNU Project)

Limited sharing has characterized the computer chess community for the past two decades. Occasional research articles give hints and suggestions for useful features, but rarely reveal the real details of the critically important advances.   We will here describe an effort underway (titled "GNU Chess") to create a more open and friendly environment of sharing.

GNU Chess is part of Project GNU, a large-scale effort in which the philosophical goals are far-reaching. We will not go into any great depth about these goals as they relate to the larger project, because these are described elsewhere [1]. However, we will mention the basic issues and the changes we hope to encourage.

The start of the GNU Chess project was a natural result of the experiences gleaned in writing a chess program. While the author was at a progressive academic location [2], he was able to conceive the idea of a communal chess program only after much heartache. During the period of writing the initial version (which has since undergone many improvements and whole revisions), it became clear that the best features and most useful hints, the very best of the heuristics, were hidden and difficult to find in the literature.

Sprinkled across many books, research papers, magazine articles, accumulated in the community, during the past 25 years, there was literally a void of true, empirical programs. Locating usable programs was difficult. Many programs were the result of academic work in "ivory towers", and hence were inaccessible to the common man. Other programs were sequestered in research think-tanks. Naturally, developers of commercial programs carefully guarded their source in order to protect their investment. On the other hand, a few chess program source listings had actually been published, but these were not really very strong, often written in a non-general language, and frequently more pedantic than practical.

The idea of a reasonably strong communal program solidified. When we refer to a communal program, we do not regard this as public-domain software. Rather, we refer to a program which is under the shared authority of a number of individuals, the principal contributors. These individuals have experienced and realized the positive results of a sharing community and the rapid improvements that come through contributing in such a community. Further, these individuals devote time and energy to coordinating the contributions of other individuals. While they exercise a certain editorial right, this is usually not exercised arbitrarily; instead, a discussion is often undertaken.

Eventually, a working C program that played chess was available. The coordinating institution for Project GNU, accepted our suggestion of inclusion of a chess program in the GNU distribution. Initial distribution of GNU Chess commenced in October of 1986. Interest in the project increased rapidly.

Contributions came in from many places and people. Interfaces to X-windows and SUN-windows were donated, thus allowing very fancy chess fonts on bit-mapped screens. Also, contributions involving large portions of opening books such as MCO and collections of master games were added to the distribution.   Additionally, tree-search modifications and heuristics were provided, and occasionally even entire rewrites.

The program advanced in strength by several USCF class intervals during a period of less than one year. During this time, many unusual features and enhancements were added to the program, usually under the coordination of two or more people, with one working in a distant-advisory capacity to the other.

Frequently, graduate students would give up significant time from their thesis work to devote energy to contributing. Their corporate counterparts would often give up project time to make their donation.

Contributors would often enter the project in a very forceful way and then having made their contribution, learn the viability of communal sharing once others had stepped in and contributed to them, thus providing considerable reinforcement. Frequently, contributors would then go into "hibernation" for a long period of time, but most of them remained open to contributing and were helpful when asked to reprogram their particular contribution in a more recent version.

GNU Chess has made great strides in relatively little time.   It has run on many different hardware architectures and has been compiled by a number of C compilers. A sampling of the computers on which the program has run is: National 32032, Vax 11/750, 8550, 8600, 8650, Motorola 68020, CCI 5/32, CCI 6/32 (tahoe), Cray XMP, SUN Sparc-1.

It is our belief that GNU Chess will stimulate graduate research in computer chess theory and practice. When students are able to easily obtain a state-of-the-art program in order to test out their ideas, they will no longer need to reinvent the wheel. The students will be able to investigate their research areas much more thoroughly, because they will spend more time on the specific research areas they are concerned about. Basically, GNU Chess "frees up" time in order to get on to more fundamental issues.

We also feel that as other researchers gain trust in the GNU Chess project, they will be more likely to release their results directly and rapidly, through journal articles, or directly to the GNU project, and in fact become contributors and join the present list. At the very least, a communal, ever-growing program will encourage the few "closeted" researchers to be somewhat more open in their approach to disseminating advances.

In whatever form it takes, the progress toward elaboration of machine chess is ongoing, and we hope that GNU chess will be helpful to the community. Copies of GNU Chess source and "book", as well as additional experimental code are available from the Free Software Foundation [3] or the author [6].

[1] The GNU Manifesto, Richard Stallman, Free Software Foundation, Inc.

[2] University of Southern California, Information Sciences Institute.

[3] Free Software Foundation, Inc. 675 Massachusetts Ave.,   Cambridge MA 02139.

[4] Stuart Cracraft, P.O. Box 2841, Laguna Hills, California.   92654-2841., cracraft@wheaties.ai.mit.edu.

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GNU Chess Move Generator

New move Generation algoritm:

Revision: 1989-09-06

Author: Hans Eric Sandstroem.

This algortim is the result of an attempt to make an hardware move generator, but since I newer had the time and resources to build the hardware I wrote a software version and incorporated that one into gnuchess. This was the best way I could think of sharing this algorithm with the computer chess community.

If there is anybody out there with the time and rescources to build a hardware move generator I will be glad to assist.

The general idea behind this algoritm is to pre calculate a lot of data. The data that is pre calculated is every possible move for every piece from every square disregarding any other pieces on the board. This pre calculated data is stored in an array that looks like this:

```
struct sqdata {
   short nextpos;
   short nextdir;
};
struct sqdata posdata[8][64][64];
/* posdata[piecetype][fromsquare][destinationsquare] */
example:
          the first move for a queen at e8 is stored at;
          posdata[queen][e8][e8].nextpos
          suppose this is e7 and e7 is occupied then the next move
          will be found in;
          posdata[queen][e8][e7].nextdir
```

To handle the differeces between white and black pawns (they move in opposite directions) an array ptype has been introduced:
```
static const short ptype[2][8] = {
   no_piece,pawn,knight,bishop,rook,queen,king,no_piece,
   no_piece,bpawn,knight,bishop,rook,queen,king,no_piece};
              ^^^^
```
And it is used like this:
```
    piecetype = ptype[side][piece]
```

When generating moves for pieces that are not black pawns, piece can be used directly in posdata. As in the example above.

Thus the only thing one has to do when generating the moves is to check for collisions with other pieces. the move generation to do this looks like this: (for non pawns)

```
p = posdata[piece][sq];
u = p[sq].nextpos;
do {
  if (color[u] == neutral) {
    LinkMove(ply,sq,u,xside);
    u = p[u].nextpos;
  }
  else {
    if (color[u] == xside) LinkMove(ply,sq,u,xside);
    u = p[u].nextdir;
  }
} while (u != sq);
```

 - I`nt this just beautiful!

The array posdata is initialized in the routine Initialize_moves. This routine is called just once and it works so no time has been spent on the structure of this code. GenMoves and CaptureList generates the moves but the routines ataks, BRscan, Sqatakd, KingScan and trapped also relies on the move generation algoritm so they have also been rewritten.

GNU Chess heuristics

 -- requested by main author

Heuristic descriptions for CHESS.

Revision: 12-16-87

Copyright (c) 1987 by John Stanback

 Here is a brief description of the heuristics used in the positional evaluator of the GNU Chess program. Many heuristics are functions of the stage of the game which is based on the total non-pawn material remaining for both sides.

PAWNS

 The material value of a pawn is 100 points. Isolated pawns get a penalty depending on which file they occupy: (12,14,16,20,20,16,14,12) for files (a..h). Doubled pawns (which are not also isolated) get a penalty of 12 points. Backward pawns (defined simply as not being defended by a pawn with the square in front also not defended by a a pawn) are penalized 6 points. A 4 point penalty is also invoked for each attack by the opponent to a backward pawn and for a backward pawn on a half-open file. Pawn Advancement in the centre is given a bonus of about 4 points per rank in the opening increasing to about 8 points per rank in the ending. Advancement on the edges is given a lower bonus. Pawns on the e and d files and on the 2nd rank are given a 10 point penalty. An additional penalty of 15 points is invoked if these pawns are also blocked. Pawns within 2 squares of the king are given a 10 point bonus. Passed pawns are given a bonus for increasing rank which is a function of stage of the game and of whether the opponent blocks or attacks one or more squares in front of the pawn or if the opponents king is in the square of the pawn. This bonus ranges from about 15 points for a pawn on the second rank up to about 300 points for a passed pawn on the 7th rank which can't be stopped from queening.

KNIGHTS

 The material value of a knight is 330 points. The main heuristic for knights is a bonus for proximity to the centre. This varies from 0 points in the corners to 30 points in the centre. Knights are also given a bonus for being within 2 squares of each enemy piece. This bonus is a function of the stage of the game, equalling 4 points in the end game. A penalty of 1 point per square is given for distance from either king. A bonus of up to 8 points (depends on stage) is given for knights which can't be driven away by enemy pawns.

BISHOPS

The material value of a bishop is 330 points. Bishops are given a bonus as material falls off the board equalling 10 points in the end game. Bishops get a bonus for mobility and Xray mobility thru pieces but not pawns. This bonus ranges from -4 points for a totally blocked bishop up to 18 points for a bishop attacking 12 or more squares. Xray attacks on an enemy R,Q,K or any undefended piece are given an 8 point bonus. Bishops are given a bonus of 14 points if they lie on the edge of the board up to 22 points if the lie in the centre. A bishop is given a bonus of up to 5 points for each attack to a square adjacent to the enemy king.

ROOKS

The material value of a rook is 520 points. Rook mobility is handled similiarly to bishops with a bonus of 0 points if blocked up to 20 points if attacking 12 squares or more. A bonus of 8 points for Xray attacks is handled as it is for bishops. Rooks are given a bonus of 10 points for occupying a file with no friendly pawns and a bonus of 4 points if no enemy pawns lie on that file. After the opening Rooks are penalized slightly depending on "taxicab" distance to the enemy king.

QUEENS

The material value of a queen is 980 points. The only heuristic for a queen is that after the opening it is penalized slightly for "taxicab" distance to the enemy king.

KINGS

Kings are given a penalty for proximity to the centre in the opening and a bonus for proximity to the centre in the endgame. The penalty is about 24 points for being in the centre in the opening with a bonus of about 36 points for being in the centre in the endgame. Kings are penalized for lying on an open or half-open file or if the adjacent file closest to the corner is open or half-open. This penalty is up to 23 points in the opening and goes to zero in the end game. The King is penalized up to 8 points if there are no pawns immediately adjacent. A penalty is invoked depending on the number of "safe" checks available by the opponent. This penalty ranges from 6 points for one such check to 50 points for 4 or more. Depending on game stage, Kings are given up to 10 points for castling and a penalty of up to 40 points for moving before castling.

SPECIAL

If more than one piece is "hung" (attacked and not defended or attacked by an enemy piece of lower value) an extra penalty of 10 points is invoked for that side and the search may be extended one ply. Pinned or trapped pieces are treated similarly. A special mating routine is used if one side has only a king and the other has mating material.

GNU Chess Sample Match with MACH

The following is the complete match between GNU Chess 1.55 on Sparc-1 and Fidelity Mach 3. The game header contains the sides with White listed first. The result is listed after the last move of each game. Time control was 60/15. Both sides used transposition tables and thinking on the opponent's time. Opening books were enabled using random openings.   --Stuart Cracraft

P.S. This version of GNU has just been released by FSF.

Match Game   GNU_vs_Mach3
1 . e2e4,e7e5   2 . g1f3,b8c6   3 . f1c4,c6d4   4 . f3e5,d4e6   5 . d1h5,g7g6
6 . h5h3,d8g5   7 . e5f3,g5c5   8 . b2b3,f8g7   9 . c2c3,c5c6   10. c4d5,c6b5
11. d2d4,g8f6   12. d5c4,b5a5   13. b3b4,a5b6   14. d4d5,f6e4   15. h3h4,e4c3
16. d5e6,f7e6   17. a2a3,a7a5   18. b4a5,a8a5   19. b1d2,a5h5   20. h4g4,c3e4
21. d2e4,g7a1   22. e1g1,a1g7   23. c1g5,d7d5   24. c4d5,e8g8   25. d5c4,g8h8
26. e4g3,e6e5   27. g4e4,h5g5   28. f3g5,b6f6   29. g5f3,f6e7   30. f1e1,e7c5
31. e4d3,c8g4   32. g3e4,c5a5   33. f3d2,g4f5   34. e1b1,b7b6   35. d3g3,c7c6
36. g3e3,b6b5   37. c4e2,a5d8   38. b1c1,f5d7   39. d2f3,d8e7   40. e3a7,e7f7
41. c1c5,f7e6   42. e2d3,e6b3   43. d3c2,b3e6   44. a3a4,b5a4   45. a7a4,f8b8
46. a4a7,b8b2   47. c2d3,b2b3   48. a7a8,d7e8   49. e4c3,b3b6   50. d3c4,e6e7
51. c5a5,b6b4   52. a5a7,e7f8   53. f3d2,h7h6   54. c3e4,b4b2   55. c4d3,b2b4
56. d2c4,b4b3   57. d3c2,b3b4   58. c4d6,b4e4   59. c2e4,f8d6   60. a8e8,h8h7
61. a7d7,d6f6   62. e8c8,c6c5   63. c8c5,f6f4   64. c5c6,f4g5   65. c6c7,h7h8
66. c7c8,h8h7   67. e4d5,g5c1   68. c8c1,h6h5   69. h2h4,h7h8   70. c1c8,h8h7
71. c8g8,h7h6   72. g8g7 1-0

Match Game   Mach3_vs_GNU
1 . e2e4,e7e5   2 . f2f4,e5f4   3 . g1f3,d7d6   4 . d2d3,g7g5   5 . c1d2,f8g7
6 . d2c3,g7c3   7 . b1c3,g5g4   8 . f3g1,d8h4   9 . e1d2,g8f6   10. d2c1,e8g8
11. d1d2,f6h5   12. c3d5,h5g3   13. d2e1,h4h6   14. h2g3,h6h1   15. d5c7,b8a6
16. e1a5,f7f5   17. a5d5,f8f7   18. c7a8,h1g1   19. c1d2,a6b4   20. d5c4,g1f2
21. f1e2,f2e3   22. d2d1,b4c6   23. a1c1,e3g3   24. e4f5,c8f5   25. c4d5,g3e3
26. c2c3,c6e5   27. d5d6,f4f3   28. g2f3,g4f3   29. e2f1,f3f2   30. d1c2,f5d3
31. f1d3,e5d3   32. d6d8,f7f8   33. d8d3,e3c1   34. c2c1,f2f1   35. d3f1,f8f1
36. c1d2,f1f2   37. d2c1,h7h5   38. a8c7,h5h4   39. c7d5,h4h3   40. d5e7,g8f7
41. e7f5,f2f5   42. c1d2,h3h2   43. d2c2,f5f2   44. c2b3,h2h1   45. a2a3,h1b1
46. b3c4,b1b2   47. a3a4,f2f4   48. c4d3,b2g2   49. a4a5,g2e4   50. d3d2,f4f2
51. d2d1,e4h1 0-1

Match Game   GNU_vs_Mach3
1 . e2e4,c7c5   2 . g1f3,d7d6   3 . d2d4,c5d4   4 . f3d4,g8f6   5 . b1c3,b8c6
6 . d4c6,b7c6   7 . f1c4,a8b8   8 . e4e5,f6d7   9 . e5d6,e7d6   10. e1g1,d6d5
11. f1e1,f8e7   12. c4d5,b8b6   13. d5f3,e8g8   14. c3a4,b6a6   15. e1e4,f7f5
16. e4d4,c6c5   17. d4f4,a6d6   18. d1e1,e7g5   19. f4c4,d7e5   20. c1g5,e5f3

21. g2f3,d8g5	22. g1h1,c8b7	23. e1e3,g5e3	24. f2e3,b7f3	25. h1g1,d6d2
26. h2h3,f8e8	27. c4c5,e8e3	28. c5f5,d2g2	29. g1f1,g2c2	30. h3h4,f3c6
31. b2b3,e3h3	32. f1e1,h3h4	33. e1d1,h4h2	34. d1e1,c2e2	35. e1d1,e2e6
36. f5f1,c6g2	37. f1f2,h2h1	38. d1c2,h1a1	39. f2g2,a1a2	40. a4b2,h7h5
41. b3b4,g7g6	42. c2b3,a2a6	43. b2d3,e6e3	44. b3c4,g8g7	45. c4d4,a6e6
46. d3c5,e6e7	47. g2a2,e3e1	48. a2g2,g7h6	49. g2a2,h5h4	50. a2h2,g6g5
51. b4b5,h6h5	52. c5d3,e1d1	53. h2h3,g5g4	54. h3e3,e7e3	55. d4e3,d1d3
56. e3d3 0-1				

Match Game   Mach3_vs_GNU

1 . e2e4,c7c5	2 . b2b4,c5b4	3 . a2a3,b8c6	4 . g1f3,g8f6	5 . a3b4,f6e4
6 . d2d3,e4f6	7 . b4b5,c6b4	8 . f1e2,d7d6	9 . c1d2,b4d5	10. c2c4,d5b6
11. e1g1,h7h6	12. b1c3,e7e5	13. f1e1,d8c7	14. d1b3,c8e6	15. d2e3,f8e7
16. c3a4,b6a4	17. b3a4,b7b6	18. d3d4,e5e4	19. f3d2,d6d5	20. c4d5,e6d5
21. e1c1,c7d7	22. f2f3,e4f3	23. d2f3,e8g8	24. f3e5,d7b7	25. a4a6,b7a6
26. a1a6,d5b7	27. a6a2,e7d6	28. e2c4,f6d5	29. e3f2,f8c8	30. a2a1,c8c7
31. a1a2,d5b4	32. a2a1,b7e4	33. f2g3,b4c2	34. a1a4,c2e3	35. c1e1,e4c2
36. a4a2,e3c4	37. a2c2,c4a3	38. c2b2,f7f6	39. e5g6,d6g3	40. h2g3,g8f7
41. g6f4,c7c2	42. b2b3,a3c4	43. b3b1,c4d6	44. g1h2,a8e8	45. e1e8,f7e8
46. h2h3,e8f7	47. b1b4,g7g5	48. f4h5,f6f5	49. h3h2,f7g6	50. g3g4,f5g4
51. h5g3,h6h5	52. h2g1,h5h4	53. g3f1,h4h3	54. g2h3,g4h3	55. b4b3,g5g4
56. b3g3,g6h5	57. g3g4,h3h2	58. f1h2,c2h2	59. g4g7,h2a2	60. g7d7,d6f5
61. g1f1,h5h6	62. f1e1,a2b2	63. d7a7,f5d4	64. a7a6,b2b5	65. e1d2,h6g5
66. d2c3,d4c6	67. c3c4,b5c5	68. c4b3,b6b5	69. b3b2,g5f4	70. a6a3,b5b4
71. a3b3,c5c4	72. b3d3,c6d4	73. b2b1,f4e4	74. d3h3,b4b3	75. h3g3,e4d5
76. g3g5,d5d6	77. g5g3,d6c5	78. g3g5,c5b4	79. g5g4,d4b5	80. g4c4,b4c4
81. b1b2,b5d6	82. b2a3,c4c3	83. a3a4,b3b2	84. a4a5,b2b1	85. a5a6,b1b5
86. a6a7,b5b7 0-1				

Match Game   GNU_vs_Mach3

1 . e2e4,c7c6	2 . d2d4,d7d5	3 . e4e5,c8f5	4 . f1d3,f5d3	5 . d1d3,b8a6
6 . d3b3,d8a5	7 . c1d2,a5b6	8 . b3b6,a7b6	9 . g1f3,e7e6	10. e1g1,f8e7
11. c2c3,g8h6	12. d2h6,g7h6	13. b1d2,h8g8	14. g1h1,a6c7	15. f1g1,e8d7
16. c3c4,d7c8	17. c4d5,c7d5	18. g1c1,d5b4	19. d2c4,c8b8	20. a2a3,b4d3
21. c1c2,a8a6	22. a1d1,d3f4	23. c4e3,f7f5	24. g2g3,f4h5	25. e3c4,f5f4
26. c2c3,g8d8	27. g3g4,h5g7	28. b2b4,g7e8	29. h2h4,e8c7	30. h1g2,c7d5
31. c3c2,a6a4	32. d1d3,a4a7	33. c2c1,b6b5	34. c4d2,d8g8	35. g2h3,a7a6
36. d2e4,d5c7	37. e4c5,a6a7	38. c1b1,b8a8	39. b1g1,g8d8	40. g1d1,a8b8
41. h3h2,b7b6	42. c5e4,d8g8	43. h2h3,c7d5	44. d1e1,a7d7	45. e1c1,b8c7
46. e4c3,g8a8	47. c3d5,d7d5	48. d3c3,c7d7	49. h4h5,d7e8	50. c3c6,a8a3
51. h3g2,e8f7	52. c6c7,d5d8	53. c1c6,d8g8	54. f3h2,a3d3	55. c6b6,d3d4
56. b6b5,f7e8	57. b5b8,d4d8	58. b8b6,e8f7	59. b6b7,g8e8	60. c7c4,d8b8
61. c4f4,f7g8	62. b7d7,e8f8	63. f4f8,g8f8	64. f2f4,f8e8	65. d7c7,b8b4
66. g2f3,b4b3	67. f3e4,b3b4	68. e4e3,b4b3	69. e3f2,e8d8	70. c7c4,e7h4
71. f2g2,b3b2	72. g2h3,h4e1	73. h2f3,b2b3	74. h3g2,b3b2	75. g2f1,e1g3
76. f3d4,d8d7	77. d4e2,g3h4	78. c4a4,h4e7	79. a4a7,d7e8	80. a7a6,b2b1
81. f1g2,b1b2	82. g2f3,b2b3	83. f3e4,b3b4	84. e4d3,b4b3	85. d3c2,b3e3
86. c2d2,e3a3	87. a6e6,e8d8	88. e6h6,e7b4	89. d2c2,a3e3	90. e2d4,e3c3
91. c2b2,c3c4	92. d4c6,d8d7	93. b2b3,c4c6	94. h6c6,d7c6	95. b3b4,c6d7
96. f4f5,d7e7	97. e5e6,e7f6	98. g4g5,f6e7	99. g5g6,h7g6	100. h5g6,e7f6
101. b4b5,f6f5	102. e6e7,f5g6	103. e7e8,g6f5	104. e8e3,f5g4	105. e3e4,g4g5
106. e4f3,g5h6	107. f3g4,h6h7	108. g4g5,h7h8	109. b5c5,h8h7	110. c5d5,h7h8
111. d5e5,h8h7	112. e5f6,h7h8	113. g5g7 1-0		

Match Game   Mach3_vs_GNU

1 . d2d4,g8f6	2 . c2c4,g7g6	3 . g2g3,f8g7	4 . f1g2,e8g8	5 . b1c3,d7d6

```
6 . e2e3,b8d7      7 . g1e2,c7c5      8 . e1g1,d7b6      9 . b2b3,d8c7      10. c3b5,c7d7
11. c1b2,a7a6      12. b5c3,c5d4      13. d1d4,d7c7      14. e2f4,f6h5      15. f4d5,b6d5
16. d4d5,h5f6      17. d5d3,c8f5      18. e3e4,f5d7      19. a1e1,f8e8      20. b2a1,f6g4
21. c3d5,c7a5      22. a1g7,g8g7      23. d3d4,e7e5      24. d4b6,a5b6      25. d5b6,a8d8
26. b6d7,d8d7      27. g2h3,f7f5      28. f2f3,g4h6      29. e1d1,d7d8      30. d1d3,f5e4
31. f3e4,h6f7      32. h3g2,f7g5      33. h2h4,g5e6      34. g1h2,e6d4      35. d3d2,e8f8
36. d2f2,b7b6      37. h2h3,f8f2      38. f1f2,d8d7      39. g2f1,d7f7      40. f2f7,g7f7
41. f1d3,f7e6      42. h3g4,h7h6      43. h4h5,g6g5      44. d3b1,e6d7      45. g4h3,d7c6
46. b3b4,a6a5      47. b4a5,b6a5      48. b1d3,c6c5      49. a2a3,d4b3      50. h3g4,c5d4
51. d3c2,b3d2      52. g4f5,d2c4      53. f5g6,c4a3      54. c2a4,d4e4      55. a4c6,e4d3
56. g6h6,e5e4      57. h6g5,e4e3      58. c6f3,e3e2      59. f3e2,d3e2      60. h5h6,a3c4
61. h6h7,c4e5      62. g5f6,e2f3      63. h7h8,f3g3 1-0
--------------------------------------------------------------------------
Match Game     GNU_vs_Mach3
1 . d2d4,e7e6      2 . e2e4,d7d5      3 . b1d2,c7c5      4 . g1f3,b8c6      5 . f1b5,c5d4
6 . f3d4,c8d7      7 . b5c6,b7c6      8 . e1g1,a8b8      9 . e4d5,c6d5      10. f1e1,g8f6
11. d2b3,d8c7      12. h2h3,f8d6      13. d4f5,d6h2      14. g1h1,f6e4      15. e1e4,d5e4
16. f5g7,e8e7      17. g2g3,h2g3      18. f2g3,c7g3      19. d1g4,g3g4      20. h3g4,h8g8
21. c1h6,e4e3      22. a1e1,b8b4      23. g4g5,d7c6      24. h1h2,b4h4      25. h2g3,h4e4
26. g7h5,g8d8      27. h5f6,e4c4      28. b3a5,c4c2      29. a5c6,c2c6      30. e1e3,c6a6
31. e3c3,e7d6      32. a2a3,a6c6      33. c3d3,d6c7      34. d3d8,c7d8      35. f6h7,a7a5
36. h6g7,a5a4      37. g3f4,c6c2      38. g7c3,d8e7      39. h7f6,c2f2      40. f4e3,f2h2
41. f6e4,h2h3      42. e3f4,h3h4      43. f4f3,e7f8      44. e4c5,f8g8      45. f3g3,h4c4
46. c3b4,c4d4      47. c5a4,g8h7      48. a4b6,h7g6      49. b4c3,d4d1      50. c3f6,g6h5
51. b6c4,d1a1      52. b2b4,a1h1      53. g3f3,h1h3      54. f3e4,h3b3      55. f6e7,b3c3
56. e4d4,c3f3      57. b4b5,f3f4      58. d4c5,f4f5      59. c5c6,f5f4      60. c4d6,f4f3
61. a3a4,f3a3      62. b5b6,a3c3      63. c6d7,c3b3      64. d6b5,b3b2      65. b6b7,b2a2
66. b7b8,a2a4      67. b8h2,a4h4      68. h2h4,h5h4      69. g5g6,h4h5      70. g6f7,e6e5
71. f7f8,h5g4      72. d7e6,e5e4      73. f8f5,g4g3      74. f5f1,e4e3      75. e6f5,e3e2
76. e7d6,g3h4      77. f1h1 1-0
--------------------------------------------------------------------------
Match Game     Mach3_vs_GNU
1 . d2d4,g8f6      2 . c1g5,f6e4      3 . g5h4,g7g5      4 . f2f3,g5h4      5 . f3e4,c7c5
6 . e2e3,d8b6      7 . g1f3,b6b2      8 . b1d2,f8g7      9 . d2b3,h4h3      10. b3c5,h3g2
11. f1g2,b2c3      12. e1e2,h8g8      13. g2h3,b7b6      14. c5d3,c8a6      15. h1g1,b8c6
16. h3f5,e8f8      17. d1d2,c3d2      18. e2d2,d7d6      19. f5h7,g8h8      20. h7f5,e7e6
21. f5g4,c6a5      22. a1b1,a5c4      23. d2e2,g7h6      24. d3b4,a6b7      25. e2d3,c4e3
26. d4d5,e6d5      27. e4d5,f7f5      28. g4h5,e3d5      29. b4d5,b7d5      30. f3h4,d5e4
31. d3e2,h8h7      32. b1f1,h6e3      33. h5g6,h7h4      34. e2e3,f8e7      35. g6f5,e4f5
36. f1f5,h4h2      37. e3d3,e7e6      38. g1f1,a7a6      39. a2a4,h2h3      40. d3d4,h3h4
41. f1f4,h4f4      42. f5f4,a8c8      43. c2c4,c8c5      44. f4f3,d6d5      45. c4d5,c5d5
46. d4c4,d5c5      47. c4b3,c5e5      48. f3d3,e5e4      49. d3d8,e4e3      50. b3b4,a6a5
51. b4b5,e3b3      52. b5c6,b3b4      53. d8d6,e6e7      54. d6d7,e7f6      55. d7d2,f6f5
56. d2d5,f5e4      57. d5b5,b4a4      58. c6b6,e4d4      59. b5a5,a4c4      draw
--------------------------------------------------------------------------
Match Game     GNU_vs_Mach3
1 . e2e4,c7c5      2 . g1f3,d7d6      3 . d2d4,c5d4      4 . f3d4,g8f6      5 . b1c3,a7a6
6 . f1c4,g7g6      7 . c1g5,f8g7      8 . e1g1,e8g8      9 . a1c1,d8b6      10. c4b3,b8c6
11. d4c6,b7c6      12. d1d2,c8b7      13. c1e1,c6c5      14. e4e5,d6e5      15. d2e3,h7h6
16. g5h4,b6b4      17. h4g3,f6g4      18. e3e2,a8d8      19. a2a3,b4b6      20. e2g4,d8d4
21. g4e2,c5c4      22. b3c4,b6c6      23. c4f7,f8f7      24. f2f3,c6b6      25. e2e3,e5e4
26. c3e4,b7e4      27. f3e4,f7f1      28. g1f1,b6b2      29. e3b3,b2b3      30. c2b3,d4d3
31. e1b1,d3e3      32. g3f2,e3e4      33. b1c1,e4f4      34. f1e2,g8f7      35. c1c6,f4f6
36. c6c4,f6e6      37. f2e3,g6g5      38. e2d3,e6d6      39. d3e4,g7b2      40. a3a4,d6e6
41. e4f3,b2e5      42. h2h4,g5h4      43. c4h4,e5g7      44. g2g4,e6f6      45. f3e4,f6g6
46. b3b4,g6e6      47. e4d3,e6d6      48. d3c4,d6c6      49. c4d5,c6e6      50. e3c1,e6d6
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51. d5c5,g7d4	52. c5c4,d4f6	53. h4h5,d6d4	54. c4b3,d4g4	55. h5h6,g4g3
56. b3a2,g3g1	57. c1a3,g1g2	58. a2b1,e7e5	59. b4b5,a6b5	60. a4b5,e5e4
61. b5b6,e4e3	62. b6b7,e3e2	63. a3b4,f6e5	64. h6h5,e5d6	65. h5h7,f7g6
66. h7h1,g2f2	67. h1c1,f2f1	68. b4d2,f1f7	69. c1g1,g6f6	70. g1g2,f7b7
71. b1c2,b7e7	72. d2e1,d6f4	73. g2f2,f6f5	74. c2d3,e7e3	75. d3d2,e3h3
76. d2e2,f5e4	77. e1d2,f4e5	78. f2g2,e5d4	79. g2g4,e4d5	80. g4g5,d5c4
81. g5g4,h3h2	82. e2d1 draw			

Match Game   Mach3_vs_GNU

1 . g2g3,g8f6	2 . f1g2,d7d5	3 . g1f3,b8c6	4 . d2d4,e7e6	5 . e1g1,h7h6
6 . b1c3,f8b4	7 . c1f4,b4c3	8 . b2c3,f6e4	9 . d1d3,g7g5	10. f4c1,e8g8
11. c1a3,f8e8	12. f3e5,c6e5	13. d4e5,c7c5	14. g2e4,d5e4	15. d3e4,d8a5
16. a3b2,e8d8	17. f1b1,d8d2	18. a2a3,a5a6	19. c3c4,c8d7	20. b2c3,d7c6
21. e4e3,d2c2	22. e3d3,a6a4	23. b1b2,c2b2	24. c3b2,b7b6	25. f2f3,a7a6
26. e2e4,a8a7	27. d3d6,a7d7	28. d6b8,g8g7	29. a1f1,a4b3	30. f1f2,d7d1
31. g1g2,c6a4	32. b8c8,d1b1	33. b2c3,b3c3	34. c8d8,c3e5	35. d8a8,a6a5
36. a8d8,e5c3	37. e4e5,c3e5	38. d8d3,b1b3	39. d3d8,e5d4	40. f2d2,d4d8
41. d2d8,a4c6	42. d8d6,b3b2	43. g2g1,c6f3	44. a3a4,g5g4	45. g1f1,g7f6
46. f1e1,f6e5	47. d6d2,b2b4	48. d2a2,f7f5	49. a2a3,e5e4	50. e1d2,e6e5
51. h2h3,h6h5	52. h3g4,h5g4	53. a3e3,e4d4	54. e3a3,f3c6	55. a3d3,d4c4
56. d3d6,c6a4	57. d6f6,b4b2	58. d2c1,b2c2	59. c1b1,c2c3	60. b1b2,c3b3
61. b2a2,a4d7	62. f6d6,d7c8 6	3. d6c6,c8b7	64. c6e6,e5e4	65. e6e7,b7d5
66. e7e5,b3f3	67. a2b2,e4e3	68. b2c2,d5e4	69. c2d1,f3g3	70. e5e4,f5e4
71. d1e2,g3f3	72. e2d1,f3f2	73. d1c1,g4g3	74. c1d1,g3g2	75. d1c1,g2g1 0-1