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.

Commands

GNU Chess menu commands

Background Information

Article: What is GNU Chess
Article: Experiences of communal developlment
GNU Chess Copyright notice
GNU Chess move generator
GNU Chess heurisitics
GNU Chess sample match with MACH

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.

File	Save and restore a game
Edit	Change board setup
Options	Adjust game options
Skill	Adjust the degree of difficulty of the game
Side	Choose what side to have to computer play
Colors	Sets up screen colors
Hint	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

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.

Contact information: The author may be reached by a variety of methods. Via U.S. mail: Stuart Cracraft, P.O. Box 2841, Laguna Hills, Ca. 92654-2841. Via Email: cracraft@wheaties.ai.mit.edu. The author may also be contacted via the Free Software Foundation, Inc. 675 Massachusetts Ave.,Cambridge 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

This file contains a description of GNU's new move generation algoritm.

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

Heuristic descriptions for CHESS.

Revision: 12-16-87

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

Article 1586 of rec.games.chess:
Path: ai-lab!cracraft
From: cracraft@wheaties.ai.mit.edu (Stuart Cracraft)
Newsgroups: rec.games.chess,gnu.chess
Subject: GNU Chess 1.55 vs. Fidelity Mach 3
Message-ID: <5741@rice-chex.ai.mit.edu>
Date: 3 Jan 90 04:52:50 GMT
Reply-To: cracraft@wheaties.ai.mit.edu ()
Organization: Project GNU
Lines: 181
Xref: ai-lab rec.games.chess:1586 gnu.chess:29

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
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
