Rodent III UCI

Introduction

There are different kinds of chess engines. Some are programmed for strength. Komodo by Mark Lefer, Larry Kaufman and late Don Dailey has been able to beat human grandmasters giving them material odds. Some, like Stockfish, merge the oursuit of strength with adherence to software engineering principles. Some are programmed to prove a research hypothesis. Giraffe by Matthew Lai plays strong chess using neural networks for evaluation and highly unusual search algorithm. Some are programmed for style, like legendary Chess System Tal by Chris Whittington.

Rodent III has been programmed for tunability. You can turn it into a crazy attacker, an old-fashioned positional player, or a sparring partner for Your kids. Its tuning options are both intuitive and relevant from the chess point of view, making it a perfect free replacement of commercial programs.

Facts and numbers

Rodent III is an open source chess engine by Pawel Koziol, licensed under GPL 3.0. It is based on a much weaker engine Sungorus 1.4 by Pablo Vazquez (https://sites.google.com/site/sungorus/). This makes it a derivative work.

Rodent III is just a chess engine, so in order to enjoy it you will need a graphical user interface (GUI). Some of possible choices are: Winboard, Arena, TarraschGUI, ChessGUI. If You are using another GUI, You should be fine as long as it understands UCI protocol (which is usually the case, since top engines like Stockfish and Komodo use it).

Rodent's strength probably exceeds 2920 Elo on the CCRL scale. This should allow the engine to hover slightly above the 50th place on CCRL and CEGT rating lists. You can conclude that Rodent III is a decent engine, albeit far from the top dogs or from aspiring engines like Fizbo or ICE.

Origins

Rodent III is a derivative of much weaker, yet very cleanly written engine Sungorus by Pablo Vazquez (https://sites.google.com/site/sungorus/). Its concise and logical code served as a base to add further enhancements.

Throughout the developement cycle, a lot of knowledge from other open-source programs has been added. These inspirations include (in alphabetic order):

Andscacs – penalty for bishops that cannot reach enemy half of the board

Crafty – material imbalance table

DiscoCheck – evaluation of hanging pieces (extended also to defended pieces with smaller weights).

Fruit (via Toga log user manual) – many evaluation weights, including piece square tables (PstStyle = 1 / "classic") and mobility values (MobilityStyle = 1 / "linear"). Fruit values served as reasonable first guesses and some of them were subsequently retuned.

Gambit Fruit – king tropism weights.

Hakapeliitta – basis for piece square tables (PstStyle = 0 / "quirky" is symmetric and tweaked version of Hakapeliitta tables)

Senpai – implementation of aspiration windows and late move pruning

Stockfish – late move reduction depths, the way of initializing king safety table.

Texel – pawn island evaluation

Toga II 3.0 – razoring implementation and forwardness evaluation (in Toga II it is called "space").

Contributors

These people helped to improve Rodent

Jim Ablett supplied Android compiles in the past

Graham Banks made a funny, cartoon-like logo

Matthew R. Brades, **Denis Mendoz**a and **Martin Sedlak** supplied Linux compiles of some 1.x versions

Lucas Braesch prompted me repeteadly to maintain Linux compatibility

Dann Corbit has sent a patch allowing to use popcount intrinsics and fast 64-bit compiles, pointed some bugs.

Jon Dart supplied a Linux patch of some bitboard functions

Kestutis Gasaitis made a thorough code inspection of 0.xx versions, spotting bugs and suggesting improvements.

Raimar Goldschmidt supplied several bugfixes and created personality testing framework

Dave Kaye prepared Rodent II to be compiled under Linux

Denis Mendoza created a logo featuring Speedy Gonzales

Ferdinand Mosca created very funny KingHunter personality

Brendan J. Norman created Henny and Remy personalities and reviewed Rodent on his blog

Frank Quasinsky tested Rodent II for FCP rating list

Roman T. Sovanyan created Rodent Risky branch, and his contribution has been accepted

Pablo Vazquez has kindly allowed me to use the codebase of Sungorus to start this project

Notes about recent release

Rodent III is a complete rewrite. It has been rather draining to do it relatively soon after a rewrite of Rodent II, but unfortunately I failed several times trying to add multicore support to that codebase.

basic.ini

As it has been stated before, Rodent allows its users to modify several options influencing its playing style. The way of accessing all of them may seem a little clumsy. It is a result of an attempt to have the best of both worlds: instantly accessible predefined styles for a casual user and a possibility to tweak the engine for those who like it.

The choice between these scenarios must be made in **basic.ini** file. That file does not initialize the engine itself, but drastically changes the way how it talks to the GUI. There are two setups: "**HIDE_OPTIONS**" and "**SHOW_OPTIONS**". The first lets the user play with predefined personalities, the second – to set them manually via UCI options.

The second choice made in basic.ini relates to HIDE_OPTIONS mode only. The string "**PERSONALITY_BOOKS**" means that opening books are read from personality files. This works fine under Windows, but under Linux you must actually type correct paths to opening books in the personality files. The string "**GENERAL_BOOKS**", on the other hand, allows to set opening book independently and orders the engine to ignore book settings from personality file.

The third choice is between "**ELO_SLIDER**" and "**NPS_BLUR**". If ELO_SLIDER setting is in effect, user gets the chance to set engine's Elo via standard UCI_Elo option. If he opts for NPS_BLUR, he gets two independent parameters – nodes per second limit and the pseudo-random value added to evaluation function output. The first setting is more intuitive to use, the second one gives more liberty to the user (see hilarious "Drunk" personality with full tactical strength and hopelessly twisted evauation).

UCI options for "HIDE_OPTIONS" mode

In "HIDE_OPTIONS" mode Rodent is initialized by a personality file, which uses the same syntax as UCI parser. Personality files can invoke the other (which may be useful if You want to change just one or two parameters). Options will be described in the section "UCI options in SHOW_OPTIONS mode" below. A sample personality will be shown on the next page.

```
; Marshall personality for Rodent III chess engine
; by Pawel Koziol
; hommage to Frank Marshall (1877-1944)
; very high attack, very high mobility, sacrificial, likes knights

setoption name Strength value 2737
setoption name PawnValue value 100
setoption name KnightValue value 335
setoption name BishopValue value 335
setoption name RookValue value 500
setoption name QueenValue value 1000
setoption name KeepPawn value 0
setoption name KeepKnight value 0
setoption name KeepBishop value 0
setoption name KeepRook value 0
setoption name KeepQueen value 0
setoption name BishopPair value 50
setoption name KnightPair value -10
setoption name ExchangeImbalance value 25
setoption name KnightLikesClosed value 6
setoption name RookLikesOpen value 3
setoption name Material value 90
setoption name OwnAttack value 150
setoption name OppAttack value 100
setoption name OwnMobility value 150
setoption name OppMobility value 100
setoption name KingTropism value 25
setoption name PiecePlacement value 100
setoption name PiecePressure value 100
setoption name PassedPawns value 100
setoption name PawnStructure value 90
setoption name Lines value 100
setoption name Outposts value 100
setoption name Fianchetto value 0
setoption name PawnShield value 100
setoption name PawnStorm value 100
setoption name Forwardness value 100
setoption name DoubledPawnMg value -12
setoption name DoubledPawnEg value -24
setoption name IsolatedPawnMg value -10
setoption name IsolatedPawnEg value -20
setoption name IsolatedOnOpenMg value -10
setoption name BackwardPawnMg value -8
setoption name BackwardPawnEg value -10
setoption name BackwardOnOpenMg value -8
setoption name PstStyle value 1
setoption name MobilityStyle value 0
setoption name NpsLimit value 0
setoption name EvalBlur value 0
setoption name Contempt value 0
setoption name SearchSkill value 10
setoption name SlowMover value 100
setoption name Selectivity value 175
setoption name BookFilter value 20
setoption name GuideBookFile value books/players/marshall.bin
setoption name MainBookFile value books/hist/_pre30.bin
```

Available personalities

Depending on the Rodent II distribution, You will obtain a set of personalities – predefined playing styles, often together with tailormade opening books. That is where Rodent's powerful and expressive option set really shines. For user's convenience, personalities are grouped in folders. Again, not every distribution package will contain all the folders. Broad outline of what to expect is shown below.

Personalities from the folder "**famous**" try to reenact the famous players.

"**masters**" are accomplished players in 2000-2300 range.

"**league**" contains players in 1700-2000 Elo range, often with certain quirks.

"**club**" players are meant to be in 1400-1700 Elo range.

"**school**" players are probably 1200-1400 Elo and they are prone to tactical mistakes.

"**kids**" folder packs even weaker players.

"**fun**" folder contains rather unusual opponents, some of them quite strong, but decidedly quirky

UCI options in SHOW_OPTIONS mode

These options can be accessed in two ways. SHOW_OPTIONS written in basic.ini asks GUI to display a full set of UCI options. Personality files also use the same syntax as the UCI options parser. Possible choices include:

Material options:

QueenValue, RookValue, BishopValue, KnightValue, PawnValue

material values, expressed in centipawns. Interesting effects can be obtained by slightly changing bishop, knight and rook value. It is even possible that default valuess are not perfect, and that someone might come up with a better set of parameters (if I were to guess, increasing bishop's value might help).

KeepQueen, KeepRook, KeepBishop, KeepKnight, KeepPawn

preference for a given piece for the computer side. These values should be rather low.

Usage guidelines: KeepQueen = 20 is generally a good addition for aggressive personalities, since Rodent does not evaluate king attacks for the side without a queen. KeepPawn value of 2 or 3 together with KeepKnight set at 5 and KeepBishop set at -5 should be a good starting point for a personality that likes closed positions.

BishopPair

basic bonus for a Bishop pair. Default 50 is a reasonable value.

Usage guidelines: You might lower it emulating Nimzowitsch or Tchigorin.

KnightPair

for best play this value should be negative.

Usage guidelines: making it positive has interesting, if weakening effect on engine's personality, as long as opening book allows Rodent to keep its options open.

ExchangeImbalance

this bonus is applied to a side is exchange up (having a rook against a minor piece).

Usage guidelines: Lowering it pr setting it to a negative value makes the engine more inclined to exchange sacrifices. Useful if You want to emulate Petrosian (coupled with defensive play and preference for closed positions) or Topalov (coupled with attacking play).

KnightLikesClosed

a bonus given for each pawn if a knight of the same side is present. Actually it is tuned in such a way that knight gains value with 5 or more pawns on the board, and loses otherwise. This option should generally have a single-digit value (default is 6).

Usage guidelines: KnightLikesClosed may sound like a dry, technical option, but its effects are rather interesting: increasing it causes the engine to love and cherish its knights, and in case it ends with knight(s) against bishop(s) it urges Rodent II to keep as many pawns as possible, thus keeping position closed. Predefined "Hedgehog" personality makes use of this trick.

RookLikesOpen

rooks gain power with more open files available, and therefore with less pawns on the board. Both this and the previous option come from the classic article *Evaluation of material imbalances* by GM Larry Kaufman.

Material

percentage of material value used in actual evaluation. This idea comes from Rhetoric chess engine.

Please note that options described above do not display a full set of bad trade penalties – and that all of them, visible or not, are scaled by Material weight to ensure consistency.

Usage guidelines: Use it with caution! 90% is enough to see a lot of pawn sacrifices without compromising playing strength, anything below that leads to much weaker, but very entertaining play style.

Positional options

PiecePlacement

basic positional score from piece/square tables, kings not included. Explanation for non-programmers is that raising it exaggerates the effect defined by PstStyle, whereas lowering it makes engine more dependent on mobility evaluation.

OwnMobility

percentage of mobility value for engine side.

OppMobility

percentage of mobility value for non-engine side.

OwnAttack

percentage value of engine's king attack.

OppAttack

percentage value of opponent's king attack.

Usage guidelines: Mobility and attack options may be set independently to create asymmetric evaluation. This is the core of personality tuning mechanism. The engine can concentrate on carrying out own attacks, on preventing opponent's agression, on activating own pieces or on blocking enemy movements.

Fiddling with mobility can also have an interesting side effect: if opponent's mobility weight is bigger, engine will be slightly more inclined to exchange pieces. You might want to compensate this effect by using small positive values for keeping own pieces on the board.

Since Rodent's evaluation is rather speculative, value around 150 would already create a ferocious attacker. However, personalities created by Ferdinand Mosca (Kinghunter) and Brendan J. Norman (Henny, Remy) successfully use even higher values.

KingTropism

percentage of value awarded for piece proximity to enemy king. Pieces that are far get a penalty, those that are near get a bonus, different weights are used for each piece (there ar two sets: for midgame and for endgame). Exact values are derived from GambitFruit. Initially I thought that it is only a "flavour" option, but tests have shown that low values tend to score slightly better than 0.

Usage guidelines: aggressive personalities with high tropism and low tropism behave differently: the first kind amasses pieces around the enemy king, the other one shoots from afar. Negative king tropism might make sense for certain positional personalities (Petrosian rather than Nimzowitsch), but its impact is untested.

PiecePressue

weight for a bonus for attacking enemy pieces.

PawnStructure

percentage of penalty for isolated, backward and doubled pawns, as well as for pawns supporting each other (defended or standing side by side).

Usage guidelines: Increasing this option results in more tight game and may be suitable for some of the positional personalities.

PassedPawns

percentage of bonus for passed and candidate passed pawns. Engine increases this bonus for connected passers, decreases it for blocked passers and makes a correction for control of a stop square.

Outposts

weight of a bonus for occupying good squares immune from attacks by enemy pawns or defended by own pawns. This deals with positioning of minor pieces.

Usage guidelines: this value might be increased for positional personalities, but it is not strictly necessary.

Lines

weight of a bonuses for open files, semi-open files and major pieces on the 7th rank.

Pawn shield

this option determines engine's desire to protect king with own pawns.

Pawn storm

this option determines the willingness to attack enemy king with pawns.

Forwardness

this option determines the bonus for placing pieces on enemy half of the board (generally: the more, the merrier and stronger pieces have bigger weight)

Fianchetto

Bonus for a fianchetoed bishop near own king. Default is 0, but even ludicrously high values like 50 tend to test rather well.

Pst style

this option is rather difficult to describe – it makes the engine choose between three different sets of

piece/square tables. These are the backbone of evaluation function, telling which piece belongs where. The available choices are likely to be expanded, but for now three distinct styles are available:

Number in UCI options dialog	Name in personality creator	About
0	quirky	dynamic, likes advancing edge pawns
1	classic	likes to centralize pieces
2	normal	balanced style
3	blunt	Weaker, primitive, centralizing

MobilityStyle

This options gives two possiblilties. Mobility can be either **linear** (gain from 1 to 2 possible moves is the same as from 7 to 8) or **decreasing** (improving low mobility scores comes before improving high mobility scores). In personality creator, we use the aforementioned names, in UCI options dialog 0 is linear and 1 is decreasing.

Other options

BookFilter

irrelevant for eval tuning, influences usage of Polyglot books by eliminating moves with the value lesser than a given percentage of best move's value. Read more in "Opening book" section.

NPS

nodes per second. This option is meant to slow the engine down, and used to create weak personalities. This needs more testing, but NPS of about 5000 puts Rodent II somewhere within the 1600-1800 Elo range (FIDE scale).

EvalBlur

Random value added to evaluation function, used to create weak personalities.

Contempt

Represents the unwillingness to draw. For example, value "12" means that in the opening position Rodent will prefer to be 11 centipawns behind than to accept a draw by repetition.

SlowMover

percentage modifier for time usage. Values < 100 make the engine play faster at the beginning of the game, values > 100 make it use more time.

SearchSkill

Another way of weakening the engine. Search skill lower than 10 means that certain search techniques are disabled.

Search skill 1 – transposition table enabled
Search skill 2 – null move enabled
Search skill 3 – LMR of quiet moves enabled
Search skill 4 – razoring enabled
Search skill 5 – futility pruning enabled
Search skill 6 – late move pruning enabled
Search skill 7 – aspiration window enabled
Search skill 8 – static null move enabled
Search skill 9 – reduction of bad captures
Search skill 10 – null move verification

RiskyDepth

Contribution from Roman T. Savonyan. If above 0, it denotes depth at which score is modified by a formula that makes engine to like risky continuations.

Selectivity

Determines how often Rodent uses pruning and reduction heuristics at move level. This option affects late move reduction, late move pruning and futility pruning, but has no effect on null move pruning and razoring. Minimum value of 0 switches these techniques off, maximum value of 200 means using them on any eligible move. Values in between indicate how often a move that has been successfull in the past searches is exempt from pruning. Default value is 175.

Usage guidelines: Default has been tested to be stronger than 150 and 200. Values around 100 can be used to emulate primarily positional players.

Describing personalities

When creating new personality for Rodent II, it might be a good idea to prepare a description, telling the user what to expect. Description can be brief (just a couple of adjectives) or more "artistic" (describing a set of parameters as if it was a human character). Here I propose a couple of terms. Please treat them as guidelines, not as

Proposed term	**Meaning**
active	OwnMobility increased
restricting, grinder	OppMobility increased
aggressive	OwnAttack increased
careful, prophylactic	OppAttack increased
dynamic	both OwnAttack and OwnMobility increased
materialist	MaterialWeight > 100
sacrificing	MaterialWeight at about 90
romantic	MaterialWeight < 90
classical	PiecePlacement > 100

improvising	PiecePlacement < 100
solid	PawnStructure > 100, possibly also Outposts > 100
undervalues/overvalues X	piece value different from default
likes blocked positions	KnightLikesClosed > 6 KeepPawn > 0
moderate	NPSLimit at about 2000
weak	NPSLimit < 1000
careless	high evalBlur
fast	MoveTime < 100
slow	MoveTime > 100

Opening book

Rodent uses two Polyglot (*.bin) books in succession. The idea behind this design is that first book may be a narrow, handmade repertoire book, whereas the second one, usually bigger and more general, constitutes a fallback option.

Rodent has a unique feature allowing it to filter moves that would be used with the frequency lower than n% of best move frequency. Default settings use n = 10. If you set it to 100%, engine will pick only the book moves played with the greatest frequency. Most of the time it will be just one move, sometimes two or three. When using rodent.bin, 50% will give you a narrow book exploring only major alternatives.

Elo	NPS	Rejected version – weak below 2000	Blur
1000	50	54	200
1100	130	58	180
1200	210	64	160
1300	290	72	140
1400	370	98	120
1500	450	128	100
1600	660	186	80
1700	740	303	60
1800	1000	540	40
1900	2000	1007	20
2000	4000	3800	0
2100	8000	7560	0
2200	16000	15051	0
2300	32000	30000	0
2400	64000	60000	0
2500	128000	241000	0
2600	256000	482000	0
2700	512000	964000	0
2800	1mln+	1 mln+	0