

# How to use [Othello research support AI app Egaroucid](#)

---

[日本語](#)

If you have some requests, please let me know through my Twitter ([@Nyanyan\\_Cube](#) or [@takuto\\_yamana](#)), [GitHub](#) issue, or pull requests.

**Functions below are in Study mode. Some functions are disabled in other modes.**

## Index

- [Directory](#)
- [Lookahead](#)
- [Evaluation Values](#)
- [Analyze](#)
- [History](#)
- [Input & Output](#)
- [Book](#)
- [Joseki](#)
- [Use AI without GUI](#)

## Directory

Mode: All

Check if the all things are in these directories before you start the application.

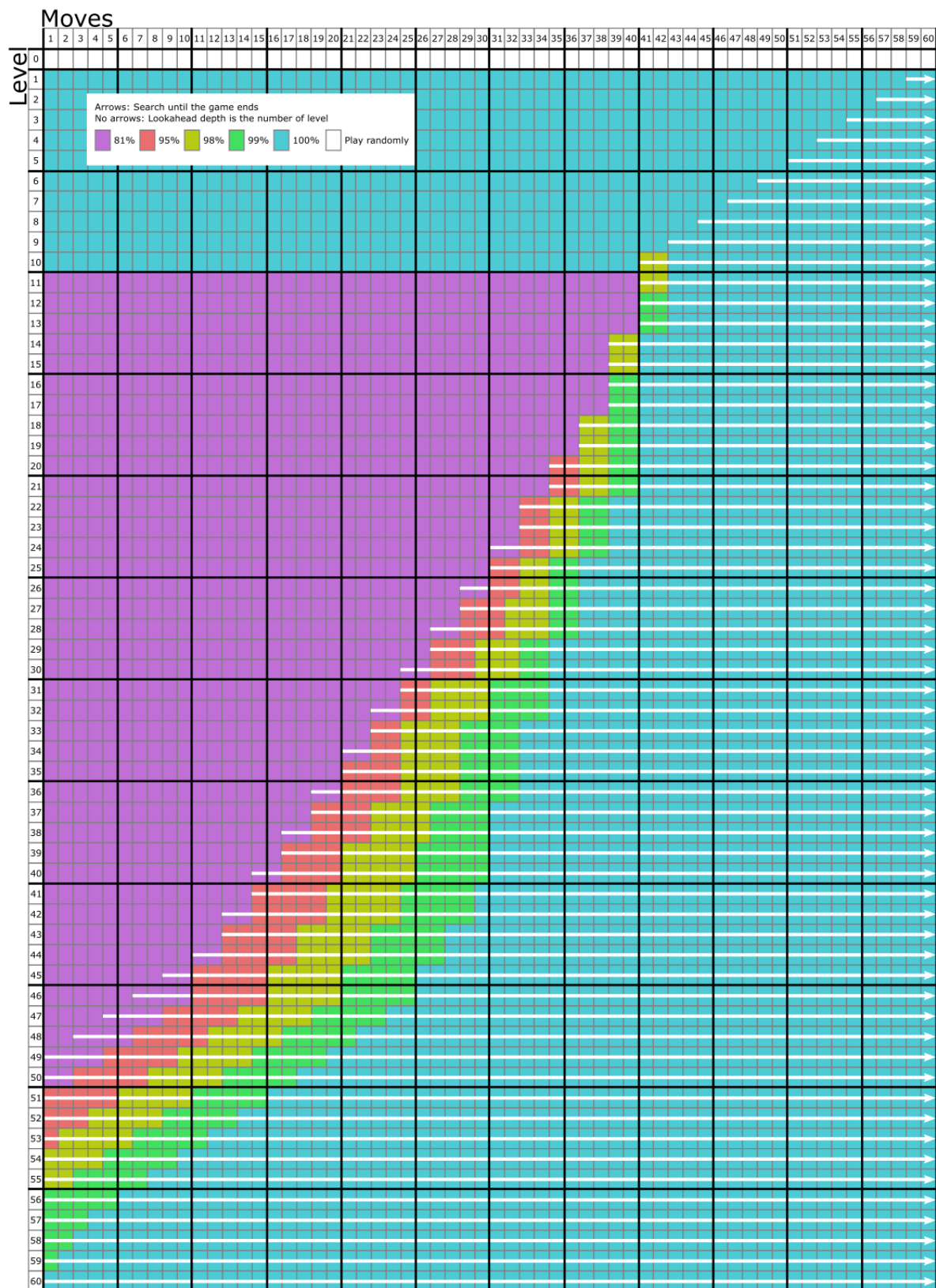
```
Egaroucid5.exe
resources directory
  book.egbk
  eval.egev
  joseki.txt
  settings.txt
  img directory
    checked.png
    icon.png
    logo.png
  languages directory
    english.json
    japanese.json
    languages.json
    languages.txt
records directory
```

Execute `Egaroucid5.exe` to start the application.

## Lookahead

Mode: All

Lookahead depth is defined by the "Levels". These levels are defined as this image.



You have to be careful when raising the level, because some high levels are too heavy to use in your computer.

## Evaluation Values

Mode: Study, Simple

Evaluation values are shown in each legal cells.

### Disc Difference Values

If the board is in your book, `book` will be shown. If not, the AI will search at the `Hint Level` and show the the level or `100%` when exact search is done.

The best moves are shown in blue letters. Best moves and values sometimes mismatch, but this is not a bug. Best moves seems to be more accurate than values.

### Graph of Disc Difference Values

Disc Difference Values are shown in the graph under the board when AI plays. Horizontal axis shows the move numbers, and vertical axis shows the disc difference. If the graph goes upper, it shows that black seems to win. The lower, white seems to win.

## Human Sense Values

Mode: Study

This application has another evaluation values. Human Sense Values are defined as putting together these values:

- Prediction of disc difference
- Each player's bifurcation

The idea came from (in Japanese): <https://othelloq.com/tweet/quantifying-human-difficulty>

Checking `Human Sense value` to enable this function. The values are shown in upper-right corner. Black letters for black player, white letters for white player. When the situation seems to be equal, the value is 50. The greater the value is, the better the move is.

Human Sense Values are calculated as:

1. Calculate the all recent N moves bifurcation
2. Calculate the disc difference prediction in each end of bifurcation
3. Calculate the number of good and bad bifurcations

### Graph of Human Sense Values

Human Sense Values are shown in the graph on the right side of the screen. Horizontal axis shows the value of black, and vertical axis shows the values of white. If graph goes right, black seems to win. If graph goes up, white seems to win.

## Umigame's values

Mode: Study

Umigame's values are the numbers of the bifurcations of the best moves to memorize in your book.

You can see this value with checking `Umigame's value`.

Black letters show black player's number, White letters show white player's number. The values are shown in the bottom-left corner.

Umigame's values are announced here in Japanese: [http://blog.livedoor.jp/umigame\\_oth/archive/s/1075469317.html](http://blog.livedoor.jp/umigame_oth/archive/s/1075469317.html)

## Analyze

Mode: All

Clicking `Analyze` button, the evaluation values are re-calculated and plotted on the graph in `AI Level`.

## History

Mode: Study

You can move across the boards with dragging the graph or pushing right/left or A/D keys. You can play another line with putting a stone.

## Input & Output

### Importing a Record

Mode: Study

You can add a record. The record must be written in F5D6 or f5d6 format.

If importing succeed, you can see the board in your app.

### Importing a Board

Mode: Study

You can add a board. The board must be written in one line with these characters.

- Black Stones: `0/B/b/X/x/*`
- White Stones: `1/W/w/O/o`
- Empty Squares: `./-`

The color to play must be put in the 65th character.

You can add space anywhere and therefore Edax's board inputting format can be used.

The sample input is:

```
.....10.....100.....1.....0
```

If importing succeed, you can see the board in your app.

## Save Game

Mode: Study

You can save the game with clicking `Save Game` button. You can add white/black player names and memo.

A text file will be created in `records` directory.

The filename is:

```
yyyy_mm_dd_hh_mm_ss.txt
```

```
yyyy: Year  
mm: Month  
dd: Day  
hh: Hour  
mm: Minute  
ss: Second
```

The contents:

```
f5d6 record  
Black's Score  
yyyy_mm_dd_hh_mm_ss  
AI Level  
Playing Mode(0:AI plays second 1:AI plays second 2:AI vs AI 3:Human vs Human)  
Black player's name  
white player's name  
Memo
```

If the game is not finished, the score will be `?`.

## Copy Record

Mode: Study

You can copy the record of the board shown with clicking `Copy Record` button.

## Book

### How Book is used

Mode: All

If AI found at least one move of the legal moves, the AI do not search and put a stone from registered moves. That means that if you register bad moves only in your book, the AI will put on bad squares. You must register better moves first.

## Book Error

Mode: All

When some legal moves from a board are registered in your book with different evaluation values, AI puts a disc with book error.

Let X as the value of the best move in the legal positions and let Y as the book error, the policy is selected from legal moves in book which has  $(X-Y)$  or higher values.

If the registered moves are +1, -2, -10 respectively and book error is 0, to 2, The +1 move only selected. If book error is 3 to 10, one move is selected from +1 or -2 moves randomly. if book error is over 10, a move is selected from all moves.

## Modifying and Register a Value to Book manually

Mode: Study

Set any board and right click the legal cell. You can now set a new value with keys number keys, ten keys, and **-** key. You see what you typed on lower left of the app.

If you right click a legal cell by mistake, do nothing and click the cell again. You can escape.

When closing the app, the book is automatically saved.

## Register Values to Book Automatically

Mode: Study

First, you have to set a board which will be the root of a book.

Then you have to set **AI Level** now because this cannot be changed after starting learning the book.

Also You can set the depth of the book and disc difference acceptance now.

Then press the **Start Learning** to start.

You can stop it anytime by **Stop Learning**.

## How books are created

Books are created with the algorithm below.

The algorithm uses priority queue.

1. Push the root board to the queue.
2. Loop until the queue is empty.
3. Pop a better and early board from the queue.
4. Do these for all legal moves
5. Put a disc and calculate a score, then push it to the book. If the value may be less than the acceptance, the value is not calculated.
6. push the board to the queue

## Import (Join) a Book

Mode: Study

Any book created with this application or created by Edax can be imported on this app.

Press **Import** button in the **Book** tab, then you can import it with drag-and-drop.

## Modify the book automatically

Mode: Study

Set any board as the root of the modification, then press **Auto Modification** to modify the values after the board.

You can see that the latter value has better accuracy than the early one. This function uses latter values to modify the early values.

Best moves must be in your book. If not, the values after modification will be different from what you expected.

## Default Book

This application has a default book. This book is created as:

- Modified Zebra's book
- AI Level 21
- Depth 40
- Modified with a Edax's book [here](#).
- I modified manually

I got a permission to use Zebra's book.

## Joseki

Mode: All

Josekis are shown in Japanese. If you created a Joseki data, then I'm very pleased if you send me to pack it in the downloaded zip file.

I used the joseki data here: <http://evaccaneer.livedoor.blog/archives/11101657.html>

## Use AI without GUI

This Application is released under GPL3.0 license. you can use freely under this license.

[Here](#) you can see codes. [Here](#) is a code with which you can use AI without GUI. Please compile it to use it.

Inputting format is:

```
Player number(0: Black 1: white)
Board Row 1
Board Row 2
Board Row 3
Board Row 4
Board Row 5
Board Row 6
Board Row 7
Board Row 8
```

For example,

```
0
.....
.....
.....
...10...
...100..
...1....
.....
.....
```

Outputting format is:

```
{Row of the next move (0-7)} {Column of the next move (0-7)} {evaluation value}
```