

# Gomoku

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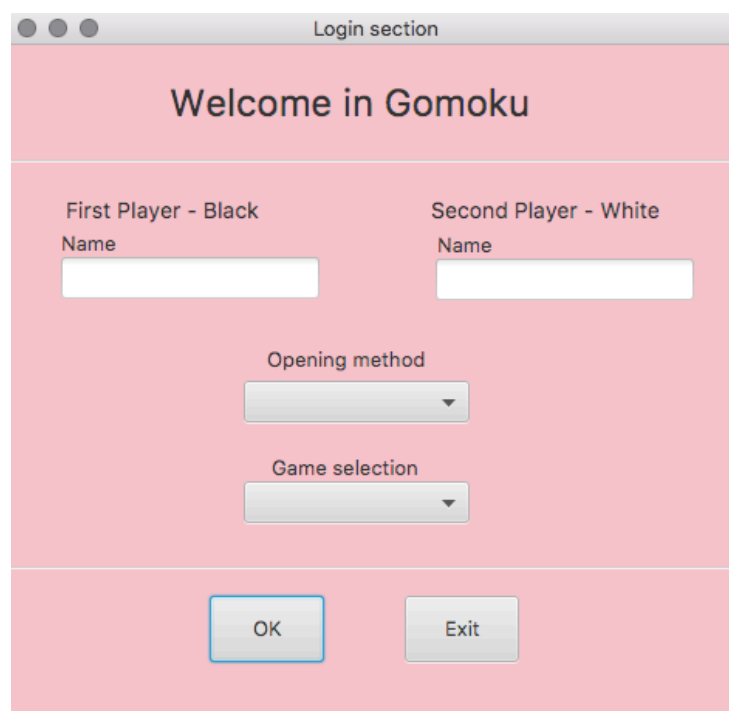
## Game introduction.

Gomoku is a traditional Japanese abstract strategy board game with several variations.

Players alternate turns placing a stone of their color (black or white) on an empty intersection. The stones put on the table remain untouched till the end of the game (except if the game version admits invalid moves). The winner is the first player to form an unbroken chain of five stones (or more depending on the chosen version of the game) horizontally, vertically, or diagonally.

In the project we provide the user 3 different implementations of Gomoku and 3 different opening rules. Each implementation has different rules and board dimension.

The user will be able to set the favorite version of the game, along with the desired opening rule, in a login view.



The image shows a screenshot of a web application window titled "Login section". The window has a pink background. At the top, it says "Welcome in Gomoku". Below this, there are two input fields for player names: "First Player - Black Name" and "Second Player - White Name". Underneath these, there are two dropdown menus: "Opening method" and "Game selection". At the bottom of the window, there are two buttons: "OK" and "Exit".

GOMOKU LOGIN VIEW

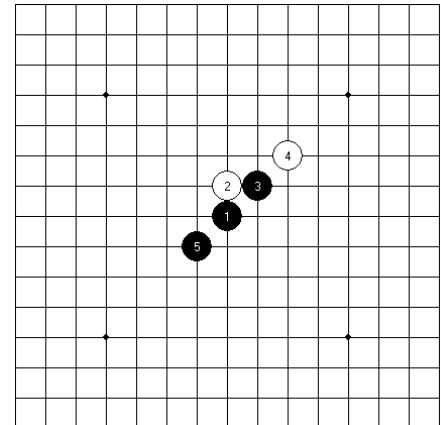
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## Opening Rules.

The players can decide which opening rule will be applied to the Gomoku implementation. Here we present the functionality of each opening with an example of the first moves (image on the right).

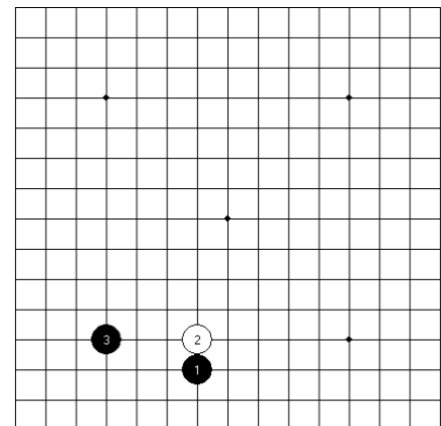
### STANDARD

Black plays first, and players alternate in placing a stone of their color on an empty intersection. There's no restriction where to put, the players put their stones alternately until an unbroken row of five stones (or more) are collected either horizontally, vertically, or diagonally. This rule is 100% black win mathematically.



### SWAP

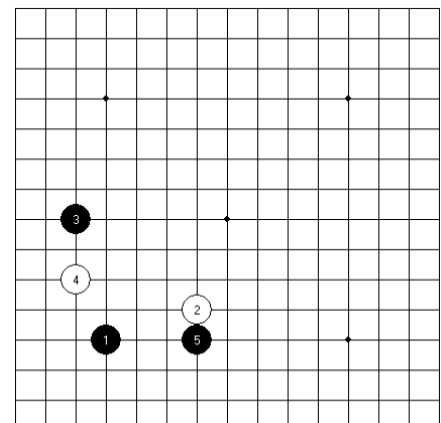
The starting player puts the first three stones anywhere on the board (two black stones and a white one). The second player can decide whether s/he wants to stay at white and put a fourth stone or s/he can swap and control the black stones. After this decision the players keep on moving till someone gets five in a row. This opening rule equals chances much more than the previous rule. The starting player is forced not to put an opening shape which would be too advantageous for one of the colors.



### SWAP2

The first player puts three stones (two blacks and one white) on any intersections of the board. The second player has three options now:

- can choose white and puts the 4th stone
- can swap and controls the black stones
- can put two more stones (one black and one white stone) so there will be a position composed of five stones on the board and s/he passes the opportunity to choose color to the opponent.



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## Gomoku versions.

Many variants of GoMoku exist; they all restrict the players in some sense, mainly reducing the advantage of Black's first move.

### **FREE**

This version of Gomoku is played on a 15×15 board and it doesn't contain any restriction to the intermediate players' moves between the opening and the end of the game. It requires a row of five or more (***overlines***) stones for a win.

### **STANDARD**

As in Free, it's played on a 15×15 board and it doesn't contain any restriction to the intermediate players' moves between the opening and the end of the game. It requires a row of exactly five stones for a win (***overlines*** do not count).

### **OMOK**

Same rules as Standard Gomoku; however, it is played on a 19×19 board and include the rule of ***three and three***. It requires a row of exactly five stones for a win (***overlines*** do not count).

## Invalid moves.

### THREE AND THREE

The rule of three and three bans a move that simultaneously forms two open rows of three stones (rows not blocked by an opponent's stone at either end). Figure 1 on the right shows examples of "open three".

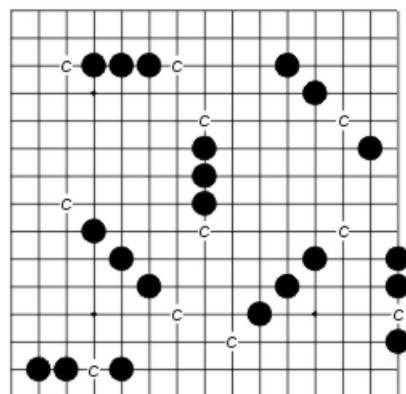


Fig 1. Open three

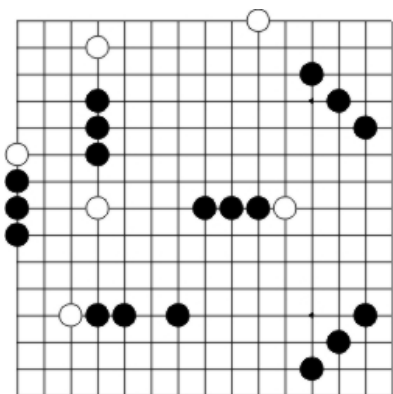


Fig 2. Closed three

It is very important to tell the difference between the real open three and the "fake" three. Figure 2 shows the examples of "closed threes", which are not dangerous to white player.

Figure 3 below shows examples of double-three (3x3) forks, at the points J and Y. In order to have a winning fork, both threes must be "open threes". Point K and Z shows an example of not winning fork (composed by at least one closed threes). It is also important to notice that the point Z is not a forbidden move, because one of the threes is not open.

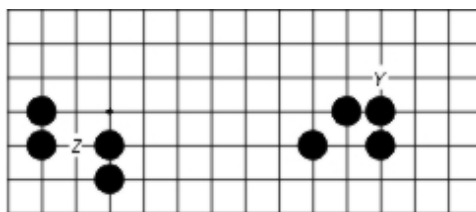
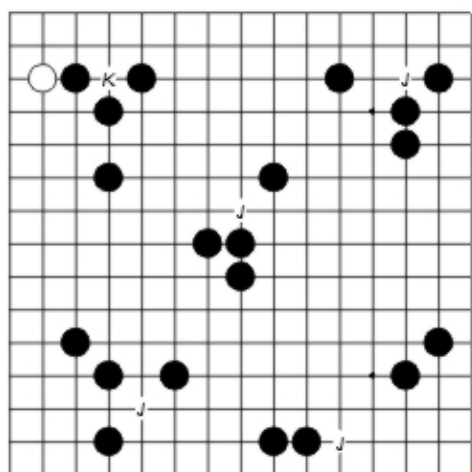


Fig 3. Double-three

For clarity purpose, the images in the Appendix will represent some examples of three and three banned moves.

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Closing.

## OVERLINES

Require a row of five or more stones for a win, admitted only in Free-Gomoku (See Fig.4).

## NO OVERLINES

Require a row of exactly five stones for a win, admitted in Standard-Gomoku and in Omok-Gomoku (See Fig.5).

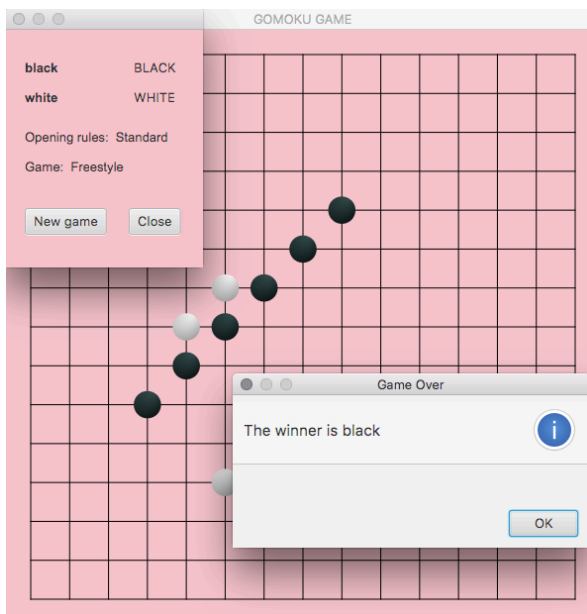


Fig 4. Overlines

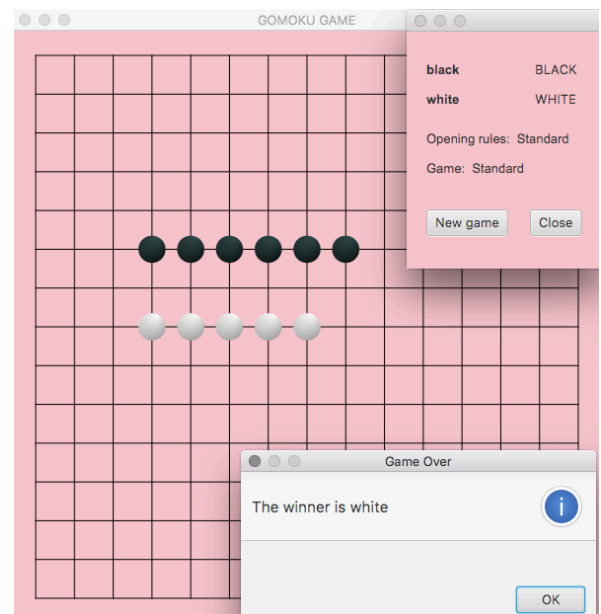
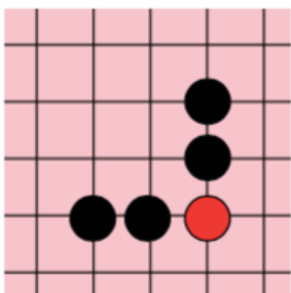


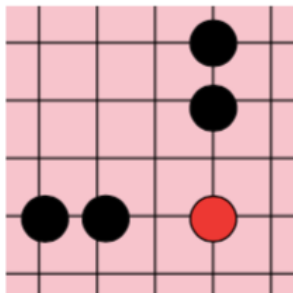
Fig 5. No Overlines

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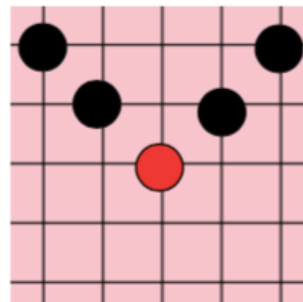
## Appendix



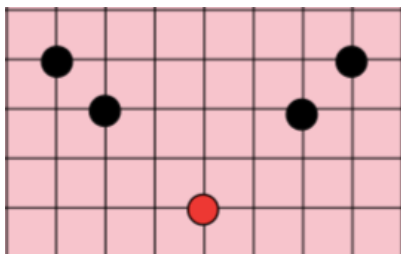
N. 1



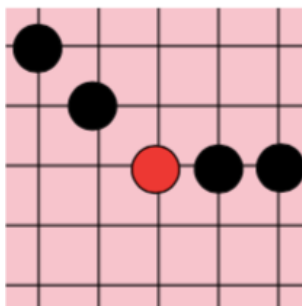
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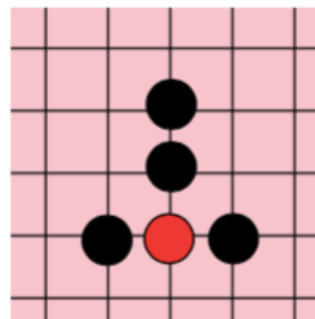
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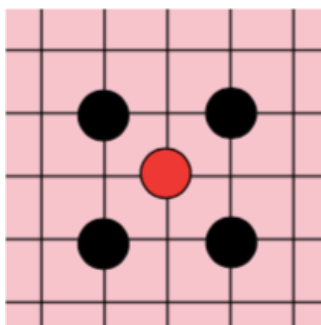
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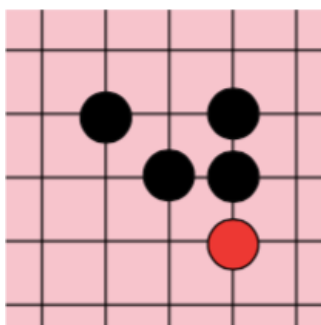
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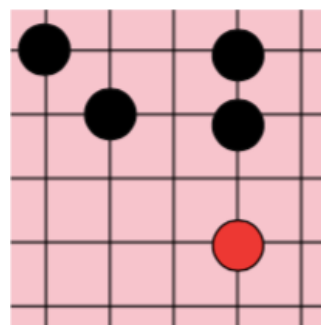
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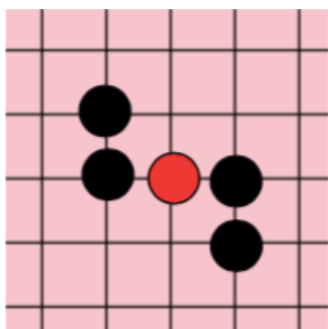
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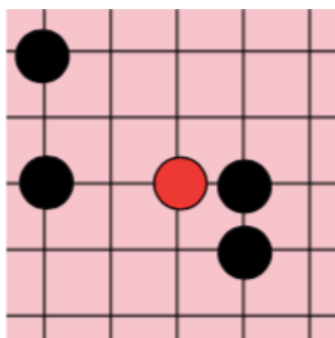
N. 8



N. 9



N. 10



N. 11

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## References

- <http://gomokuworld.com/gomoku/2>
- <http://www.renju.net/media/tournrulesexample.php>
- <https://en.wikipedia.org/wiki/Gomoku>