

Pente

Game Overview, History, Rules and Initial Implementation

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Overview and History

Pente is an *abstract strategy board game*, played usually by two players, in which the aim is to create an unbroken chain of five stones *or* to capture ten of the enemy's stones.

It was created in 1977 by Gary Gabrel at the restaurant *Hideaway Pizza*, in Stillwater, Oklahoma, USA.¹ Customers waiting for their orders to arrive would play a variation of the game on checkerboard tablecloths.¹

Some variations allow for more than two independent players, and even teams, to play simultaneously. These require relaxing the winning conditions of the game to accommodate for the increased opposition — namely requiring only a four-in-a-row for three or four players, and allowing mixed captures for teams.²

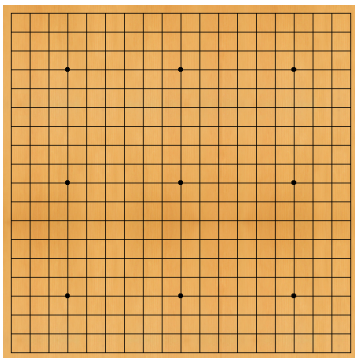


Figure 1: 19x19 *Go* board.

The game has many variations for two player games — all of which have a common ancestry in *Gomoku*, which has a significantly simpler rule-set. All variations of the game are played in the style of *Go*, on the intersections of a traditional 19x19 *Go* board with black and white pieces called *stones*. One player, *White*, uses the white stones, and the other, *Black*, uses the black stones. Once placed on the board, stones may not be moved, but may be removed from the board if *captured*.

Introductory or speed games may be played on the smaller 9x9 or 13x13 boards, but the tighter space makes it very difficult to generate common patterns of play.

Game Rules

The game's precise rules vary considerably throughout variations and sources. As such, we'll first review the common base rules and then discuss a few variations.

Base rules

Let's recall there are two winning conditions, same for White and Black:

- Form an unbroken chain of 5 or more consecutive friendly stones — vertically, horizontally or diagonally.
- Capture a total of 10 enemy stones.

Unlike traditional *Gomoku*, the chain may indeed have more than five consecutive stones.

Captures

Captures occur when two friendly adjacent stones (and only two) become bracketed by a pair of enemy stones, in a configuration depicted in Figure 2. Captures may arise in any direction.

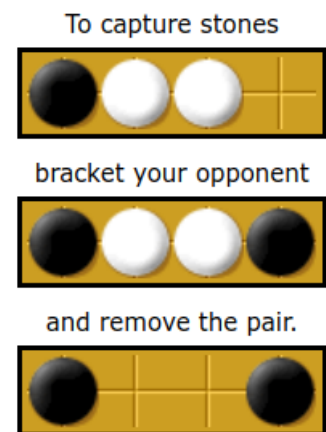


Figure 2: Capturing³

Variations

Some sources add the following secondary rules.

- White always plays first, in the center.^{1,5} This is unlike *Renju* and *Gomoku*.
- *Suicides* are not possible – if a player places two adjacent friendly stones into a bracketed position — for example, if White forms the second panel of Figure 2 — his stones are not captured.^{1,2,4,5}
- Tournament Rule: The first player's second move is restricted – it must be at least three intersections away from the center (that is, outside the board's middle 5x5).^{1,2,3,4}

We'll be using these three rules hereafter.

Other sources do not specify starting player (or choose Black) and do not require the tournament rule, at least for casual play.

Among variations we find: suicides allowed, called *poofs* (*Poof-Pente*); harsher Tournament Rule (*G-Pente*, *D-Pente*); 3-in-a-row captures (*Keryo-Pente*), and others.^{3,4}

Implementation: Internal Representation

Representing the game's board is fairly simple. Every position in the 19x19 board is in one of three states: white piece, black piece, or empty. We'll represent the board using a 19x19 matrix (list of lists), whose elements are **w**, **b** or **c**, for each state respectively. This matrix will be called *Board*.

Now, each player has captured a certain number of pieces (an integer) and only plays pieces of a certain color (white or black). These will be `player(Color, Captures)`.

The overall game state will be kept by `game(Board, White, Black, next)`, where *White* and *Black* are players and *next* is **w** or **b** according to who will play next.

For examples see Figure 3, Figure 4 and Figure 5 below.

Implementation: Board Display

We've decided to flip the board (display only, not representation) when it is Black's turn to play, as if the two players were playing face-to-face on a physical Go board. Naturally we adjust the identification of rows and columns.

To draw the board with text (on the console) we used unicode box-drawing characters (range `u+2500–u+257f`). The white and black pieces become filled and empty unicode circles, respectively.

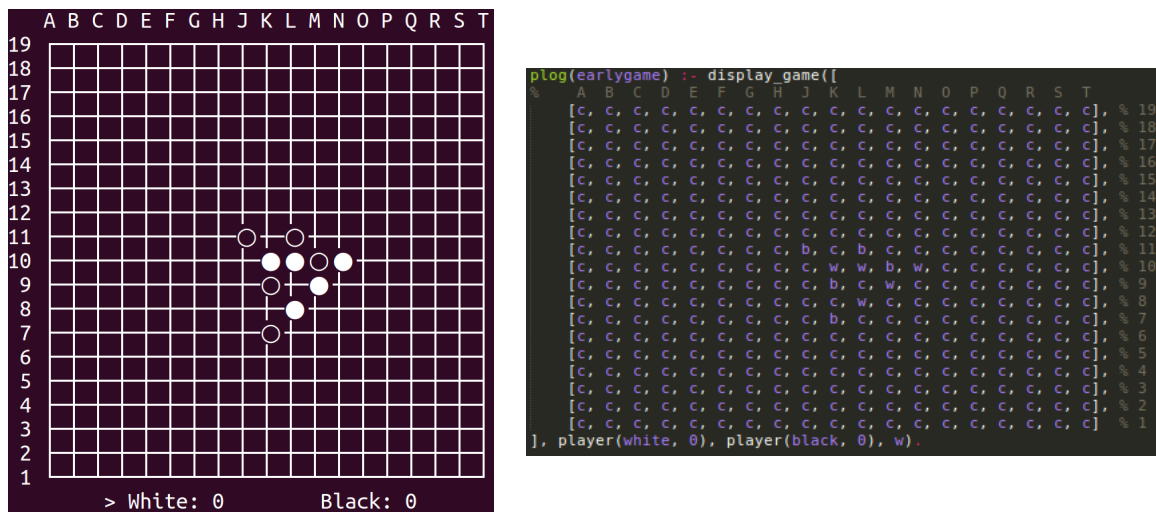


Figure 3: A game after 10 moves. It is White's turn to play.

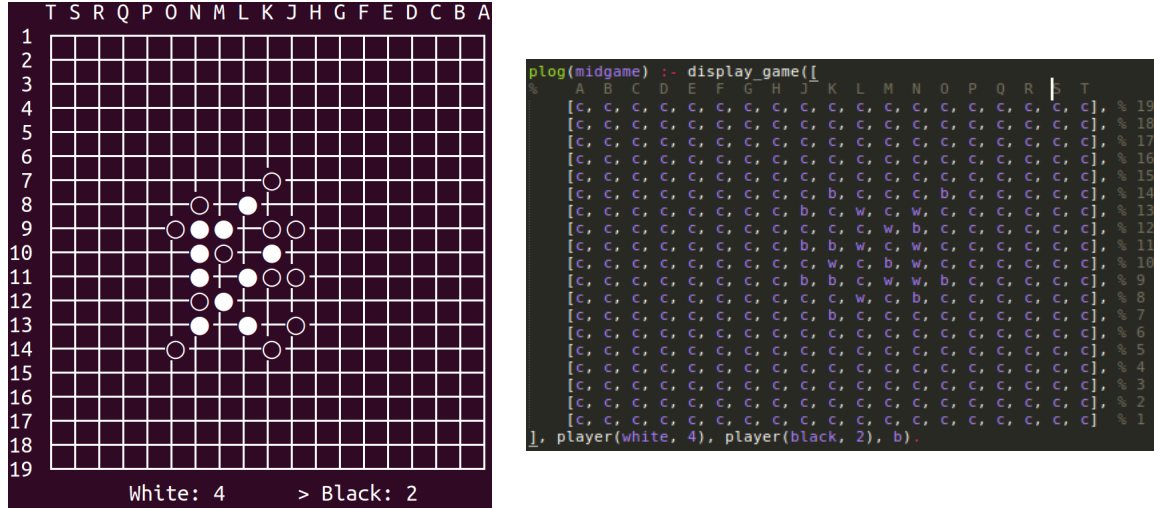


Figure 4: A game after 29 moves. It is Black's turn to play.

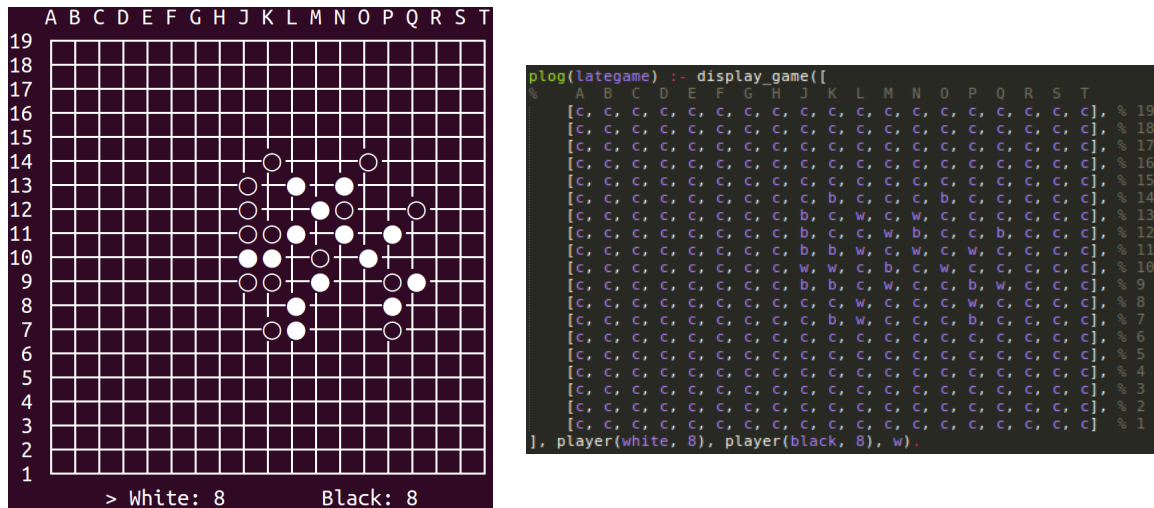


Figure 5: A game after 44 moves. It is White's turn to play, and win at H11.

References

- [1] Wikipedia. *Pente*. URL. (Visited on 10/17/2018).
- [2] winning-moves.com. *Pente – The Classic GAME of Capture and 5-in-a-Row*. URL. (Visited on 10/18/2018).
- [3] www.pente.net. *How to play the game of Pente*. URL. (Visited on 10/17/2018).
- [4] www.pente.org. *Pente Game Rules*. URL. (Visited on 10/17/2018).
- [5] www.renju.nu. *Rules of Pente, Keryu-Pente and Ninuki-Renju*. URL. (Visited on 10/17/2018).