

The `calculateb` function in the `AI.py`'s job is to assess the desirability of a non-terminal chess board state. The function performs the following steps:

Initialize a variable value to zero. This will be used to tally the total evaluation score of the board.

Loop over every square on the chessboard (which is an 8×8 grid, making for 64 squares in total), examining each tile one by one.

For each tile, the function checks if there is a piece on that tile and identifies its type. Different types of pieces are assigned different numerical values, reflecting their importance and role in the game:

Pawns (P/p): Each white pawn on the board contributes -100 to the value, and each black pawn contributes +100. This suggests that pawns are considered the least valuable units, with a base value, and that the evaluation function is from the black perspective (hence, black pawns add to the value while white pawns subtract from it).

Knights (N/n) and Bishops (B/b): Each white knight or bishop decreases the value by 350, and each black knight or bishop increases it by 350. Knights and bishops are of equal value, which is why they contribute the same amount to the evaluation. This also places them above pawns in terms of their value to the overall board state.

Rooks (R/r): Each white rook subtracts 525 from the value, while each black rook adds 525.

Queens (Q/q): Each white queen subtracts 1000 from the value, and each black queen adds 1000.

Kings (K/k): Each white king decreases the value by 10000, and each black king increases it by 10000. While the king's value in gameplay is not typically quantified since its capture equates to a loss, this large number in the evaluation function likely serves to ensure that checkmates and checks against the king are heavily prioritized in the AI's decision-making.

After assessing all the pieces on the board, the function returns the final value, which represents the material balance from black's perspective. A positive score suggests an advantage for blacks, and a negative score suggests an advantage for whites.

The evaluation function is simplistic and solely considers the material value of the pieces on the board. It does not take into account strategic elements such as piece mobility, control of key squares (like the centre), pawn structure (such as doubled pawns or passed pawns), the safety of the king, or other tactical themes such as pins, forks, and skewers.

In more advanced chess AI (which will be implemented in Q2.2), the evaluation function might also consider the phase of the game (opening, middle, endgame) because the value and role of pieces can change as the game progresses. For instance, kings become more active in the endgame, and the presence of opposite-coloured bishops greatly increases the chances of a draw.