Math\Model Notation
for Prediction of Chess Endgame

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Abstract

A quick definition of terms used for our final project. This will help when we write our final report and will make sure we can communicate easily.

1 Chess Board Positions

Let the following notation describe the space of a Chess board,

$$
\begin{aligned}
\text{File} &\in [a, b, c, d, e, f, g, h] \\
&\in [1, 2, 3, 4, 5, 6, 7, 8] \\
\text{Rank} &\in [1, 2, 3, 4, 5, 6, 7, 8]
\end{aligned}
\tag{1}
$$

2 Game Pieces

Let the three game pieces be defined as $Piece_i$, where $i = [1, 2, 3]$ represents the piece index,

$$
\begin{aligned}
Piece &\in [W_k, W_r, B_k] \\
W_k &= \text{White King} \\
W_r &= \text{White Rook} \\
B_k &= \text{Black King}
\end{aligned}
\tag{2}
$$

3 Class Labels

Class labels are defined as the remaining moves till checkmate of B_k. Note, checkmate of B_k is called on the mth move of B_k.

$$
\begin{aligned}
Class &\in [draw, 0, 1, 2, 3, 4, \dots, m] \\
&\in [-1, 0, 1, 2, 3, 4, \dots, m]
\end{aligned}
$$

4 Instance of a Game

Let a instance of a game be defined as $Game_k$ where $k = [1, 2, 3, \dots]$ is the game index,

$$
\begin{aligned}
Game_k &= [Piece_i \{file, rank\}, Class] \\
&= [\{2, 1\}, \{7, 9\}, \{6, 3\}, 8] \\
&= [W_k \{2, 1\}, W_r \{7, 9\}, B_k \{6, 3\}, 8] \\
&= [W_k \{b, 1\}, W_r \{g, 9\}, B_k \{f, 3\}, 8]
\end{aligned}
$$

5 Parameters

Several parameter functions are used to classify or achieve an objective function, these parameter functions are labeled as $\boldsymbol{\Phi}\left(\mathbf{x}\right)_{j}$. Where, $j = \{1, 2, 3, 4, \dots\}$ is a index for the parameter function and $\mathbf{x}$ could be any parameter used in the function.