

CHAPTER 4

ANALYSIS AND DESIGN

4.1 Analysis

The goal of the project is to create an Othello game. In general, the game requires input from both players. The program is created as a sparring partner, thus artificial intelligence is needed. Artificial intelligence needs to make a decision in the form of the coordinate of the next move. All possibilities are evaluated and artificial intelligence will search for game state with a maximum evaluated score.

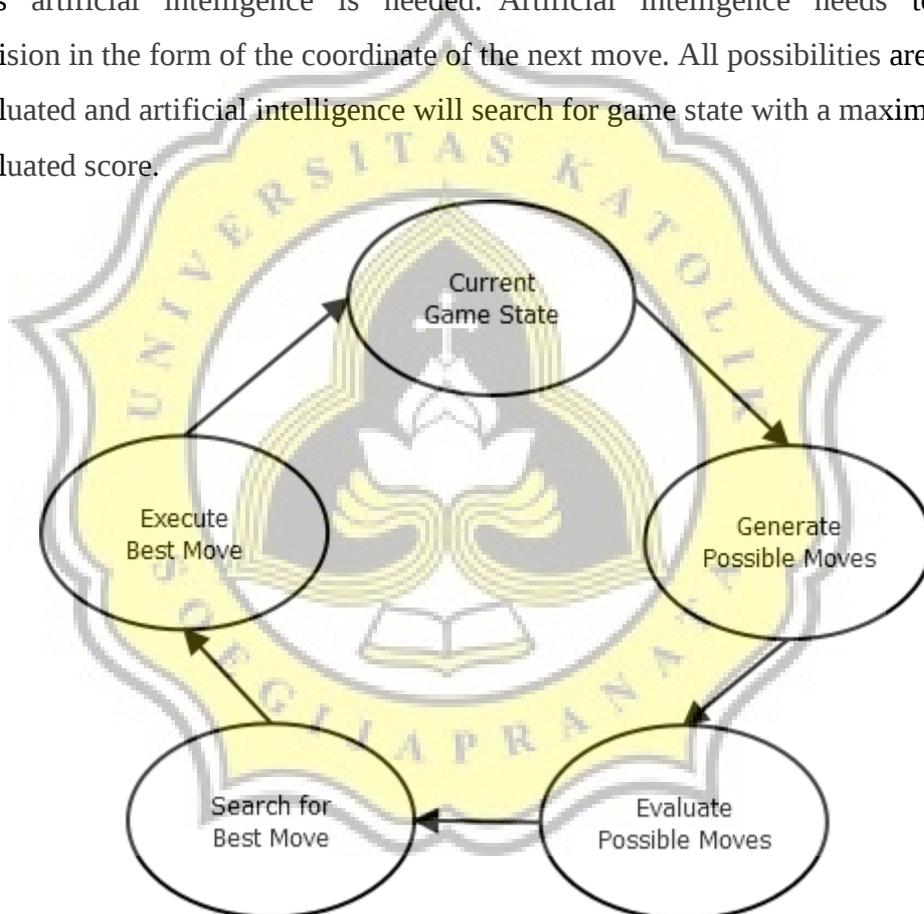


Illustration 4.1: Best Move Search Process Diagram

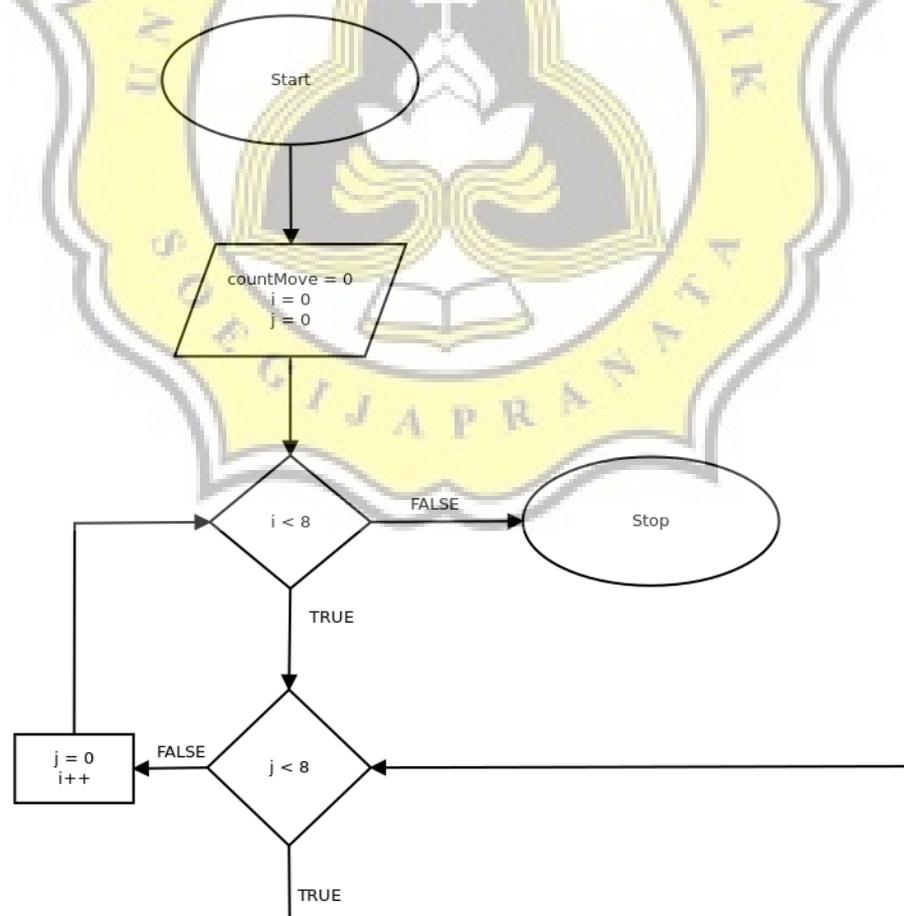
4.2 Design

The artificial intelligence needs to be able to generate all possible moves and furthermore evaluates and change them into numbers. All of the possible

game states are stored in tree data structure. Negascout is used to search for game state with a maximum evaluated value. Hence, there are three process designs; moves generation process, game state evaluation process, and Negascout search process.

4.2.1 Moves Generation Process

Moves generation process is used to generate the possible game states. Basically, artificial intelligence looks for opponent's discs and send the surrounding squares to a validation method. Afterwards, the validation method will decide if the moves are valid moves or not. Then, the valid moves will be stored in an array.



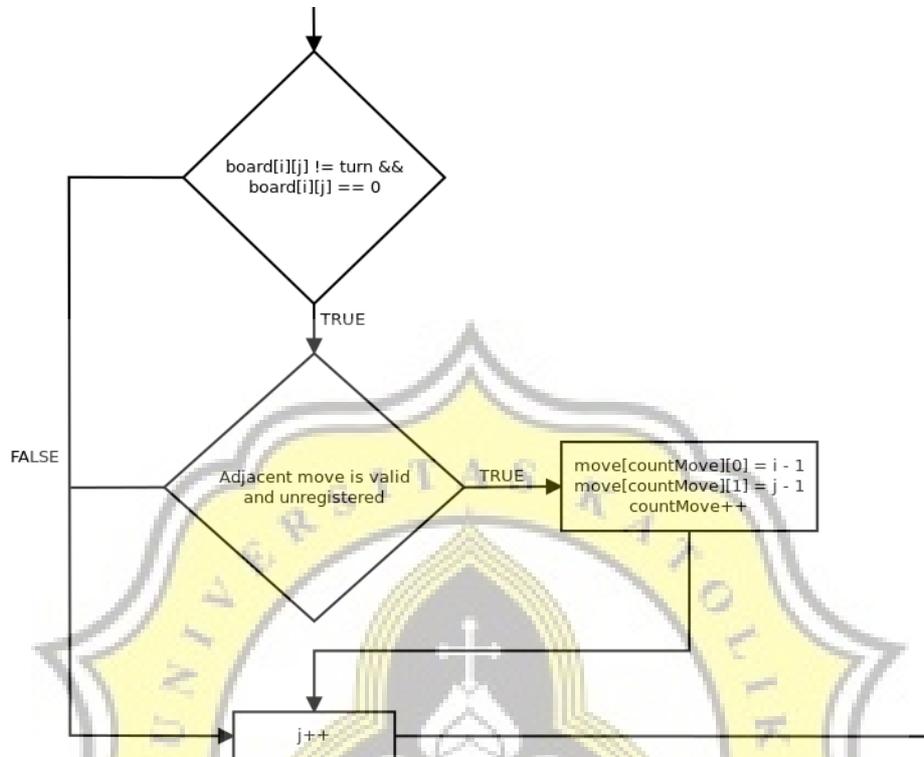


Illustration 4.2: Moves Generation Flowchart

4.2.2 Game State Evaluation Process

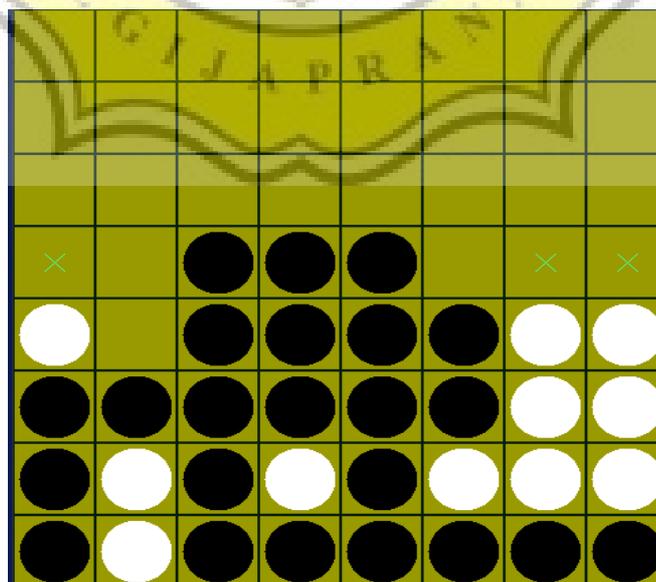


Illustration 4.3: Board State Example

Game state evaluation evaluates the current game state. For example, the current game stage is as described by the image above. The evaluation method requires game state which includes opponent last move, current game stage, etc. The evaluation will yield the result :

Table 4.1: Evaluation result table

Factor	Value	Explanation
Mobility	3	There are 3 possible moves.
Stability	9	There are 9 stable discs. 7 in the bottom row and 2 in the leftmost column.
Weight	-6	Opponent's last move in coordinate (4,7). The square weight is -6.
Control	-12	Black has 23 discs and white has 11 discs. Because in the early game it is better to minimize discs amount, control value is -(12).

4.2.3 Negascout Search Process

Searching process using Negascout algorithm consists of two parts, visiting nodes and comparing evaluation value. Using tree data structure, Negascout will visit the leaf node (node with no child), compare the evaluation value with its sibling, and set the best value for the parent node.

Negascout function is a recursive function. Recursive function is used to easily traverse each node in tree data structure. The function will save a temporary node with maximum evaluated value. Afterwards, artificial intelligence will make a decision with the Negascout search result.