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Comparison of Simple Hill Climbing Algorithm and Stepest Ascent Hill Climbing Algorithm in The Game Order of Numbers

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Abstract

The arrangement of a series of numbers is a game that is in great demand by various groups, this game is very useful for all circles because this game requires concentration and sharpening the brain power of the player, if this game follows the existing rules it will produce output in the form of a solution. Arrangement of numerical series is an implementation of the Searching method. The process of compiling a series of numbers has strong rules in order to obtain a solution. Problems In this study, we are looking for a comparison between the Simple Hill Climbing Algorithm and the Ascent Hill Climbing Algorithm which method is the fastest to find a solution. The final result of this research is an arrangement of numbers that is in accordance with the sequence by looking at the time and memory used to obtain the final solution.The final result of this study concluded that the Ascent Hill Climbing Algorithm is easier and faster to find a solution compared to the Simple Hill Climbing Algorithm

Keywords; *Searching, Simple Hill Climbing Algorithm, Ascent Hill Climbing Algorithm, Number Series*

1. Introduction

Artificial Intelligence is one of the computer sciences to make a computer machine able to do work like humans do. At first computers were used for calculating tools but with the development of the times and the development of computer technology, it can be used to help humans, making it easier and easier to complete human work [1]. The benefit of this heuristic is that it can solve problems selectively so that the final goal result is the most likely [2]. In some case examples, there are several solutions to the problem. This game can be solved with various algorithms, including: Brute Force Algorithm, Greedy, Depth First Search, Breadth First Search, Hill Climbing, and A*. [3]. According to Exposure [4] To solve problems in a searching algorithm, there are 4 things that must be considered including:

a) Make a precise and clear definition
b) Analyzing the form of the problem
c) Able to present problems using the concept of knowledge)
d) Selecting problem solving techniques using the best techniques

There are two slightly different types of Hill Climbing, namely Simple Hill Climbing and Steepest-Ascent Hill Climbing[5]. Search for Hill Climbing. Hill Climbing is the process of testing a problem by applying a heuristic function. Where in the generation of the state of the problem is very dependent on the results of the test procedure. The test that comes from the application of this heuristic function will show how well the guess value is taken against other conditions that may be used as a decision. The Hill Climbing method looks for steps that aim to reduce costs to get to the goal / decision, by always choosing the smallest heuristic value [6].The algorithm for SimpleHill Climbing Search is as follows[7]:

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a) Initial state evaluation, If this state is a goal state, then return this state as a solution and exit the program. If this state is not a goal state, continue the process with the initial state as the current state.
b) Repeat until a solution is found or until no new operator (production rule) can be applied to the current state:
    1. Select an operator that has not been applied to the current state and apply the operator to produce a new state.
    2. Evaluation of new state.
        a. If this state is a goal state, then return this state as a solution and exit the program.
        b. If this state is not a goal state but better than the current state, then make this state the current state.
        c. If this state is not better than the current state, return to step 2a.

Simple Hill Climbing, in simple terms, directly selects a new state that hasa path that is better ("steep") than the previous paths without taking into account other paths that are more "steep". While Steepest Ascent Hill Climbing, as the name implies, will evaluate all states that are under the current state and choose the state with the most "steep" path.The simple hill climbing method is used for heuristic functions that are good in evaluating state. To solve the shortest distance problem, we can represent the existing problem into a graph structure, where the point represents the city and the side represents the path that connects the two cities. Each side is given a weight that states the distance between the two cities [8]. Simple hill climbing method[9] :

a) The algorithm will stop if it reaches the local maximum value, i.e. the mention of the current trajectory is the shortest path to be traversed, but it is not certain that this trajectory is used as a destination because other path opportunities have not been allocated.
b) Sort the use of the position used to make the exchange so that it can have an effect on determining the next position.

The steps in the calculation of SAHC (Steepest Ascent Hill Climbing) are: (1) counting the squares that occupy the correct place, (2) calculating the possible movements. (3) get the value of h(n) using manual calculations using the sum of squares that occupy the correct place, (4) compare the heuristic values of the possible movements, (5) apply the search path of the SAHC (Steepest Ascent Hill Climbing) algorithm with the heuristic value of h (n) which has been obtained [9] The steepest ascent hill climbing method is an algorithm method that is widely used for optimization problems. One application is to find the shortest route by maximizing or minimizing the value of the existing optimization function [10] [11].

2. Research Methodology

The method used in this research is a case study so that the steps taken in this research are to find, collect, study and analyze all the data obtained. The process of completing this research include:

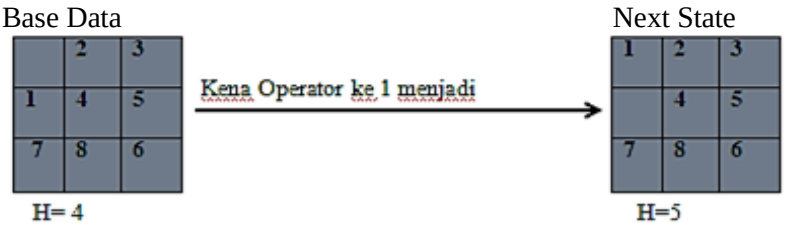
a) Identify search-related problems;
b) Analyzing the problems found in the research;
c) Collecting data, books and journals related to Simple Hill Climbing and Ascent Hill Climbing;
d) Analyze data using Simple Hill Climbing and Ascent Hill Climbing algorithms
e) Process Algorithm;
f) Final Solution.

3. Results and Discussion

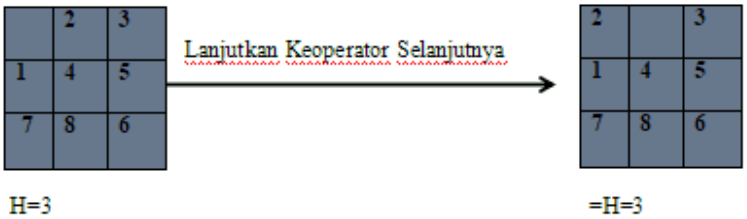
3.1. Simple Hill Climbing Algorithm

State Space Completion Form
Example: x= row = [1.2.3] y = Column = [1.2.3]
Thus, suppose the state space = all possible positions of the city in puzzle 8 We enter the puzzle position on lift 7 which is in the initial state with position The rules that must be followed include:
The initial box position is empty(x,y)
x= Rows of boxes that are still empty
y= Column box that is still empty

a) The basic rule that must be done is to move the empty box to the top of the puzzle where if x>1 then (x-1,y)
b) The basic rule that must be done is to move the empty box down Puzzle if x<3 then (x+1,y)
c) The basic rule that must be done is to move the empty box to the right. Puzzle if x<3 then (x,y+1)
d) The basic rule that must be done is to move the empty box to the left. Puzzle if x>1 then (x,y-1).

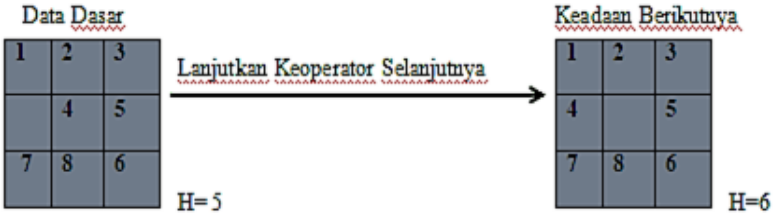


After being processed, the correct position is the current state < The correct position is the next state, then: Current state = Next state
Check Current Condition = Goal

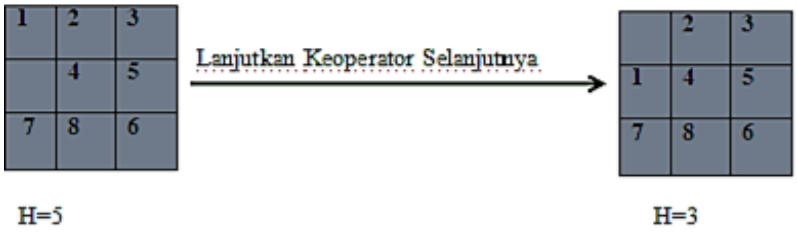


After processing the correct position, the current state > the correct position, the next state then: the current state = Fixed

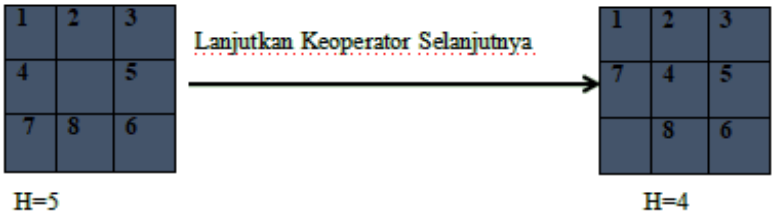
Check Current Condition= Goal
Continue to Next operator



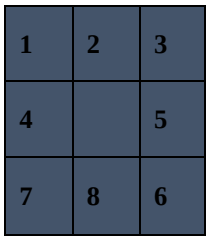
After being processed, the correct position is the current state < The correct position is the next state, then: Current state = Next state



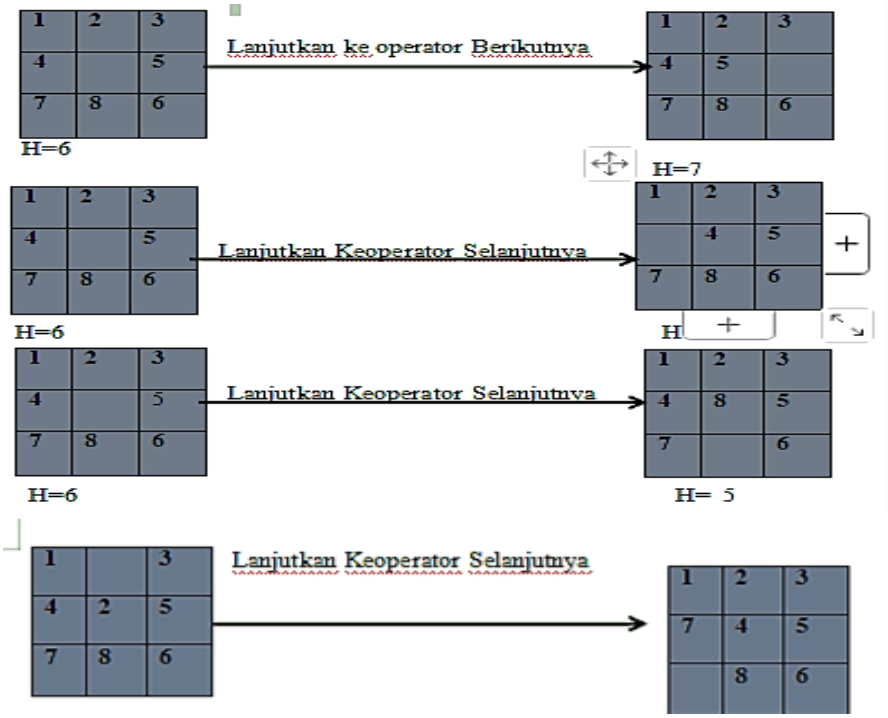
After processing the correct position, the current state > the correct position, the next state then: the current state = Fixed
Check= Current Situation = Goal
Continue to Next operator



After processing the correct position, the current state > the correct position, the next state then: the current state = Fixed



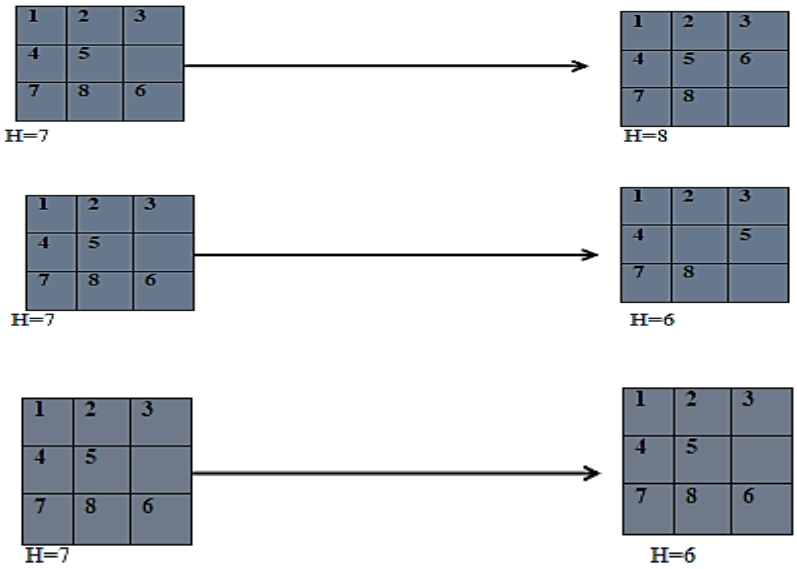
Check = Current Status = Goal



From the picture above, all the rule processes are carried out by shifting numbers using 4 sliding rules to the left, sliding to the right, sliding up and sliding down. Next steps
Check= Current Situation = Goal
Continue to Next operator

1	2	3
4	5	
7	8	6

After being processed, the correct position is the current state < The correct position is the next state, then: Current state = Next state



out by shifting numbers using 3 sliding rules to the left, sliding up and sliding down. Next steps
Check= Current Situation = Goal
Continue to Next operator

1	2	3
4	5	6
7	8	

H=8
Check Current Status = Goal, stop Search

1	2	3
4	5	6
7	8	

Solution found

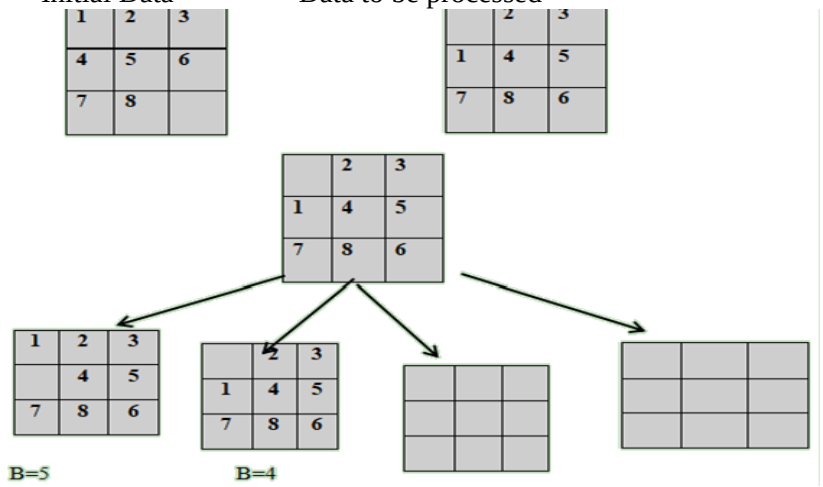
3.2. Stepest Ascent Hill Climbing Algorithm

State Space Completion Form
Example: x= row =[1.2.3] y = Column = [1.2.3]

Thus, suppose the state space = all possible positions of the city in puzzle 8 We enter the puzzle position on lift 7 which is in the initial state with position 3.1
The rules that must be followed include:
The initial box position is empty(x,y)
x= Rows of boxes that are still empty
y= Column box that is still empty

a) The basic rule that must be done is to move the empty box to the top of the puzzle where if x>1 then (x-1,y)
b) The basic rule that must be done is to move the empty box down Puzzle if x<3 then (x+1,y)
c) The basic rule that must be done is to move the empty box to the right Puzzle if x<3 then (x,y+1)
d) The basic rule that must be done is to move the empty box to the left. Puzzle if x>1 then (x,y-1)

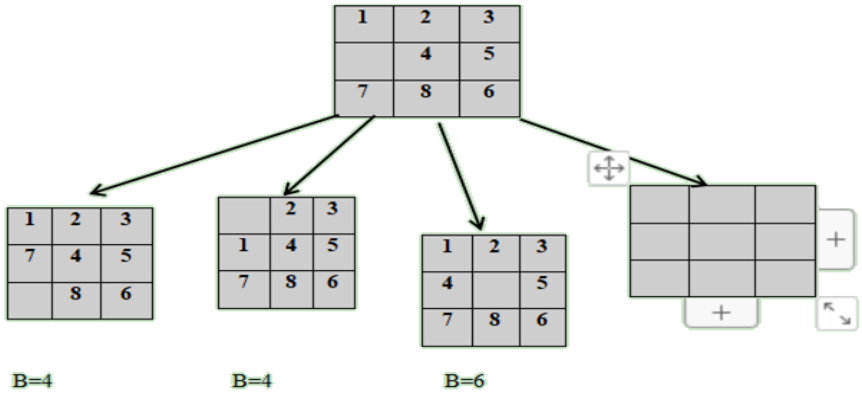
Initial Data Data to be processed



Results After doing Process

1	2	3
	4	5
7	8	6

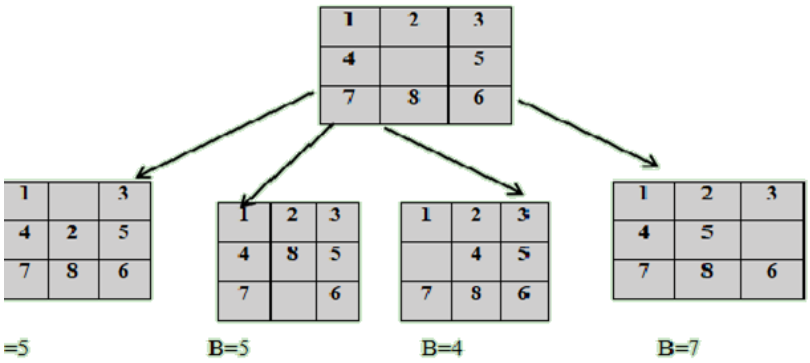
Check Initial State = Goal
Current State = Initial State



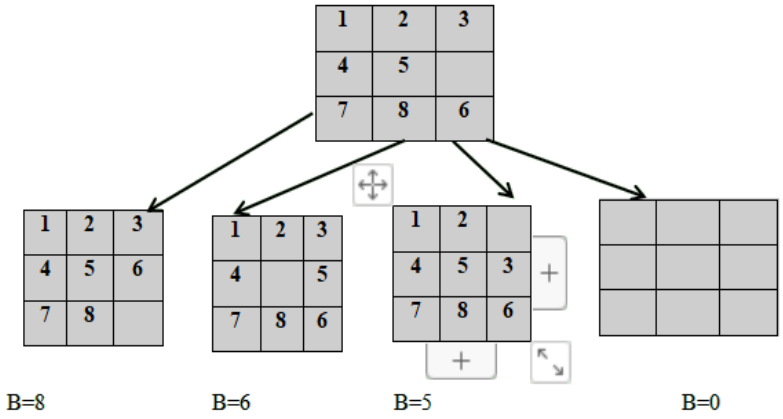
Results After doing Process

1	2	3
4		5
7	8	6

Check Initial State = Goal
Current State = Initial State



Check Initial State = Goal
Current State = Initial State



Check initial state = Goal, Stop Search Process

1	2	3
4	5	6
7	8	

After testing the 2 Simple Hill Climbing and Ascent Hill Climbing algorithms, it is concluded that the Ascent Hill Climbing Algorithm finds a solution faster because it takes less time to find a solution using a few processes. While the Simple Hill Climbing Algorithm takes a long time to obtain the Final Solution in the preparation of a Number Series.

4. Conclusion

Based on the research results that have been obtained, the use of the simple hill climbing algorithm and the Ascent hill climbing algorithm must follow the established rules. The rules set there are 4 parts, namely shift the position of the box to the right, shift the position of the box to the left, slide the position of the box up and slide the position of

the box down. Using the Simple hill climbing method, it takes a long time because it has to be processed one by one. If you don't find the correct position which is smaller than the initial state, you return to the initial state, while the Ascent Hill Climbing Algorithm method is processed directly by looking at the most correct positions. so quickly find a solution. The Simple Hill Climbing search process is difficult to find the correct position because the system used must be larger, correct with the current situation, if it does not return to the initial position. Meanwhile, the Ascent hill climbing algorithm is easy to find a solution because the work process can be seen directly so that it quickly finds a solution and saves processing time and requires small memory in storage.

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