IMPLEMENTATION OF SIMPLE ALGORITHM HIERARCHICAL ORDER PLANNER GAME STRATEGY FOR RESOURCE MANAGEMENT AND FORCES

Muhamad Septiana

Informatics Engineering. UNIKOM
Jl. Dipatiukur No.114-116, Bandung 40132
E-mai : muhamadseptiana@gmail.com

ABSTRACT

Game is one of the results created from any programming language. In the game there are a lot of elements includes gameplay, story, graphics, and rules that are inside. Game may also have Artificial Intelligence to interact with the players so the players though - will be dealing with other real players. Game has a complex region, for it takes the algorithm to undergo various computing processes in the game. Based on the results of previous studies based strategy game. But after doing experiments on the game has a problem when dealing with an aggressive player so that the processing efficiency of resources is less than 50%. For it in terms of algorithms to process the good management of the resources needed in the game. One alternative is simple hierarchical algorithm planner ordered planted in the game to handle the management of resources and troops.

This study focused on how the AI works in an environment that this algorithm will be planted in an environment that is almost similar to the actual approach. The study examines various aspects of the game strategy itself. Organize workers, the troops, the production resources for other purposes.

Based on the results of testing algorithms have been studied have achieved the goal of getting the value of the ratio of the efficiency with which the algorithm could generate value ratio of 80% in-game strategy for the management of resources and forces..

Keywords **:** *Games, Artificial Intelligence, algorithms, resource management, strategy.*

1. INTRODUCTION

1.1 Background

Game Strategy is a model of the interaction of every player who chose action or did not choose the action and informed to other players of a command player action. Players can leave act simultaneously or alternately. Game strategy requires anyone involved in an event, what they can do, and the possible end result that comes out of their experience. The mechanism of such a strategy game players choose several options for action that can generate possibilities and then responded to other players to interact from the possibility of a player who has taken the appropriate action sets a specific time event. The need to take advantage of AI (Artifical Intelligent) more handles problem solving in complex computing. AI capabilities in finding solutions quickly and does not require a lot of power into a needed, especially in the game. AI capabilities depend on the algorithm applied to its Source Code. Based on the "Efficient Resource Management in StarCraft: Brood War" game algorithm using greedy algorithm. Based on the already quick reference greedy algorithm but has drawbacks. Where is the weakness of the algorithm is still less provide solutions in terms of utilizing the resources possible efficiency se. So that the opponent can exploit the AI capabilities like rush. According to Indonesian dictionary efficiency is run the task properly and appropriately. Thus here is how the efficiency of the algorithm's ability to handle the precision of the resources that go with the right resources expended in accordance with the needs.Based on the results of other algorithms, the solution offered in regulating the management of resources and forces there are several algorithms that have methods that can be applied to one of them is Planning.HTN Planning HTN algorithm called Hierarchical Task Network Planning is an algorithm that is used to handle the selection of action on an issue so that a perpetrator of the agent in question can do its job by choosing the optimal action. Similar observations using HTN planning is the analysis of turn-base strategy game in the game Call to Power II by Antonio and his friends, in the form of similar games civilization. This study uses adaptation algorithm and ontology retrieval plan is scheduling the task - a task that is planted on the AI for the computer to do the movements according to plan in certain conditions.This

algorithm is intended to allow the computer to adapt to the situation by using scheduled opponent in performing tasks and appropriate action game era. Problems in these studies is a greedy algorithm still have difficulty in choosing an action when responding to the aggressive movement of players for the management of resources and troops.The purpose of the movement of an aggressive player is a player who quickly build troops to attack early so the computer is not ready forces to survive. Based on the results of existing algorithms, namely whether there is a problem HTN Planning algorithms can provide good results in the management of resources and troops efficiently. HTN Planning algorithm is one part of the Automated Planning. HTN Planning algorithm is a scheduling algorithm for the purpose tertentu.Algoritma HTN Planning has plenty of its kind in this study are taken one algorithm SHOP (Simple Hierachical Ordered Planner). SHOP algorithm selected for by Dana Nau because SHOP is an algorithm development of HTN Planner efficiency and performance in the execution of the task faster than a blackbox testing and TLPlan. Based on the problem, then the solution given that the implementation of algorithms Simple Hierarchical Ordered Planner on game strategy for the management of resources and troops. Algorithm SHOP (Simple Hierachical Ordered Planner) is a process planning algorithm where the algorithm is running a process - a process which has the task tersekuensial - another task in the procedure that will be run as needed. According to Dana Naus, this algorithm can be used to run the process logic, complex computer calculations, and call external functions. Expectations from this study in order to get results if the algorithm is able to perform his duties SHOP resource management and efficiency se forces as possible. The rest in the management of resources and forces to be developed further with a method ketahap another algorithm that can improve the ability of a computer to regulate the movement of resources and more balanced forces in the set so that the computer can respond faster movement of players.

1.2 Research Objectives

Test SHOP algorithms can be applied to game strategies for resource management and pasukan.Mengetahui how much value the efficiency of algorithms Simple Hierarchical Ordered Planner organize incoming resources and resources that come out in response to the action of the players in the game manajamen strategy for resources and forces.

1.3 Data Envelopment Analysis

Data Envelopment Analysis (DEA) is a service management and benchmarking techniques originally developed by Charnes, Cooper and Rhodes (1978) to evaluate the non-profit and public sector organizations. DEA has been proven to find ways to improve services not seen with other techniques. But there are anomalies surrounding this development methodology. One of the largest US banks are located more than $ 100 million annual excess personnel and operating costs, enough to affect their earnings per share and these savings can not be identified by other techniques used. While other banks also recognize the benefits of improved through initiatives driven by the DEA, can not find more than 10 banks in this regard. While businesses have an obligation to report their internal methods, DEA has not been widely adopted by banks. DEA, a method that can generate new pathways for increased profits are not used when other less powerful techniques continue to be used. DEA comparing the services unit consider all the reso*urces used and services provided, and to identify the most efficient units or units of best practices (branches, departments, individuals) and an efficiency unit where real efficiency improvements are possible. This is achieved by comparing the mix and volume of services and resources used by each unit compared with those of all the other units. In short, the DEA is very powerful benchmarking techniques. Efficiency is a value of the ratio of output to input. How much output per unit of input reflected how much efficiency in sync. The calculation of the efficiency of resource management efficiency using the calculation method Data Envelopment analys (DEA). Similarities in the calculation of the efficiency of resource management can be written as follows:*

$$1x\ 100\% \qquad (1)$$

1.4 Automated Planning

Planning is based on the book SHOP: Simple Hierarchical Ordered Planned is the thought of an action. Shaped abstract, explicit consideration of the process to select and set the action to anticipate results in the suspect. Objective consideration to obtaining the best possible purpose. Automated planning is in the

region Artifcial Intelligence (AI) who studied the process of consideration in computing.
The concept of a model describing the main elements of the problem. It can be broken down significantly with computational approaches and algorithm approach to solve the problem. However, it is very useful to explain basic concepts to clarify the boundaries assumption in analyzing the needs of representation and the exchange rate to improve the property semantics. Since planning focuses on the selection and set the action in a turn of the state system, a concept model for planning requires a general model for dynamic systems. Most approach to planning for the book using state mode - transition system formally as follows:

S = $\{s_1,s_2, \ldots\}$ is finite or recursively denumerable set of state
A=$\{a_1,a_2, \ldots\}$ is finite or recursively denumerable set of action
E=$\{e_1,e_1, \ldots\}$ is finite or recursively denumerable set of events
Y : S x A x E ->2^S is a function of a state of transition

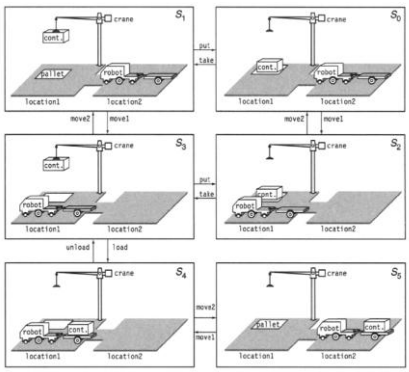


Figure 1. 1 Transition State

1.5 *Hierarchical Task Network Planning*

Hierarchical Task Network Planning by the book SHOP: Simple Hierarchical Order Planner as classical planning that at each represent their state from the set of atoms, and each action to adjust deterministic state transition. However, different from classical HTN planners planners what they are planning purposes and circumstances of their merencakannya.
In HTN planners, an outline is not to get the result of the goal but to carry out any task his collection. Data input to the planning system uses a similar operator degnan classical planning and also every set of its methods break down each task into subtasks her. Planning process by breaking down non-primitive task recursively into smaller sections task. Each method is part of the specification branch function.
HTN planning more widely used for the practical application of the other planning in the book SHOP: Simple Hierarchical Ordered Planner. That is because the method provides an easy way to write the "recipe" solving problems adjusting how humans work on solving problems planning. Here is an example of the application of HTN planners as follows:

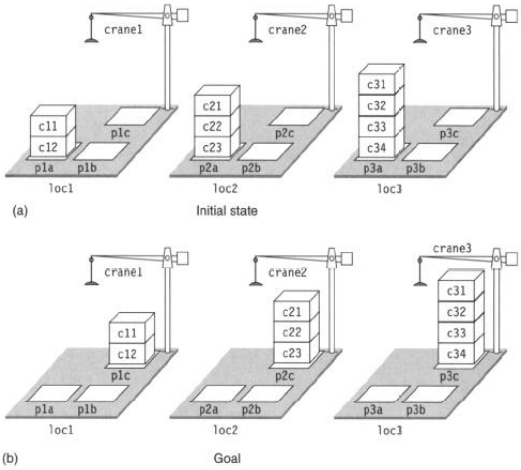


Figure 1. 2 Figure DWR problem with HTN Planner

1.6 *SHOP Algorithm*

Based on the book SHOP SHOP: Simple Hierarchical Order Planner, Dana Nau is planning algorithm interconnected multilevel complete and opposite each other in every area of his task. task that contains tasks - tasks in the same order will be on the run. SHOP by Dana Nau has an advantage in the knowledge base. Like, SHOP can perform complex computational logic.
SHOP (Simple Hierarchical Order Planner) has regions that generalization of scheduling techniques used in some special area system. SHOP algorithms including HTN (Hierarchical Task Network), but little berbda of HTN. This algorithm makes a schedule with mengdekomposisi recursively from the task becomes part of the task - a small task or sub-task. SHOP idea of how the work as follows:

```
procedure SHOP (S, T, D)
1.  if T = nil then return nil endif
2.  t = the first task in T
3.  U = the remaining tasks in T
4.  if t is primitive (i.e., there is an operator for t) then
5.      nondeterministically choose an operator o for t
6.      P = SHOP (o(S), U, D)
7.      if P = FAIL then return FAIL endif
8.      return cons(p, P)
9.  else if there is a method applicable to t whose
        preconditions can all be inferred from S then
10.     nondeterministically let m be such a method
11.     return SHOP(S, append(m(t,S), U), D)
12. else
13.     return FAIL
14. endif
end SHOP
```

Figure 1. 3 SHOP Algorithm

2. Content Research

Based on the many solutions planning algorithm that may be applied in the management of resources and forces in a strategy game. In accordance with the problem of the background issues of efficiency in resource management. Efficiency in the management of its resources are lacking. So many resources unused.
The solutions offered to answer it with Simple algorithm implementation Hiearchical Ordered Planner on game strategy for the management of resources and troops. The algorithm will handle the management of resources with efficiency se may be so that no unused resources are wasted.

2.1 Efficiency analysis

In the game environment that will be built in order to implement the algorithm SHOP required elements in such a strategy game, the resources used any, what is involved in building the game, what forces are involved in winning the game. For that created the table description What resources, building anything, and any forces that would terliba in the management of resources and forces as follows:

Table 1. Table Resource

Name Resources	Definition
Gold	The main resource used for many purposes wages
Food	Resources used for things relating to troops and workers
Wood	Resources used for building things and building defenses
Worker	Resources used to produce timber and food
Forces	Resources forces to attack the city

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