Available online at www.sciencedirect.com

ScienceDirect

IERI Procedia 10 (2014) 203 – 208

Procedia IERI

www.elsevier.com/locate/procedia

2014 International Conference on Future Information Engineering

Dynamic Multi-Branch Operational Plan's Modeling Based on Meta-Actions

Pinggang Yu, Zhanguang Cao

National Defense University, Beijing 100091, China

Abstract

Dynamic multi-branch operation plan's modeling（DMBPM） is the basic of operational plan simulation and evaluation by computer. By the way of decomposing the operational plan step by step, we can representing the dynamic multi-branch operational plan as "meta-actions" and their relationships. This method provides a way to deal with operational plan's dynamic adjusting additional with their simulation and evaluation. So, commander can make decision quickly based on the computer's aiding.

Keyword: dynamic, multi-branch, operational plan's modeling

1. Introduction

Operation plan's simulation is a method to evaluate plan's availability and advantage by using computer's simulation technology. From then on , Commander can make a scientific decision by the aid of operation plan's simulation.

The traditional operation plan's modeling methods, such as CPR(Core Plan Representation)[1,2], SPAR(Shared Planning and Activity Representation)[3,4], sysML[5] and so on, mostly based on static and supposition beforehand, have some characters like the simulated entities coupled closely with computing resource, can't adjust with dynamic situation, usually simulating as a series mode[6]. In fact, these methods essentially divide an operational plan into several different static plans, then simulate one by one serially. This meaning of simulation has poor efficiency, can't compare multi-branches simulation result real-time, so can't fulfill the need of quickly decision aid with closing real dynamic operation.

doi:10.1016/j.ieri.2014.09.078

Dynamic multi-branch operation plan's modeling method takes the quickly modeling of dynamic multi-branch operation plan into reality. It can support multi-branch operation plan's quickly and dynamically exercise, result comparing real-time and the technology aid to commanders. Practice testifies that dynamic multi-branch operation plan's modeling method has efficiency preferable.

2. Operation plan's modeling method based on meta-actions

Any operation plan, neither multi-services joint operation nor coordinated operation, both can be looked as an actions aggregation composed with some independently, inseparably actions which arranged by an order relatively based on the constraint of time, space and resource. This phenomenon provides an approach of operation plan's modeling method based on meta-actions.

2.1. Operation plan's description

Any operation plan complicated can be divided into some action branches possibly according to operation plan's time-relationship and the law of causation. Every action branch also can be seen as composed by independently "meta-action" with some serial order. Meta-action has characters of independent each other, inseparably. Then, the operation plan can be formalized as:

$$L=\{A_i\}\ \mathrm{i}>1,\ i\in N \tag{1}$$

Here, L is an action branch, Ai is a "meta-action", and $0 < i \in N$. That's mean, any action branch can be described as an aggregation of meta-actions with the relationship of time-relationship and the law of causation.

2.2. The operational meta-action's description

Any operation meta-action A can be formed by parameters as follow: operation name A_N, the relatively service A_M, currently state A_S, performable ability A_P, pre-condition P_C, end-condition E_C, current action's completion A_Q, next action N_A, decision point sign D_P, then

$$A=\{A_N,\ A_M,\ A_S,\ A_P,\ P_C,\ E_C,\ A_Q,\ N_A,\ D_P\} \tag{2}$$

2.3. The operational plan's branch description

Operational plan's branch mainly concludes: the branch's name LN, that's the only signal of each operational plan's branch; branch's station LS, that's denote the branch's running station, such as the currently simulated action, simulation time-lasting and so on; branch's operation meta-actions' aggregation LA, that's meaning the aggregation which composes the operational plan's branch; end-condition EC, that concludes condition of strength, enemy's situation, time, location space, supply, and so on. Branch's performing probability LP, that's describe the probable of the branch's execution, at the same time, the summation of all the branch's probability should be 1; branch's completion LQ, that's express the degree of the branch's performing; branch's priority LO, that shows the priority order of the distribution of simulation's resource. Such as follow:

$$L=\{L_N,\ L_S,\ L_A,\ L_E,\ L_P,\ L_Q,\ L_O\} \tag{3}$$

2.4. The decision point description

A operational plan maybe have many decision point. If not decision point at all, then the operational plan is a one branch plan. Only operational plan which has more than one decision point is multi-branches