Command Control Activity Simulation Research based on "Control Power Degree"

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Abstract: In many situations control power is not absolute sometimes, especially modern war even though the ascendant part can hardly capture the whole battlefield control power. Therefore, we introduced the concept of “control power degree”, which is regarded a measurable indicator of command control activity simulation, being used for reflecting the contest of both side military strength, command confrontation and decision-making. The concept of “control power degree” merged the “situation” and “power” together in command control, which used the methods of qualitative simulation and intelligent agent simulation, making personnel analyzes the overall situation and method of operation furthermore, recognizing the organization of forces action and conversion of battle efficiency. Command control activity simulation based on “control power degree” is a positive exploration and beneficial attempt on analyzing fighting capability exactly.

1. Introduction

Simulation experiment is an effective means of researching command control activity in the modern situation. From the view of actual use, it can be used for analysis, experiment and evaluation for operational command and coordination control. Command control activity simulation mostly can realize the goal of analyzing or verifying the command control activity through constructing suppositional operational environment. At the same time it can explore the method and track through analyzing the subjective and objective elements that affect command control activity.

2. Ingenerate Operation Mechanism of Control Power Degree

2.1. Connotation of Control Power degree.

At present the definition of “control power degree” hasn’t be explicit yet, so the apprehension of this definition is on the basis of battlefield control power, control degree and so on. The concept of “control power degree” can be interpreted as commanders take the degree of capturing the battlefield initiative as the experimental index through conducting the troops, and grasping battlefield situation on the basis of fight goal in the process of battle experiment implement. This concept is not really rigid, its major idea is that putting the research core of command control activity simulation on winning and holding the battlefield initiative by means of conducting the troops operation and changing the tactics and methods. The purpose of establishing the index “control power degree” is that commanders can grasp the battlefield situation at any moment in the simulation experiment, can forecast the battlefield situation trench scientifically, can supervise and coordinate military strength actions in the round, can grasp the fight core firmly and correct the deviation, can keep the join forces of military strength, and can achieve the battle aim at the least expense.

2.2. Mutual Effect Factors of Control Power Degree.

The mutual effect mechanism of “control power degree” in the command control activity reflected in four aspects. Firstly, battlefield situation changed between “be beneficial to self” and “go against self” dynamically. Secondly, the seizure of battlefield control power is in line with the transformation of battle process, scale, and intensity. Thirdly, the battlefield information feedback is

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the main route of understanding “control power degree”. Fourthly, only playing a role in commanding efficiency can we magnify the “control power degree”. For example sea supremacy, within the limits of interspace concept, sea supremacy is often relative, obtaining a certain degree sea supremacy means getting command of specific sea battlefield range. Within the limits of time concept, sea supremacy is also relative, once obtaining the sea supremacy, must maintain it persistently. From the view of controlling military strength, sea supremacy is also relative, the relative powerful part can scrabble for sea supremacy with another stronger part. The relativity of control power shows that the seizure of control power needs the control of military strength as a support.

Command control activity simulation based on “control power degree” could come true by interactional two parts of “void” and “solid”. The content of “void” is that controlling and grappling “state” of battlefield situation, namely battlefield situation control. The content of “solid” is that coordinating and conducting “power” of troop actions, namely military strength operation control. The simulation comes true by the combination and reciprocity of “state” and “power”. The object of “state” faced is battlefield situation and position, it means commanders apprehend and hold the overall condition, and the object of “power” faced is the troop, it shows commanders can coordinate and conduct the operations. The control of “state” rests with seeking and creating situation, and the conduct of “power” rests with coordination and organization. The control of “state” must stay on the conduct of “power” in the final analysis, and that the conduct of “power” is for seeking and creating the “state” of “be benefit for self and go against enemy”, both are impartible. The conduct of “power” is the basis of the control of battlefield situation, and the control of “state” is macroscopical direction of the operational conduct. In the process of battle simulation analysis, commanders must develop subjective ability for adjusting and conducting the troop’s operation well and truly from reality, striving for creating and shaping the battlefield situation of “be beneficial to self and go against enemy”, and then controlling the battle process, scale and intension effectively.

2.3. Application Representation of Control Power Degree.

In the simulated analysis, “control power degree” mainly reflected in macro-controlling battlefield situation and micro-controlling troop actions, the specific applications show that:

First, reflecting the dynamic nature of located battlefield circumstances. Generally speaking, command control activity is usually at the fight operation phase, it often can meet sharply dynamic change battlefield, and need deal with much emergency. “Control power degree” expressed that it need adjust self state according to different change conditions and circumstance, seize the opportunity for combat and capture the battlefield initiative in time.

Secondly, reflecting the instantaneity of required feedback communication. “Control power degree” is set up on basis of the instant feedback communication, its availability and reliability are the sticking point of coming true command control actions object. “Control power degree” reflects that commanders need to correct the plan for combat according as battlefield feedback condition, redeploy and adjust fight operation. If the feedback communication is not timely and exact, the command control actions will expose deviation even mistake.

Thirdly, reflecting the restrictive nature of used fight means. “Control power degree” is revolved around control purpose, included fight means used, attack aim insured, strike scale specified, battle time restricted. Modern war is affected by politics, economy and diplomatic very large, “control power degree” also shows that commanders need restrict and limit fight means according to battle purpose.

Fourthly, reflecting the perspective nature of control and adjustment. “Control power degree” can embody the growth and decline of command efficiency and the development trend of command competition process. “Control power degree” can also can embody that be with a view to current situation in the process of controlling, take a broad view to the war situation development, full preparation, gasp the opportunity for combat, create conditions for capturing the battlefield initiative.

3. Command Control Actions Simulation Experiment Design based on "Control Power Degree"

Former battle simulated entity mostly model the “power”, for the sake of analyzing how the battle command capability generate, it can put the “control power degree” as an important index here, to simulate and analyze the command control activity through combining “state” and “power”.

3.1. Constitute Elements of Simulated Experiment.

Command control actions simulation experiment design based on “Control power degree” mainly aims at interactional connection between battlefield situation control and troops operation conduct, namely the relationship between “state” and “Power”, analyze how the battlefield situation control change along with troops conduct. Thereby, the simulated experiment elements can divide two types: “state” factor and “power” factor. “State” factor is how to control for the battlefield situation change. The control of the “situation” should be changed as the questions varied, the most elementary aim is capturing battlefield advantage in the battle. “Power” factor is how to adjust for the military strength operation according to battlefield situation change in the experiment, finally achieved the aim of scrambling for control power. To be brief, it should shape battlefield advantageous “state” for seizing right of control, and that shaping battlefield advantageous “state” should control troops operation. For example, at the beginning of the war, both sides conducted drastic contention to revolve around marine blockade and counter blockade, landing and counter landing, make the sea supremacy conflict go into a rat race, at this time part A navy used several submarines at the controversial island around 200 sea mile for marine blockade aiming at capturing the sea supremacy firstly, and make the enemy navy totally drop out contending sea supremacy before long by means of sending several main warships to the bottom. This part captured and kept the sea supremacy consequently. But subsequently, part B had gain a victory of bombarding and sinking adverse warship, and compelled enemy’s fleet to shift out the attack radius of airplanes on shore for a time. At this time, the sea supremacy of part A faced rigorous challenge, and lost control for partial sea area, both sides had gone into repeating phase on capturing the sea supremacy. This example shows that the interactional relation in command control actions based on “Control power degree”.

3.2. Organization Flow of Simulated Experiment.

Command control actions simulation experiment design based on "Control power degree", the relation of "state" and “power” is a measurement instrument, it reflects the control degree for battlefield initiative, it is a contrast of degree about every part captures the control right. “Control power degree” is a abstract measurement index, it is hardly measured by percentage in the actual combat, but its variational characteristic about add and minus degree can be a analysis bridge for command control activity. "Control power degree" is usually a qualitative expression, shows the grade of capturing battlefield initiative. As a result of it is hardly establishing a precise quantitative relation in actual command about how much initiative be controlled, so we can analyze how the initiative changes as the troops operation control vary from the qualitative facet. "Control power degree" index shows that the bigger control right degree be captured, it illuminates that battlefield advantage is more leaning to self. Contrarily the smaller control right degree be captured, it illuminates that battlefield advantage is more leaning to enemy. If enhancing the “control power degree” through reinforcing the troops, it shows that capturing right of control be enhanced, it is the logic starting point of this simulated experiment.

Command control actions simulation experiment design based on "Control power degree" mainly surrounds fight aim to put up, its object is to make battlefield situation developing to the direction of be propitious to self and go against enemy, moreover capture the battlefield initiative and achieve fight aim. Capturing the battlefield initiative reflects the exerting level of command control efficiency, and adjusting command control activity over again.

3.3. Function Mode of Simulated Experiment.

Command control actions simulation function based on “Control power degree” mainly aims at “state” factor and "power" factor to experiment. Due to the battlefield is so wide, one side controlled the battlefield “sate” can changed with another, this change is mostly from strength of both side growth and decline, it usually can realize capturing the control right for the battlefield through strengthening forces intention. From the view of space function, for the both side forces when part A forces attacked part B, the contention will become more drastic for partial control right, the advantageous forces will be more easy to obtain the right of control, and the other side will be at relative disadvantageous in capturing the right of control. From the view of time, both side who capture the control right maybe persistent, as well as temporary, when the adverse part takes advantage in the battlefield, it exits temporary control right, but temporary control right predicates no failure for part A, part A can renewedly capture control right through supportive forces. Between the two hostile parts for capturing control right, need to keep sufficient forces to maintain the control right. In the command, it is necessary to hold strong forces, if there is a lack support of corresponding forces, it will be difficult to form advantage to enemy.

4. Command Control Actions Simulation Experiment Analysis based on “Control Power Degree”

4.1. Qualitative Simulation Description.

Command control activity simulation embodies a dynamic and consecutive process. Owing to the battlefield condition is complex and unexpected things are too many, the description to models become more difficulty, the mutual relation between battlefield situation and forces operation also put up higher request to simulation. Command control activity in the battlefield exist a qualitative connection, it can adopt the qualitative simulation way to analyze the inter-relationship. It can analyze how the commanders gain the battlefield advantage and control right through adjusting forces strength using the qualitative simulation way. Qualitative simulation can adopt QSIM arithmetic, which can be described by changed parameters and qualitative differential equation restriction, and from systematic physical description to elicit activity description. The thought in simulation experiment is that: put forward change, and filter inconsistent combination. It means that QSIM arithmetic begins from command control activity original state, and gets all possible subsequent states in every command control activity parameter according to state conversion table. Every parameter state matches each other to form state combination according to constraint condition, then uses the constraint to inspect the consistency of every command control activity state combination, and wipes off the redundant state combination, and gets the qualitative result under this state combination. So and so, from one key point-in-time to one key time quantum, again to another key point-in-time, in the end gets all possible qualitative states sequence to realize the simulated analysis.

It can analyze how the troops actions control change affect battlefield situation, at the same time it can analyze how the battlefield situation change affect the troops actions control. In the simulation it can adopt qualitative constraint relationship to show the interaction between situation control and forces control. The qualitative constraint relationship is different from quantitative function relation, the quantitative function relation establish strict correspondence, and the qualitative constraint relationship only explain the variation trend among the command control activity. Furthermore, the battlefield situation control activity qualitative simulation time can use the virtual time quantum to describe, the virtual time quantum is not an exact time description, but a overview, it divides according to command control activity variable in actual apply, the simulated phase is that command control activity variation change from one state variable to another. Taking “part A forces battle strength control—part A control power degree—part B actual control efficiency” as an qualitative simulation example to express this question, This qualitative simulation model contains three interactional links, “part A forces battle strength control” is the import variable in qualitative simulation model, and “part A control power degree” is the middle variable, and “part

B actual control efficiency" is the result variable. Part A commander control the forces strength to capture the battlefield advantage for reducing the part B fight command efficiency.

4.2. Intelligent Agent Simulation.

For the sake of emulating complex command control activity, we can adopt qualitative simulation to analyze the command control activity, but also can adopt intelligent agent simulation method to get further reliable analysis of conclusion. Intelligent agent simulation is an effective tool to research complex question. Its basic thought is that the actual overall battlefield activity drive from every intelligent agent interaction, we can understand the command control activity based on "control power degree" through watching the intelligent agent interactive course phenomena. Intelligent agent simulation experiment can be used to explore the command control activity interactive relationship between "situation" and "force", which is a bottom-up description. Intelligent agent simulation research object mainly concentrate on the interactive complex system that possess certain autonomy, intelligent and adaptation forces entity. Intelligent simulation method regards battlefield situation as a interactive result of every troop in the field, mainly starting with forces interaction, reveal the battlefield situation change microcosmic principle. This principle of force affect situation and situation conduct force shows that the interactive analysis between battlefield situation and forces action control in the command control activity, it can help personnel to establish and understand the interactive relationship.

Command control activity intelligent agent simulation based on "control power degree" is not a simple accumulation of every battlefield entity actions, but a interaction rooted from command and action confrontation. If you are watching the overall battlefield, it will be observed that the "situation" shaped by command and action confrontation, and single command activity and force action will be indistinct and blend in the background. Intelligent agent simulation can embody the relationship that commanders master the overall situation and adjust local force actions. When the simulation is operating, by means of changing command control activity parameter dynamically, it will give rise to a series of exploration about "if how to do". It will reveal the internal rule about command control activity interaction through repeating experiments. Command control activity intelligent agent simulation experiment based on "control power degree" should play close attention to research how to hold the battlefield control power, rather than analyze one battle condition or calculate one damage result. Intelligent agent simulation is a verification and supplement for qualitative simulated experiment, it can further reveal the interaction of "situation" and "power", and present the dynamic change of battlefield control power, be aimed at strengthening cognition of command control activity, grasping the affection of force action control for macro battlefield situation.

5. TAG

The command control activity simulation based on "control power degree" adopts qualitative simulation and intelligent simulation experimental method, be surrounded by the relationship between "situation" and "power" to modeling and experiment. The significance to research the command control activity simulation experiment based on "control power degree" is that discussing the command control activity condition based on "control power degree" through simulation, and the simulated experiment can help commander find the questions in the command control activity, thereby play a role in the aspect of promoting command efficiency.

References

[1] Chen Jian Hua, Li Gang Qiang, Fu Diao Ping. Ship method of operation experiment and analysis [M].Beijing: National Defense Industry Press, 2010:28-31.

[2] Wang Xiao Fei. Navy battle simulation theory and practice [M]. National Defense Industry Press, 2010: 58-62.

[3] Yang Rui Ping, Zhang Zhao Feng. Simulation of command and Control System [M]. National Defense Industry Press.2013:103-105.

[4] Sastry M A. Understanding dynamic complexity in organizational evolution, dynamics of organization. Computional modeling and organization theories. Edited by Alessandro Lomi and Erik R. Larsen, MIT Press, 2001.

[5] Forgas J P, George J M. Affective Influences on Judgments and Behavior in Organizations: An Information Processing Perspective. Organizational Behavior and Human Decision Processes, 2001, 86(1).

[6] Dan FitzPatrick, Ira Miller . ANALOG BEHAVIORAL MODELING WITH THE VERILOG-ALANGUAGE[M]. 2003 Kluwer Academic Publishers New York, Boston , Dordrecht, London, Miscow