The Evaluation Method of Equipment System of Systems Based on Big Data Analysis

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Abstract. In the evaluation of equipment system of systems(SoS), equipment data has shown some new characters, such as big volume, wide range sources, and dynamic variance. The paper pointed out the idea to evaluate equipment SoS based on big data analysis techniques. The outline of the method is provided from two points of view, namely the big data processing techniques and equipment SoS evaluation methods. Based on big data, equipment SoS efficiency evaluation, counter evaluation, and other deeper level applications, such as intelligence processing and situation analysis, can be made. The method is a new method in the equipment SoS evaluation field.

Introduction

Equipment system of systems assessment is an important issue and the development of equipments and equipment in the face. Since equipmentry since birth, they develop along the direction of the system: the cold equipments, swords, longbow, spears, shields, catapults and other equipment requires a combination of different types according to the war, in order to achieve operational objectives; in black synergy gunpowder era, artillery, guns and other equipments and equipment is to play an important guarantee for cluster combat advantage; in the event of the era of mechanization, aircraft, tanks, ships and other heavy equipmentry to subvert the traditional operational concepts, so that in obtaining control of the air / sea carry out work together to achieve victory in the war is becoming a prerequisite. With the equipment into the information age, military information systems at the core of the electronic information equipment system in the war gradually play an increasingly important role, reconnaissance, early warning and detection, navigation[1], communication and command, electronic warfare, information warfare and other information technology equipment has become an indispensable equipment system combat forces [2]. Equipment system construction and development is an important guarantee for the formation of combat capability.

In order to equip a system under combat conditions characterized by information technology background combined operations, architecture, planning how to configure the system and equipment performance of each node, in order to fully maximize the performance of the system and other issues, has become a system construction new issues facing policy-makers and researchers[3]. In order to solve these problems, people from the equipment system demonstration, multiple angles assessment, simulation, test and put forward a variety of ways and means.

Big Data analysis is the concept emerged in recent years, the amount of data to describe and solve science (astronomy, biology, high-energy physics, etc.), computer simulation, Internet applications, e-commerce, and military information and other information in the field of rapid expansion and emergence growth in demand for data and other issues in-depth analysis [4]. Especially for large data analysis depth of mining massive data correlation and find a system to generate these data, or the characteristics and laws of the object's data description. In the evaluation process equipment systems, equipment needs as complete entity data, geospatial data, intelligence and reconnaissance data, meteorological and hydrological data, logistics data, force composition data, operational planning data, combat forces deploy data, intelligence data and long-term goals combat target data fusion, the internal systems of various types of equipment related information, as well as combat systems and equipment, and other data related to the data, which can be extracted

from the existing equipment or repository through big data analysis techniques sort out[5].

Big data analysis techniques, a new method of theoretical analysis, laboratory analysis, simulation and other methods after the following three categories. This paper will evaluate the equipment system to analyze large data problems discussed in order to equip the system researchers provide some new ideas.

Equipment System to Assess the Big Data Problems

Assessment of existing equipment systems and equipment technology has solved many of the problems, and has played a huge role. However, with the development of information technology, information technology equipment, equipment type, represented by more and more and more complex architecture. The traditional system of assessment methods applied to increasingly powerless in having a complex system consisting of equipment.

1) increasing the amount of data

Assess the needs of the equipment system built on a single full understanding of equipment, results of the assessment is more credible. However, the complexity of many indicators of performance or equipment, a certain kind of assessment models commonly used data only part of the equipment, or for a certain type of assessment targets, and it is difficult to establish a unified model of the overall assessment of a comprehensive description of its equipment.

In assessing the equipment system, the elements need to be considered more and more. For example, there are a variety of aircraft platforms indicators at different altitude, different weather, different applications and performance under different conditions to evaluate the operational performance of a variety of factors need to be considered; and for space-based early warning and detection systems, satellites run need to consider the atmospheric perturbation, the Earth gravitational perturbation, solar gravitational perturbation, and other environmental factors, in order to accurately assess the early warning and detection capability for a given period of time. These data elements are described finely equipped system and its environment, but it also needs to evaluate the system model or algorithm can make full use of these data in order to be able to generate more accurate results.

However, with the army in the field of information collection means joint operations, intelligence, net electric space continues to strengthen, equip the system to take advantage of a variety of assessment data also showed a military explosive growth. In the case of high field, for example, in the 20 stars, each star to produce high image data every 1TB of monthly additional amount of data will be up to 600TB. US forces also predicted in 2015 the amount of data they will reach 1YB, which intelligence information will reach 100PB. This system of evaluation methods for the use of the equipment presented new challenges [8]. Although it is possible to establish a simplified model of data analysis to support equipment system assessment, but the assessment results are usually not a good match with the actual results.

Thus, on the one hand, and equipment system to assess the needs and to take full advantage of the growing use of massive data equipment; on the other hand, the equipment itself needs assessment system evolving to be able to adapt to changes in the mass of data and equipment, mining equipment, a full analysis of the data implied equipment system characteristics and laws.

2) a wide range of data sources

Currently, the equipment needed for the assessment system, data sources typically include operational data demonstrate proof sector data, design data, the industrial sector, the test data test departments, research departments simulation data, the use of departments and relevant units or individuals reconnaissance data , empirical data. In addition, with the integration of joint operations have become increasingly demanding, form of military data also showed diversity, not only structured data, including a large number of images, video, audio, text and other unstructured and semi-structured data .

Equipment system for the assessment, it usually need to have comprehensive data, in order to give an accurate assessment, but a single data source or data offer limited dimensional finite fields, the system can not meet the data needs assessment. To do this, you need to integrate data from

multiple data sources, and comprehensive analysis, and extract to meet system needs assessment data, as shown in Table 1.

Table1 data sources, types and application

No	Data Type	Data Acquisition	Acquisition	Data Application
1	theoretical analysis	document	simulation	modelling
2	Experimental	database	document testing	acquisition guidance
3	simulation	database	document parallel	evaluation
4	entity	database,	design, testing	variety of applications
5	operational	document	capture	combat use of tactics

Data is the basis of the assessment of the equipment system must be reliable and extensive collection and storage, and is continuously updated to meet the changing needs of the development of equipment system.

3) Data dynamic changes

In addition to the assessment system should be equipped with equipment to meet construction needs, but also need to be able to respond quickly and change the composition of the architecture. Equipment system data is not static, from the big side, over time, the introduction of new equipment, out of old equipment; evolved from the local time, the ever-changing battlefield environment, command and decision making dynamic changes of equipment deployment, combat process such that the various kinds of equipment in the system will always change.

Rapidly changing nature of the data requirements for system evaluation method must be able to respond in a timely manner, and the traditional evaluation methods based computing system theory, simulation deduction is generally unable to meet such requirements.

Equipment System under Assessment Data Support the Idea

The traditional system of assessment of the need to support large data, but can not cope with the massive growth of data, multi-source, new features dynamic. However, a variety of data consisting of massive data contains a great amount of information, how can we make full use of these data, the data for the assessment of equipment system acquisition, processing and analysis, can help to improve the traditional system of assessment techniques, while massive data base, you can also propose new evaluation method based on the equipment system for large data analysis.

Equipment system of systems Based on evaluation methods of data analysis that contain large data analysis and assessment equipment system in two steps.

Data Processing Framework

Equipment system of systems Based on assessment data analysis equipment, from equipment system for data analysis and processing system based on the assessment method based on the data, and its goal is to achieve its own equipment system effectiveness evaluation, system effectiveness against the process of confrontation assessment, as well as certain types of equipment system on which elements of the sensitivity analysis, visualization, and related development tools, and so on.

Data analysis is the result of data processing after reprocessing to address data quality, and data is incomplete, the data is not standardized. Data analysis is still ready to equip the system for data to assess late, multi-source integration technology at this stage need to use the data to achieve the integration of data from multiple data sources; the use of semantic models or other techniques to complete the standardization of different data sources in the same type of data description; using data quality management techniques to analyze the data to identify different in order to meet the reliability requirements of data; use of data fusion techniques for different forms of data were

analyzed to obtain uniform data results; use of data correlation analysis, various types of equipment the relationship between the data; use of data standards, such as establishing guidelines for equipment system data.

Equipment Sector Assessment

After completing the basic data preparation, may result in the above data analysis and processing, various equipment system assessment. In this article, including equipment system to assess their effectiveness against the assessment between the assessment and system.

equipment system effectiveness evaluation, mainly on their own equipment, system capabilities, such as early-warning capability, reconnaissance capability, communication ability. Although the equipment system effectiveness evaluation also need to consider the different external environment (including combating environmental) impact is applied, but more emphasis on the ability to assess their own systems and equipment to complete the combat mission in its assessment index system and its usually the result value.

On the basis of these two areas on the assessment system based on large equipment will be easy to implement data analysis, sensitivity analysis equipment, used to assess the contribution of a particular type or class of equipment on the system performance, usually in the traditional system of assessment methods, which a process needs to be established on the basis of a large number of simulations.

Like the traditional system of assessment, based on the assessment of large data analysis equipment system still requires visualization techniques, in order to show the assessment results; complete needs of all types of tools to make the system demonstration and analysts to quickly develop a variety of applications. In addition, thanks to information provided by the data itself, based on data analysis and processing, but also for information processing, trend analysis and other types of extended application.

Summary

In carrying out equipmentry system demonstration, design work, need to use the equipment system assessment tools for analysis and optimization of the equipment system. Equipment system of systems Based on the assessment of large data analysis is a new evaluation method, its essence is to use the data of the microscopic world, to reproduce the macroscopic world system and use its natural advantages in data processing, distributed storage, high-performance computing, and quick access to the effectiveness of information systems based on correlation between the elements of the system composition and avoid the traditional system faces subjective assessment methods, such as the curse of dimensionality problem.

In this paper, based on the analysis of large data system equipment including large data analysis and assessment equipment assessment system in two parts, the former is the data base of the latter, which belong to the specific application of the former. Depth study of related models, methods and techniques of the unit is in progress.

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