The Design and Realization of Data Accessing Service in the Meta-synthetic Integrated Environment of Stratagem Research

Wei Jicai, Bai Hanbin, Zhao Wei, Ren Tingguang, Li Junmei

Abstract: Data accessing service is designed to meet the needs of searching and utilizing various data in the meta-synthetic integrated environment of stratagem research (SR) and meanwhile data fuzzy mining engine is supposed to refine the collected data to make them useful for the stratagem research. Also, for accessing and utilizing database, data accessing API is designed, which provides a uniform interface for all data accessing requests and with mapping function gets all data address and accessing transparent.

Key words: accessing, algorithms, data, mining, service .

I. INTRODUCTION

UNDER the meta-synthetic integrated environment of stratagem research[1],[2], relevant data, information and knowledge may come from different sources, with some from the simulation system or the comprehensive evaluation system under the meta-synthetic integrated environment of stratagem research, others from internet or various circles of the society. In order to make these data, information and knowledge more efficient and accessible for the stratagem research, we are supposed to figure out the potential correlations among them for the strategic decision makers or researchers and extract from them the useful elements so as to provide some useful knowledge for the decision support and studies. Additionally, to make all of the applied systems (like simulation system, the evaluation system, etc.) under the meta-synthetic integrated environment more accessible to users, user interface and data accessing API are designed, coupled with data mapping, to get all data address and data accessing practices transparent. For the sake of these applications, data accessing service in the meta-synthetic integrated environment of stratagem research is designed.

II. THE STRUCTURE OF DATA ACCESSING SERVICE SYSTEM

Data accessing service is one part of the Database on Demand (DOD) under the meta-synthetic integrated environment of stratagem research (see Figure 1), and the other part is resource accessing service. The resource accessing service, based on the resources from the internet, is to do the preliminary data mining, the results of which will be stored in the target databases; while the data accessing service, directly facing users under the meta-synthetic integrated environment of stratagem research, not only conducts deep data mining and searching on basis of the target databases but also provides the access interface to the applied systems.

Figure 1. The Schematic Diagram of the Meta-synthetic Integrated Environment of Stratagem Research

On basis of data collecting and mining, it establishes a low-level database through data fuzzy mining to furnish the applied systems under the meta-synthetic integrated environment of stratagem research with data accessing service. The structure of the data accessing service system can be seen in Figure 2.

It mainly consists of user interface, the data accessing service and the corresponding database layer within Database on Demand (DOD). Through the data mining in target data resources, it provides all the users, environments and the applied systems of the stratagem research with necessary data, information and knowledge, and also provides a uniform interface for searching, collecting, classifying and accessing data.
III. DATA MINING PROCEDURES AND THE ALGORITHMS

Data mining is an essential part in accomplishing the data accessing service under the meta-synthetic integrated environment of stratagem research, and consequently the next-up come the introduction of data mining procedures and the algorithms.

A. Data Mining Procedures

The data mining under the meta-synthetic integrated environment of stratagem research may be divided into three steps, the first of which is to use the available search engines from the internet to widely search and roughly classify relative resources there to form the corresponding database; then to preprocess these resources with the data searching and mining engine to get target databases which make data ready for the data fuzzy mining engine; and finally to refine the data from the target databases with the data fuzzy mining engine according to specific needs of the stratagem research to form the applied databases as required. The abovementioned databases are a collection of databases located at several data accessing servers in the LAN, which can be seen in Figure3.

B. Algorithms of Data Fuzzy Mining Engine

With the target databases from the data searching and mining engine plus the needs of the stratagem research, fuzzy data space is established to do deep mining upon the data, information and knowledge and re-classify the data according to the application needs. Then in accordance with the established data association rules, a decision tree is adopted to do the deep data mining to for the appropriate data pool as required by decision support studies. The “appropriate” here means being capable of providing information support and new statistical rules and associations for the strategic decision-making studies. The data mining provides every model of the meta-synthetic integrated environment with the necessary data[3],[4], preprocess the anomalism of the data being used and meanwhile get the abnormal data generated by the models explicitly marked and processed[5],[6],[7].

According to the above introduction, the conjured algorithms of the data fuzzy mining engine are as follows;
(1) Begin;
(2) Enter: the domain name, time and the server name;
(3) Enter the name of the applied databases and the problem domain;
(4) Enter the fuzzy matching precision and seeds
(5) Calculate the matched seeds according to the fuzzy matching precision and seeds;
(6) Establish the fuzzy matching space database;
(7) Search and identify
If there is any data in the searched database identical to the matched seeds
Record the information of the data pool;
Extract the data;
Add to the fuzzy matching space database;
Else if there is not any data identical to the matched data Calculate the similarity coefficient according to the entered seeds;
Produce new seeds according to the similarity coefficient;
There is some data identical to the matched seeds in the searched database
Record the information of the data pool;
Extract the data;
Add to the fuzzy matching space database;
End if
Else
End the searching and identifying
Go to (12)
End if
(8) Go back to the results, and display data formats and sizes;
(9) Process the fuzzy matching space database;
(10) Convert the data formats;
(11) Generate the applied databases;
(12) End.

IV. SOFTWARE SYSTEM DESIGNING
Software system designing of data accessing service is mainly conducted in data accessing service and databases.

A. Data Accessing Service Designing
Through the management of metadata in the resource database and the resource-to-resource mapping, data accessing service maps every resource request as the operation of low-level databases, making the resources transparent to users and the addresses of the application programs. The database accessing interface transfers the received accessing requests to be database accessing requests according to the recorded information in the meta-database and gets the database accessing requests and data accessing respectively based on SQL and information catalogue finally realized through the accessing engine in the databases. The designing may can be seen in Figure 4.

Data accessing service, mainly based on the characteristics and the structure of resource database, establishes control interfaces correspondingly to the low-level data, which facilitates the accessing and operation by callers on the various low-level resources and protects them from being directly utilized by other unwanted requests. It provides basic databases with such functions as searching, deleting, amending and inserting and is able to send the results of the data accessing back to the callers in form of a result collection and save the field values of blob and bfile as local files. It is also equipped with an abnormality treatment mechanism which sends back the error information at the time of database accessing request errors or operation failure to resource databases and then provides some instructive operational tips. Additionally, it also provides an affair handling mechanism dedicated to backspacing and submitting operations within the applicable scope. To be more specific, it starts submission only after the data maintenance of the resource databases has been completed, but if abnormality appears in the operational process, it will backspace to the original state.

![Figure 4. The Schematic Diagram of the Structure of Data Accessing Service](image)

B. Database Designing
Database designing is the foundation of data accessing service, which can be simply illustrated via database logical data model (see Figure 5). In Figure 5, DATASOURCEINFO stores the basic information of data source; DATABASE_DETAIL conserves the connection information of database-file data source; XMLFILE_DETAIL saves the connection information of XML-file data source; COLUMNSET stores the basic information of tables, views and services; TABLEINFO has the details of tables in source bases; TABLE_COLUMN has the details of columns in the source bases; VIEWINFO stores the details of views and services in source bases; VIEW_COLUMN has the field information of views in source bases; INSTANCE stores the instances in the views and services; CATEGORY conserves the basic information of domains in source bases; CONSTRAINTS saves the basic information of constraints; FOREIGNKEY has the details of constraints of foreign keys; FUNCTION stores the information...
of functions for searching views and services in source bases; FUNCTION_INSTANCE means the contingency tables of functions and instances, which means to describe the instances relating to the functions.

For the sake of good expandability and maintainability, the data accessing service adopts a hierarchical structure which, on basis of the metadata accessing interface and via the metadata data accessing service, users' accessing requests or means that users update or insert information from the information catalogue, transfers users' requests to be SQL commands and then calls the data accessing engine through the accessing interface on basis of SQL to realize the low-level data accessing. The running interface of data accessing on basis of SQL can be seen in Figure 7[8][9][10][11].

Figure 7. The Running Interface of Data Accessing on basis of SQL

C. The Flow Graph of Data Accessing

The flow graph of data accessing service can be seen in Figure 8.

Figure 8. The Flow Graph of Data Accessing

Here, I_SJFW_CONNINFO refers to the relative information of resource database/information catalogue that users set to connect via the interfaces of data accessing service. I_SJFW_CONNOBJ means the connection objectives to which data accessing service return after users finish setting the connection information of resource database/information catalogue for the sake of accessing to target databases. I_SJFW_SQLCMD refers to users' accessing commands to databases, including searching commands and non-searching commands. I_SJFW_OBJINFO means the objective names and condition information of databases to be accessed by users, including data searching, deleting and amending. I_SJFW_RECORD is the resource database record where data accessing interfaces return for searching in compliance with users' accessing requests, or means that users update or insert

V. REALIZATION OF DATABASE ACCESSING SERVICE

A. The Application Flows of Data Accessing Service

The structure of software for data accessing service is based on the framework of C/S and its basic application flows can be seen in Figure 6.

Figure 6. The Schematic Diagram of the Application Flows of Data Accessing Service

B. The Realization of Database Accessing Service

The schematic diagram of the database logical data model is shown in Figure 5. The Schematic Diagram of the Database Logical Data Model.

For the sake of good expandability and maintainability, the data accessing service adopts a hierarchical structure which, on basis of the metadata accessing interface and via the metadata...
the records into the resource database by resetting the resource database record and calling relevant interfaces. I_SJFW_OBJSTRUCTINFO refers to the structure information of database objectives users expect to set up or amend via interface setting and then call relevant interfaces to get it done. I_SJFW_CATALOGOBJ means the information catalogue objectives which information catalogue service returns after users set the path. I_SJFW_MDBCONNINFO is the connection information to information catalogue metadatabase through which users manage to connect the metadatabase and obtain more information of catalogue objectives by information catalogue service. I_SJFW_CATALOGINFO means that users obtain the tree structure of the catalogue and the details of objectives through information catalogue after connecting the information catalogue metadatabase. I_SJFW_ACCESSUSER refers to the user names only with which data accessing service may obtain privilege information through security service interfaces. I_SJFW_PRIVILEGEINFO means the privilege information the security service interfaces send back to designated users, including the objectives the users have privilege to access and the types of the privileges.

There are two ways for data accessing, one is based on SQL, and the other on information catalogue. The following part will be all about the application flows based on SQL, which is a part of data searching with the data fuzzy mining engine and there are in total eight steps (see Figure 9).

![Figure 9. The Application Flows Based on SQL](image)

1. to get the global object ISJFW_DMCatalogMng*
2. to get the connection objective to databases ISJFW_Connection
3. to get the objective executing database operation ISJFW_Command*
4. to set and execute accessing commands
5. to obtain error information
6. ergodic search throughout the result collection
7. the release after the execution
8. The release after all accessing operations.

Data accessing based on information catalogue can be seen in Figure 10.

![Figure 10. Data Accessing Based on Information Catalogue](image)

**VI. CONCLUSION**

Data accessing service directly faces users and the application systems under the meta-synthetic integrated environment of stratagem research. It is supposed to not only realize deep data mining so as to provide the stratagem research with valuable information but satisfy users’ searching requests for all resources in the environment and set up data accessing API for the application systems. Consequently, to improve the efficiency of data accessing, during the process of designing and realizing, parameter wiring is provided here to speed up the data insert, and approaches to performing the stored procedure are adopted for the convenience of direct calling[6],[7].

For the sake of good expandability and availability, data accessing service, in accordance with the metadata information of the corresponding resource database provided by information catalogue service, realizes a set of accessing interfaces based on objectives which may not be take the way of SQL commands but instead add, delete, amend and search the data of databases registered in the information catalogue service. And the metadata of accessing objectives are also provided to users via the interfaces, which helps realize the connection of metadata and data information and maximize the amount of information about the accessing objectives users can get when calling the interfaces.

**REFERENCES**


on Modeling and Simulation July6-8,2009 Banff, Albert, Canada) .


**Wei Jicai**, The birth place is Shan Dong Province China and birth date is 1973.1. The educational background was system engineer, system simulation and modeling and awarded Doctor degree in 2003. The major field of study is Complex Systems Simulation in the Science and Technology on Complex Systems Simulation Laboratory.

**Bai Hanbin**, The birth place is Beijing China and birth date is 1979.9. The educational background was signal processing and awarded Doctor degree in 2008. The major field of study is Complex Systems Simulation in the Science and Technology on Complex Systems Simulation Laboratory.

**Zhao Wei**, The birth place is Beijing China and birth date is 1978.6. The educational background was system engineer, and awarded Master degree in 2004. The major field of study is Complex Systems Simulation in the Science and Technology on Complex Systems Simulation Laboratory.

Ren Tingguang, The birth place is Si Chuan Province China and birth date is 1974.5. The educational background was system engineer and awarded Doctor degree in 2007. The major field of study is Complex Systems Simulation in the Science and Technology on Complex Systems Simulation Laboratory.

Li Junmei, The birth place is He Nan Province China and birth date is 1978.7. The educational background was system engineer and awarded Master degree in 2004. The major field of study is Complex Systems Simulation in the Science and Technology on Complex Systems Simulation Laboratory.

Address: Post Box.9702#19, Beijing China, 100101
Beijing Institute of System Engineer
Science and Technology on Complex Systems Simulation Laboratory China
Tel +86 13611209303 Wei Ji-cai