Program Design of JSON to Structured Data Conversion

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Abstract. With the maturity of structured data storage technology and the increasing demand for enterprise information development, some enterprises need to convert the data storage model of application system from JSON to structured data. A file management system is taken as an example to explain how to convert. In this article, it is achieved through the following three parts. First, the structure diagram of data transformation is built. Then, JSON model and structured data model are built. Finally, the conversion of data from JSON to MySQL is realized by using java language.

1 Introduction

With the development of relational database technology, relational database systems are becoming more stable and efficient. Relational data are studied to store semi-structured data in many enterprises, whose goal is to share data between multiple different system environments [1]. And it is beneficial to the diversified development and progress of the application system.

In non-database environments, semi structured data is common, such as XML and JSON [2]. The latter is discussed in this paper. JSON is easy to read and write, and is easily parsed and produced by machines. JSON format is not only language independent text format, but also conforms to the habit of C language family [3].

In the actual application of enterprises, different data storage technologies are used in different network systems. For example, in a file management system, two sets of storage methods are used, JSON semi-structured storage and MySQL database storage. To facilitate the application and rapid query, it is necessary to convert and merge the data storage mode.

In this paper, the file management system is taken as

an example to discuss and implement the conversion from JSON to relational database.

2 Program Design

2.1 Demand analysis

In this paper, the data conversion in a file management system is taken as an example to illustrate the process, which needs to get data from JSON file and store it into MySQL database. JSON file is composed of JSON [4] and unstructured binary data. Before storing the JSON data, the original files should be pre-processed to achieve the purpose of splitting binary data and JSON data. After it, semi-structured data is converted into JSON documents, while binary data is stored as pictures.

2.2 The overall design

The whole process of data conversion includes pre-processing, mode analysis, mode conversion, data conversion, data storage and so on. The specific process is shown in figure 1.

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Fig. 1. Schematic diagram of the structure

3 Model Analysis

Schema transformation is the foundation of the whole process. The task needs to be accomplished is to build JSON semi-structured data model and generate corresponding relational data table model, then process JSON semi-structured data into structured data and store it in database.

3.1 Model Analysis

Fig.2. JSON Model

As shown in Figure two, the JSON data is deeply parsed, and then the structure model diagram is built, which is a simplified JSON OEM model diagram [5].

First, the types of nodes are partitioned, the node Category of the pattern division is found. Because Its child nodes are only one layer and the number of child nodes is appropriate. Other nodes are considered as data nodes.

Second, based on the previous results, two tables, info and file, were created. All the data nodes are put in the nodes of the model they belong to. According to the actual situation, attributes are added to type.

Third, according to the subordination in the OEM model [5], a master-slave table relation is generated, and a foreign key index is established between the two tables. Info is the primary table, and File is a child table. The foreign key Mainno in the table corresponds to FileName in JSON.

After the above process, the JSON tree structure in Figure 2 is converted to the table structure of Table 1 and Table 2.

Table 1. Information table(info)

Properties	Data type	Meaning
Mainno	VARCHAR	Primary key
Count	INT	File number
CreateName	VARCHAR	Record man
CreateTime	DATETIME	Record time

Table 2. File storage table (file)

Properties	Data type	Meaning
ID	INT	Primary key
Mainno	VARCHAR	Foreign key
imageName	VARCHAR	File name
dir	VARCHAR	File directory
remark	VARCHAR	Remark

3.2 Model implementation

The JSON document storage and MySQL database storage model is described in figure 3. The following is a description of the data model:

In the JSON document storage model, FileName is the name of the document, RecordDate is the document creation date, count is the number of images that the document contains, and imageName is the name of the picture. Remark is a note.

The attributes of the table in the chart are shown in Table 1 and Table 2.

Fig.3 JSON model transformation diagram

4 The implementation of conversion

4.1 Data analysis

When the schema transformation is completed, the application data can be transformed into the target mode according to its corresponding relationship, and the basic process is divided into 3 steps:

- (1) Read the JSON document data, get JSON format data;
- (2) Translate from the original data to the target model of data according to the corresponding relationship between the data in Figure 2;
- (3) Write the second step of the data to the MySQL database.

4.2 Program implementation

The following are classes implemented by the conversion program, as shown in figure 4.

- (1) Doc class represents a data model class of JSON, and other data models are not described
- (2) UpdateAction class belongs to the database connection class
- (3) JSONAysis and AysisRead class, belonging to the JSON object read and model conversion class

(4) Read class is the core class, used to call other classes and complete all the steps of a file.

(5) The Account class is a target model class, where setter and getter represent the get and set functions for all attributes. Other data models are not described.

(6) FileOut class is the picture file output class, which converts binary data into JPG images.

4.3 Matters need attention

In the process of technical implementation, we should pay attention to the following aspects.

(1) In the aspect of time type transformation, the time expression format in JSON is dependent on the environment because JSON does not contain a variable type. First, the program reads data in a string, then determines the type, converts the format, and stores it in the database. If not, the system can't work. For example, "2017-03-27T16:10:11.626398+08:00", "2017-03-27", "2017-03-27T16:10:11.626+08:00" and other expressions are translated into "2017-03-27".

(2) When reading multiple byte numbers (such as 16-bit integers), we should pay attention to the problems of high byte and low byte order. For example, when IO is written to a file, the order of bytes written by the C++ is from low to high, while Java is from high to low.

(3) The following code is added to avoid the running error when the JSON is serialized. Because the JSON object and the JSON structure are not one-to-one.

```
objectMapper.configure(DeserializationFeature.F
AIL_ON_UNKNOWN_PROPERTIES, false);
```

5 Conclusions

In this paper, it discusses process from design model to the source code and gradually studies the storage of semi-structured data. First, the flow chart is used to describe the whole process of program implementation. Then the storage model of semi-structured data is constructed by using OEM model [5]. Next, according to the mapping rules, the JSON storage model is mapped to structured data, and

data conversion rules from JSON to MySQL are implemented. In addition, the program has been successfully applied to the file management system, which has realized the data conversion and achieves good results. The next step is to achieve dynamic transformation between semi-structured data and structured data

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6 References

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Fig. 4. Class Diagram of Program Implementation