

Code Generation for Mobile Terminals Accessing to the Remote Database Based on Object Association

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Abstract. Now the mobile terminal accessing the remote database is important research area. This paper presents a new access method for generating the code in order to solve the programming problems of the application design and the poor portability in Mobile terminals accessing to the remote database. The paper proposes a new management mechanism to database connection and access. It adopts the object association methods and defines the object association rules. The method achieves mobile terminals and database transmission of information and the management. It achieves visualization of the database interface.

Keywords: Mobile terminals, Database, Object Association Relationship.

1 Introduction

With the development of mobile networks, mobile terminal accessing the remote database has paid more and more attention [1]. Generally, mobile terminals connect to database and obtain the required data through the server transfer. Therefore, developers need to develop remote database server-side programs. This method is relatively flexible, but increases the cost of development and maintenance [2] [3]. It has become an important topic how to develop high reliability application quickly and efficiently in the mobile Internet era. Software visualization is an important way to solve the problem. Software visualization could play an important role in software engineering in the future [4].

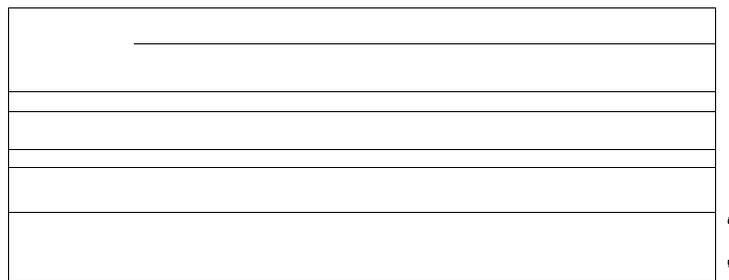
When the mobile terminals access remote database, they not only need to provide critical information for remote database access, but also consider the style of returned results. This paper proposes a new method for accessing remote database by mobile terminals. Through the method of OAR (Object Association Relationship) [5], it has been built visual development methods which access remote database.

2 Problem analysis and related research

The visual database tools and methods which mobile terminals access remote database need a specific rule definition. According to the designing rule, it is conducive to use its features. This article presents a visual software development method based on OAR. The functionality of the program is defined as objects. Through feature combination of objects and the corresponding relationships of objects, you can automatically form part of the program, combine with the mobile terminals program and finish design of programming.

Resource requirements determine database association relationship between the terminal database schema and remote database schema, through OAR method, the terminal structure of the database schema can be determined. When you create a table in the terminal database, you can either create all remote database table fields or a subset of the remote database table fields.

By Object Association way, it will be based on the real database server converts the request to query the database based on resource discovery requests, and provide a consistent interface to access the database using this method[6]. A property equivalent mode combined with XML Schema technology achieves function. Figure 1 shows querying and updating schematic.



Mobile Terminal

Table
column1, column2

Table
column1, column2

Fig. 1. Fields relationship, querying and updating schematic

Database

Terminal UI

#/

3 Defining OAR rules for accessing to remote database

Database
column1_column2=
DBTable1

column1_column2=

DBTable2

DataBase

OAR (Object Association Relationship) is an important aspect in object modeling. By OAR, the method studies the mobile terminals accessing to the remote database. When mobile terminals access to the remote database, mobile terminals data corresponds to remote databases data and interface widget data corresponds to the remote database data.

Its OAR can be defined as: relationships relational set (Relationships) is a subset of set relationship rules (RelationshipRule). A relationship rule includes a subset of table relationships (TableRelation), a subset of field relationship (ColumnRelationship) and a subset of terminal widget ID and field relations (IdColumnRelation). All elements of the field relationship subset must belong to the same remote database table (DBTable). Their relationship can be expressed as follows:

Rule1: In OAR rules, RelationshipRules set is composed of three relational object elements. They are defined as follows:

Code Generation for Mobile Terminals Accessing to the Remote Database Based on Object Association

$Relationships = \{mr/mr \mathcal{R} RelationshipRules\};$
 $RelationshipRules = \{ \langle TRs, CM, ICRs \rangle / TRs \mathcal{C} TableRelations, CMs \mathcal{C} ColumnRelations, ICRs \mathcal{C} IdColumnRelations, \vee cm1, cm2, icr3, icr4, cm1 \mathcal{R} CMs, cm2 \mathcal{R} CMs, icr3 \mathcal{R} ICRs, icr4 \mathcal{R} ICRs \rightarrow cm1.DBColumn.DBTable = cm2.DBColumn.DBTable, icr3.id = cm1.DBColumn, icr4.id = cm2.column \};$
 $TCRelations = \{field / field \in \mathcal{A} able\};$

Rule2: Table OAR and fields OAR are defined as follows:

$TableRelations = \{ \langle (table1, table2), relation \rangle / table1 \mathcal{R} Tables, table2 \mathcal{R} DBTables, Tables \mathcal{C} DBTables, relation \mathcal{R} Relations \}$
 $ColumnRelationships = \{ \langle column, DBColumn \rangle / column \mathcal{R} Columns, DBColumn \mathcal{R} DBColumns, Columns \mathcal{C} DBColumns \};$

Rule3: In field and widget OAR, set id is ID in terminal widget, and *column* is field in mobile terminals, and *dbcolum*n is field in remote database. They are defined as follows:

$IdColumnRelations = \{ \langle (id, column, dbcolum), relation \rangle / id \mathcal{R} Ids, column \mathcal{R} Columns, dbcolum \mathcal{R} DBColumns \};$
 $Relations = \{ "=", "<", ">", "<>", ">=", "<=" \}.$

Among them, "Columns" is the set of fields in the local database; "DBColumns" is a set of fields in the remote database; "Tables" is a set of tables for the mobile terminals; "Ids" is a set of id for mobile terminal widgets. And id value of terminal widgets and some of the necessary widget variables of the mobile terminal interface programming must be the same name and it is conducive to the terminal interface and database information interoperability. "Relations" is a set of Logical relationship.

4 Code generation based on OAR

(1) Generate creating table's code in mobile terminals

Assuming that remote database has login and student tables. Then DBTable = {login, student}; DBColumn contains DBColumnLogin and DBColumnStudent; DBColumnStudent = {id, name, gender, age, date, grade, class, email }. And insert the data to the remote database STUDENT table. According to rule 2 in section 3, you can create mobile terminal database tables and fields through visualization tools. So you can create one or two tables. Now you can establish table named student. Then, Tables = {student}, ColumnStudent = {name, gender, age, grade, class} and they satisfy OAR rules, such as $Tables \mathcal{C} DBTable$ and $ColumnStudent \mathcal{C} DBColumnStudent$.

Step1: According to rule 2, judging set Tables = {STUDENT} is not empty. And by comparison Relations, they satisfy Rule 2, $Tables \mathcal{C} DBTables$, so you can create tables SRUDENT. When the Tables is empty, creating table finishes and code of creating table is generated.

Step2: According to rule 2, you can create name field of STUDENT. Judgment ColumnStudent is not empty, so Columns = {name} and DBColumnStudent satisfy $Columns \mathcal{C} DBColumns$. Then you can create name field. According to the Step2, you can establish other fields. When the STUDENT is empty, creating table field ends, return to step1.

Finally, you can generate creating mobile terminal database table STUDENT code. As follows:

```
public static final String STUDENT = "STUDENT";
public static final String NAME = "NAME";
public static final String GENDER = "GENDER";
public static final String AGE = "AGE";
public static final String GRADE = "GRADE";
public static final String CLASS = "CLASS";
String tableSTUDENT= "CREATE TABLE " + STUDENT + "(" + NAME
+ " TEXT PRIMARY KEY," + GENDER + " Integer,"+ AGE + " Integer,"+
GRADE + " Integer, " + CLASS + "Integer " + " );"
```

(2) Generate querying data's code in mobile terminals

Mobile terminals operating remote database includes querying and updating remote database. Updating includes inserting, modifying and deleting data. Now describe querying process. It assumes that you have id's set Ids in mobile terminal: Ids= {querybutton, name, gender, age, grade, class}.

Click on the button with the ID value "querybutton" in mobile terminals and query STUDENT table in remote database. You can query name, gender, age, grade and class. There are querying conditions, including grade and name value that are obtained from EditText of ID grade and ID name in terminal interface. According to the class, results are sorted in ascending order. Processing is shown as follows.

Step1: Gets the ID of the query button. By iterating Ids set, you can find the ID value for the querybutton button.

Step2: By iterating DBTables set, judging if STUDENT exists. If it does not exist, the querying fails;

Step3: In remote database you need iterate DBColumnStudent of SRUDENT's fields set and get querying fields: name, gender, age, grade and class. If it does not exist, return to Step2, and select another table again, until all tables are not satisfied. If not, go to step4.

Step4: Get conditions. According to Rule 1 and 3, the terminal widget ID and field relations are the same and unique. And condition values are passed by the Android Terminal. According to Android application programming requirements, grade value is obtained by using grade.getText () in mobile terminals and name value is from name.getText (). If name or grade does not exist in the set of Ids, the querying fails, it needs to reset the terminal programming code.

Step5: Select the order in which querying results are displayed. Iterate DBColumnStudent set and select the class field. If it does not exist, return to Step2. Finally, operation finishes, it generates the query code. As follows:

```
"select      "+"name,gender,age,grade,class"+"          from
"+"student"+"  where  "+"grade="+ grade.getText()+" and
"+"name="+  "+"\' " +name.getText()+"\' " +" order by "+"class"
```

Through the above steps, the mobile terminal will return data in XML format to the client interface. Figure 2 shows a part of the query results. Through mobile terminal interface design handles querying results, and you can get the data you need and complete the design.

Code Generation for Mobile Terminals Accessing to the Remote Database Based on Object Association

```
- <Results diffgr:id="Results1" msdata:rowOrder="0">
  <NAME>Ma Zhong</NAME>
  <GENDER>1</GENDER>
  <AGE>18</AGE>
  <GRADE>3</GRADE>
  <CLASS>1</CLASS>
</Results>
+ <Results diffgr:id="Results2" msdata:rowOrder="1">
+ <Results diffgr:id="Results3" msdata:rowOrder="2">
+ <Results diffgr:id="Results4" msdata:rowOrder="3">
+ <Results diffgr:id="Results5" msdata:rowOrder="4">
```

Figure 2 Query results in XML format

5 Conclusion

This paper presents a visual coding method for the mobile terminals accessing remote database. Through OAR, we can visually design mobile terminal database structure. We can achieve access and update to remote databases with code as little as possible. By OAR, this paper designs and implements code generation tool for mobile terminal remote accessing the database. The method increases development efficiency and reduces the learning curve. It is conducive to realize mobile terminal remote accessing the database operations.

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