Chapter VII

FSQL: A Fuzzy SQL for Fuzzy Databases

The SQL language was essentially developed by Chamberlin and Boyce (1974) and Chamberlin et al. (1976). In 1986, the American National Standard Institute (ANSI) and the International Standards Organization (ISO) published the standard SQL-86 or SQL1 (ANSI, 1986). In 1989, an extension of the SQL standard, called SQL-89, was published, and SQL2 or SQL-92 was published in 1992 (ANSI, 1992).

SQL2 basically provided new types, constraints (such as checks or unique predicates), it supported subqueries in UPDATE and DELETE operations, and in the FROM clause, operator IN, ANY and ALL, CASE constructor, JOIN, UNION, INTERSECT and EXCEPT operators and the modification of base table through views.

In the latest version of SQL standard, SQL 2003, major improvements have been made in a number of key areas. Firstly, it has additional object-relational features, which were first introduced in SQL-1999. Secondly, SQL 2003 standard revolutionizes SQL with comprehensive OLAP features and data-mining applications. Thirdly, SQL 2003 integrates popular XML standards into SQL(SQL/XML). Finally, numerous improvements have been made throughout the SQL 2003 standard to refine existing features.
Nowadays, SQL may be considered one of the major reasons for the success of relational databases in the commercial world, and the bibliography about SQL language is very extensive (Date & Darwen, 1997; Elmasri & Navathe, 2000; Patrick, 2002). In all these sources, the basic commands of this language are explained in its two dimensions:

- **DML** (Data Manipulation Language): The DML statements (or sentences) enable the query (consultation) and the modification of the data stored in the database. Examples of this kind of sentences are `SELECT`, `INSERT`, `DELETE`, and `UPDATE`.

- **DDL** (Data Definition Language): The statements of this language enable the creation and modification of the structures in which the data will be stored. Examples of DDL statements are as follows: `CREATE` (to create objects of the database, such as tables, views, etc.), `DROP` (to remove objects), `ALTER` (to modify objects), and statements for security controls and indexes and for the control of the physical storage of the data.

In this chapter we focus on revising the syntax of the most useful and important commands, explaining the news that these commands incorporate into FSQL to enable us to handle fuzzy information. We do not explain the detailed syntax of each command but only the part that FSQL adds to SQL.

FSQL allows three types of comments to be incorporated into the statements that will not be used when the statements are analyzed or executed. The first of these comments (C style) starts with the character sequence `/*` and ends with the sequence `*/`. The second one uses a double hyphen `--` and comments from this point to the end of the line. These two comment types are also used in SQL and PL/SQL. In the last type, the start of a comment is marked by the character sequence `/*`, and the comment is terminated by the end of the file (end of statement, end of string, etc.).

The FSQL user is able to prevent a statement by using the FSQL Server. In order to do so, we can use symbol `!` (admiration) as the first character of the statement. This is useful if the FSQL Client program does not admit the possibility of sending an SQL standard statement. With this system, we accelerate the process for this type of statement, because the FSQL Server is not executed completely. In other words, if the admiration symbol is the first character, then the statement will be considered as an SQL statement.
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