Lab

Topic: Introduction to SQLite.

Purpose: What is SQLite. sqlite3 console client. DB Browser for SQLite graphical client.

Progress

What is SQLite?

SQLite represents a library written in C (ANSI-C) that implements a relational database engine. SQLite is probably the database system in use today. So, its database can be found in every device on Android, iOS, Mac, Windows 10/11, it is used by most common browsers - Firefox, Chrome, Safari, etc.

Unlike other database systems like MS SQL Server, MySQL, Postgres, etc., SQLite does not require a database server. SQLite represents an embedded database engine that directly accesses the database file on disk. To work with databases, we do not need to explicitly install or configure SQLite in any way.

SQLite has full support for most of the features that other relational DBMSs have - tables, indexes, triggers, views.

To create database queries, SQLite uses the SQL language (more precisely, its implementation), which is generally similar to the SQL implementations and dialects used in other relational DBMSs.

The database file format is cross-platform - you can create and work with a database file on one device with one operating system, and then safely copy it to another device with a different OS.

As far as application development is concerned, most of the common and popular programming languages like Python, C#, Java, etc. have support for SQLite, which allows you to use this DBMS in different scenarios and different types of applications.

SQLite is developed as an open source project that can be found on github athttps://github.com/sqlite/sqlite. In addition, all the supporting information of SQLite can be found on the official site -https://www.sqlite.org

The first version of SQLite was released in August 2000. The original developer is Richard Hipp (D. Richard Hipp)

What is needed to develop and manage SQLite databases without binding to a specific programming language? First of all, we can use the official client - sqlite3. However, for some, it may be more comfortable to work through a graphical program that provides an intuitive and understandable approach. In this case, you can use a number of unofficial graphical clients, such as SQLiteStudio or DB Browser for SQLite.

sqlite3 console client

To work with SQLite, the developers of this DBMS provide the sqlite3 console client. Let's briefly consider how to work with it.

First we need to download sqlite3. For this, let's go to the pagehttps://www.sqlite.org/download.html. The name of the required package starts with sqlite-tools. And on the download page we can find versions for Windows, Linux, MacOS:

Precompiled Binaries for Linux

| sqlite-tools-linux-x86-3360000.zip (2.07 MiB) | A bundle of command-line tools for managing SQLite database files, including the command-line shell program, the sqldiff program, and the sqlite3_analyzer program. (sha3: edfefce9a2b9b076102dd2d27f4b03eeafa1291088ea84ea7baee3e5333386b8) |

Precompiled Binaries for Mac OS X (x86)

| sqlite-tools-osx-x86-3360000.zip (1.47 MiB) | A bundle of command-line tools for managing SQLite database files, including the command-line shell program, the sqldiff program, and the sqlite3_analyzer program. (sha3: edd862b3ad642bdf7802d5db14c778c0642059ea035462aa526ea062deac9961) |

Precompiled Binaries for Windows

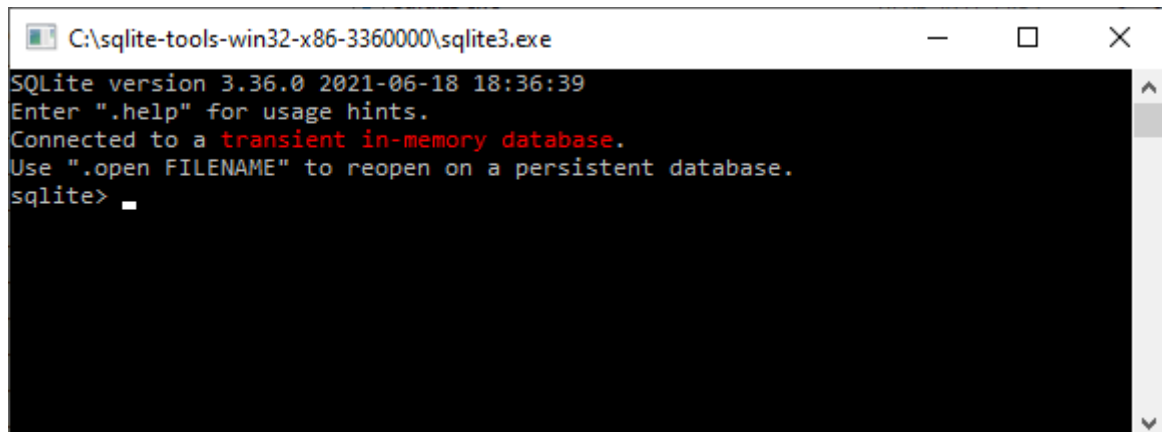| sqlite-dll-win32-x86-3360000.zip (542.87 KiB) | 32-bit DLL (x86) for SQLite version 3.36.0. (sha3: dbcc568711f3f3e12a32e5abfca652f1c38eb71ccedd81874e9669708f9c71c8) |
| sqlite-dll-win64-x64-3360000.zip (880.05 KiB) | 64-bit DLL (x64) for SQLite version 3.36.0. (sha3: af88804c191758431458611b8214b466348df17415b2671641793cef53ae762a) |
| sqlite-tools-win32-x86-3360000.zip (1.82 MiB) | A bundle of command-line tools for managing SQLite database files, including the command-line shell program, the sqldiff.exe program, and the sqlite3_analyzer.exe program. (sha3: 38a0b9d0d41487b76c86f8d45c0e05def2011ac9e48a331dde79bb28087d9eda) |

Let's download the version we need and unpack it.

In the package, we can find three utilities, of which the file named sqlite3 is actually a console shell for working with the SQLite database. Let's run it:
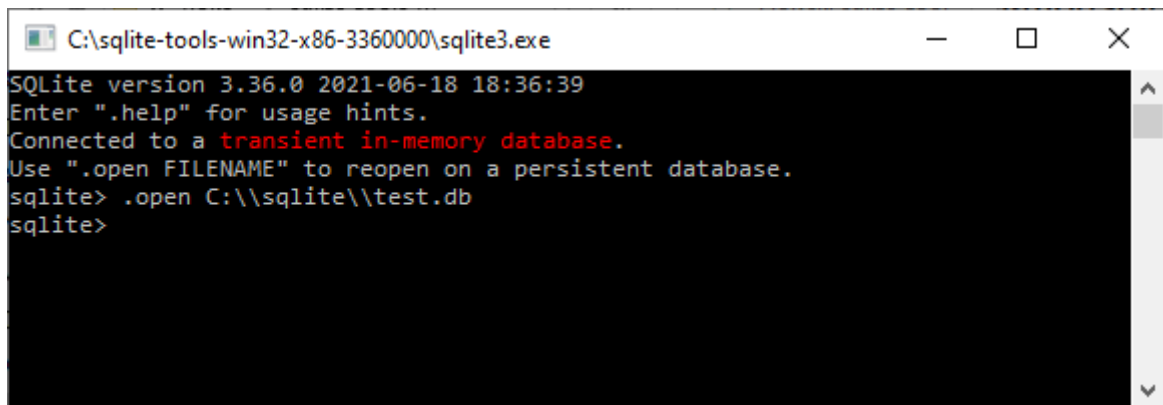

Opening the database

To open the database, you need to enter the .open command, followed by the path to the database. Example,

```
.open test.db
```

In this case, a database called "test.db" will be opened, which is located in the same folder as the console utility. If the database does not exist, it will be created.

You can also pass an absolute path:

sqlite>.open C:sqlite\test.db

After opening, we will be able to work with this database.

Creating a table

To create a table after opening the database, you must enter the CREATE TABLE command, followed by the name of the table and the specification of its columns:

sqlite>create table users(name text, age integer);

In this case, the users table is created, in which there are two columns: the name column, which has the text type, and the age column, which has the integer type

Note that the command ends with a semicolon. And all SQL commands must end with a semicolon so that SQLite can identify that the SQL command is being executed.

Data operations

The INSERT INTO command is used to add data. For example, let's add one row to the users table:

sqlite>insert into users values ('Tom', 37);

Now we will get the previously added data. For this, we use the SELECT command:

sqlite>select * from users;

And sqlite will show us all the data from the users table:

```
C:\sqlite-tools-win32-x86-3360000\sqlite3.exe                        —   □   ×
SQLite version 3.36.0 2021-06-18 18:36:39
Enter ".help" for usage hints.
Connected to a transient in-memory database.
Use ".open FILENAME" to reopen on a persistent database.
sqlite> .open C:\sqlite\test.db
Error: unable to open database "C:sqlite        est.db": unable to open database
 file
sqlite> .open C:\\sqlite\\test.db
sqlite> create table users(name text, age integer);
sqlite> insert into users values ("Tom", 37);
sqlite> select * from users;
Tom|37
sqlite>
```

DB Browser for SQLite graphical client

One popular graphical client for SQLite is DB Browser for SQLite, available at https://sqlitebrowser.org/.

To install the graphical client, go to the downloads page https://sqlitebrowser.org/dl/, where we can find different package options for different operating systems and architectures:

Downloads

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Windows

Our latest release (3.12.2) for Windows:

- DB Browser for SQLite – Standard installer for 32–bit Windows
- DB Browser for SQLite – .zip (no installer) for 32–bit Windows
- DB Browser for SQLite – Standard installer for 64–bit Windows
- DB Browser for SQLite – .zip (no installer) for 64–bit Windows

For example, in our case, the OS is Windows 64x, so we choose the package DB Browser for SQLite - Standard installer for 64-bit Windows , which represents the program installer for 64-bit Windows.

After installation, run the program:

The following window will open
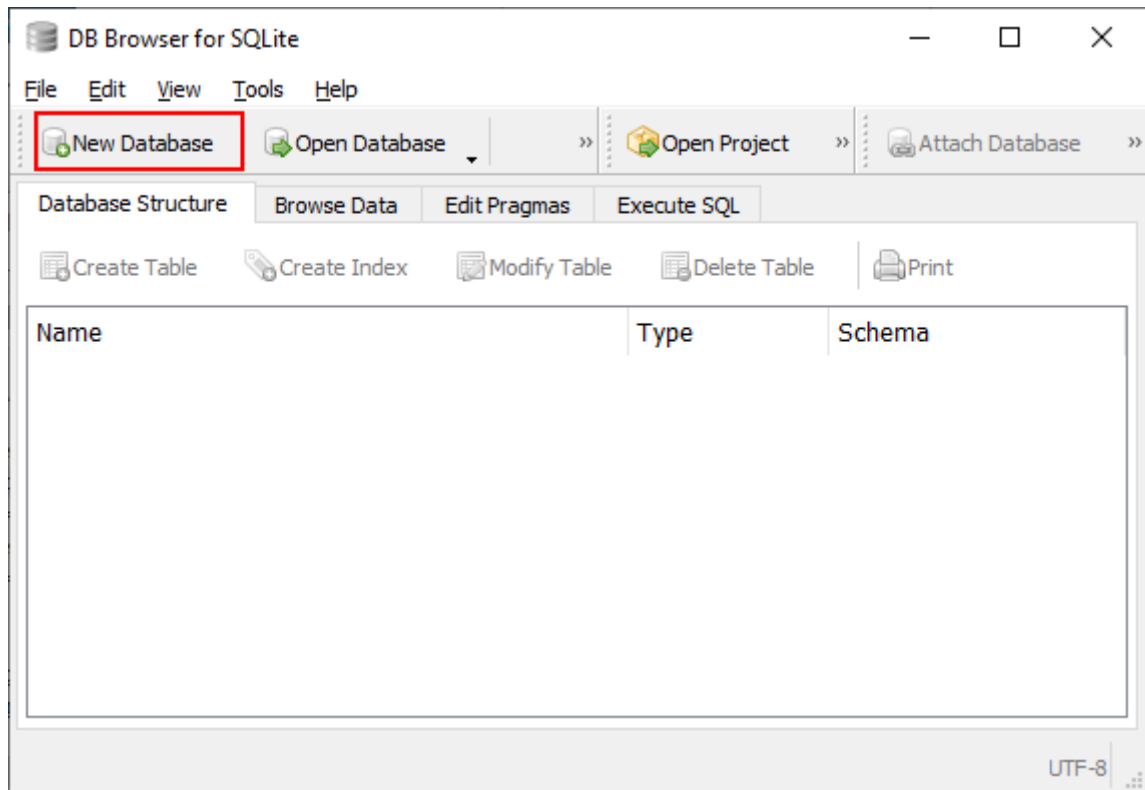
Within this database management program, we can use both graphical capabilities and SQL queries. Yes, let's create a database. To do this, click the New Database button (or via the File -> New Database menu). Next, we will be asked to specify the location and name of the new database. For example, in our case, the database file will be called people.db

Subsequently, the created database can be opened using the Open Database button or through the File->Open Database menu.

After that, we will be prompted to create the first table

On this window, enter Users as the table name in the Table field.

On the Fields tab, which contains the column definitions, click the Add button. And after clicking on the table just below the buttons will add table column definitions. For the first column, specify Name as the name, and TEXT as the type. For the second column, specify Age as the name, and INTEGER as the type.

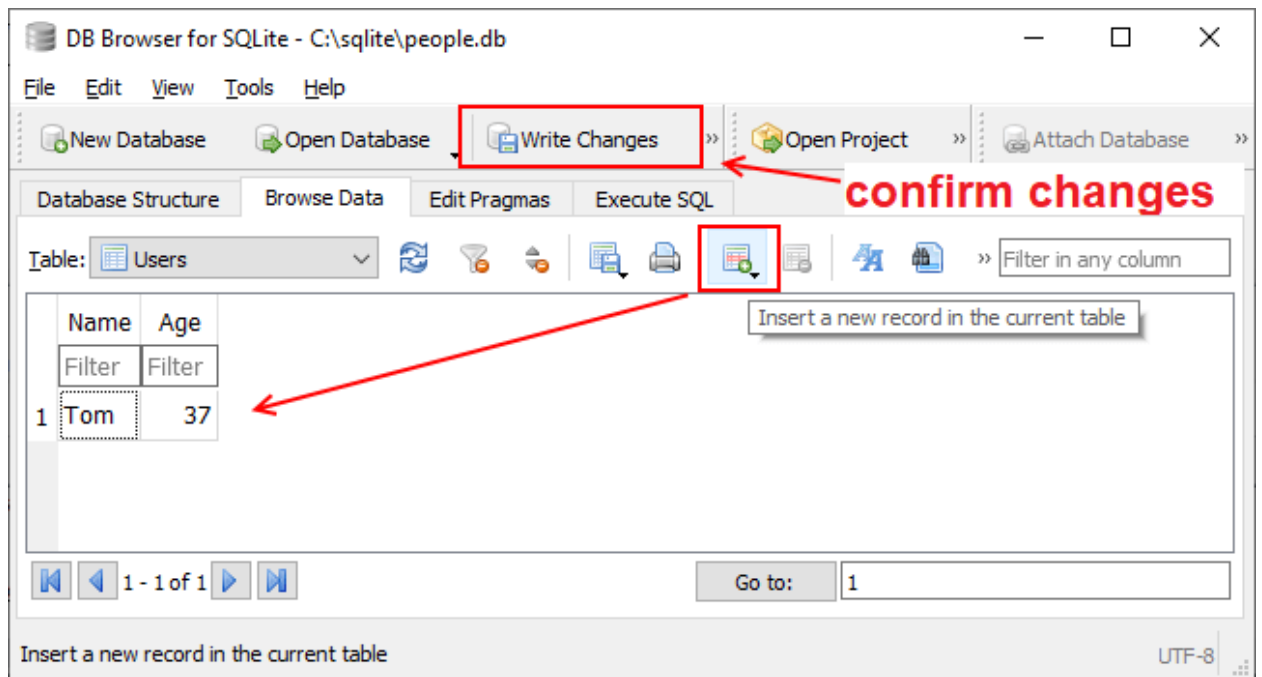That is, we will have a User table with columns Name and Age.

After defining the columns, click the OK button, and the program will generate a new table:
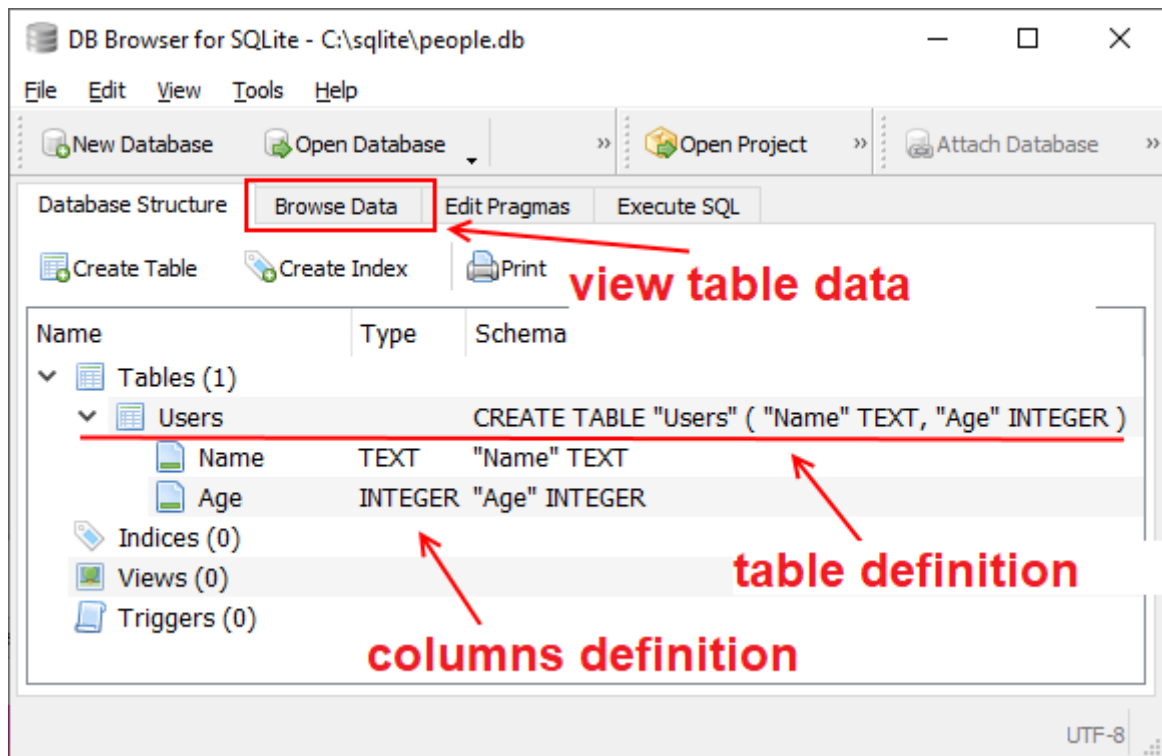
To manage data, go to the Browse Data tab. By default, we don't have any data
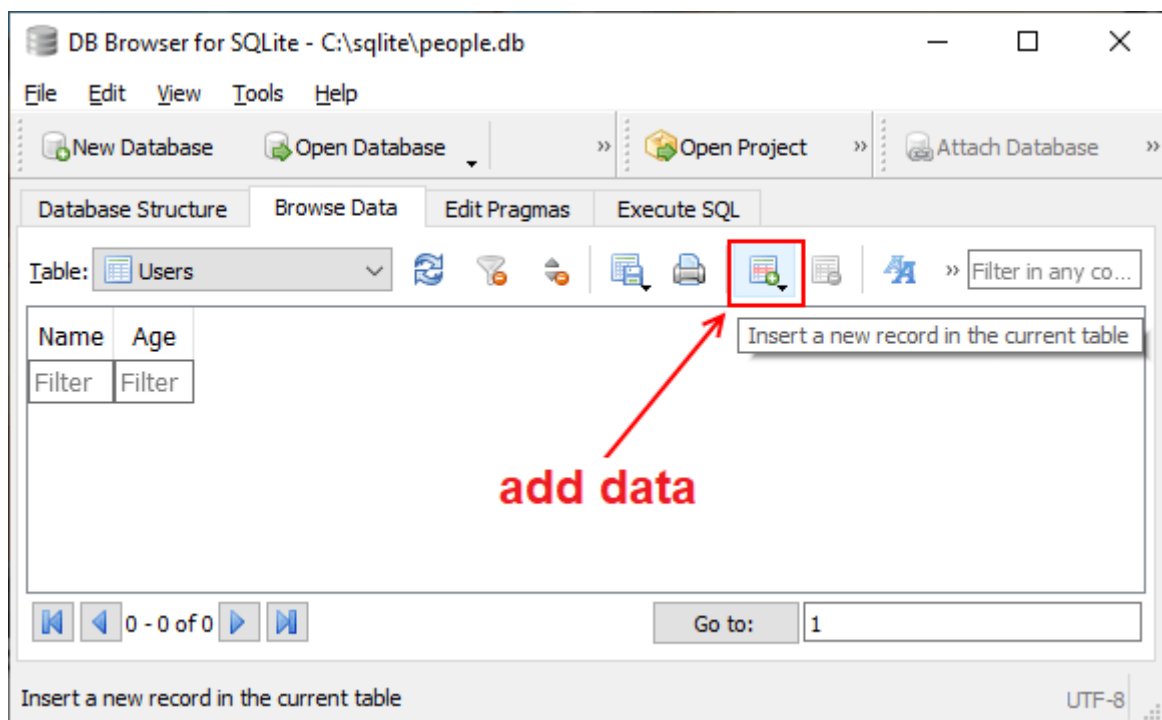
Let's add one row to the table. To do this, click on the button on the toolbar and enter some data in the added line:

After adding data (as well as after changing and deleting them), click the Write Changes button on the toolbar (or the File -> Write Changes menu item) to confirm the changes. And the data will be written to the database.

Execution of SQL queries

You can also use SQL queries to manipulate tables and data. To write and execute an SQL query, go to the Execute SQL tab
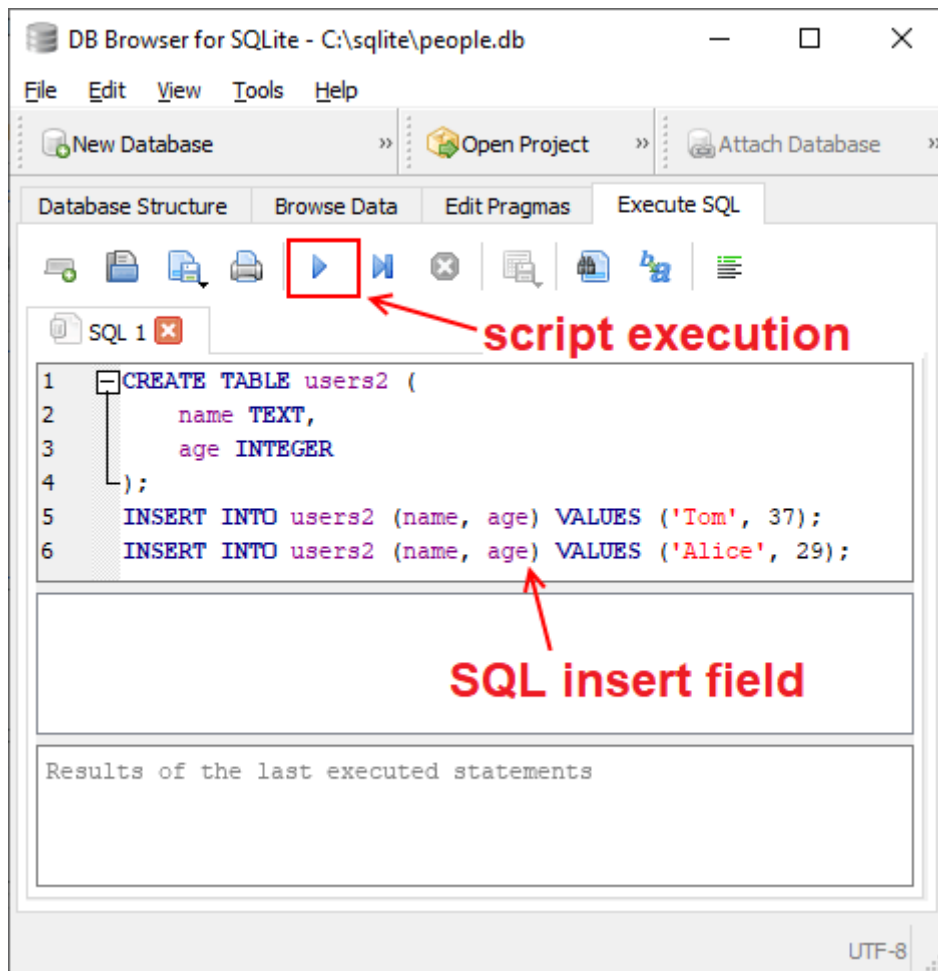
After that, a window for entering the SQL script will appear in the central part of the program. Enter the following command into it:

```
1   CREATE TABLE users2 (
2   name TEXT,
3   age INTEGER
4   );
5   INSERT INTO users2 (name, age) VALUES ('Tom', 37);
6   INSERT INTO users2 (name, age) VALUES ('Alice', 29);
```

Here, the users2 table is created, which is actually similar to the previously created users table. It also has two columns name and age. And I add two lines to it.
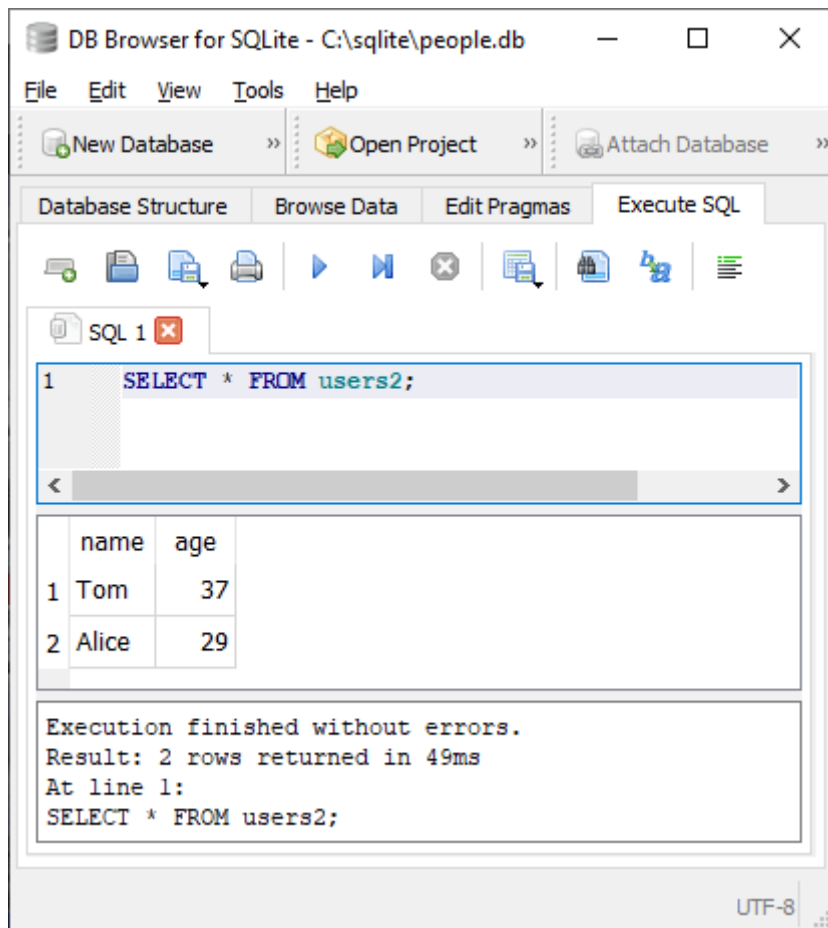
Click the blue arrow on the toolbar to execute this code. And after running the SQL code, we will be able to see the report of its execution
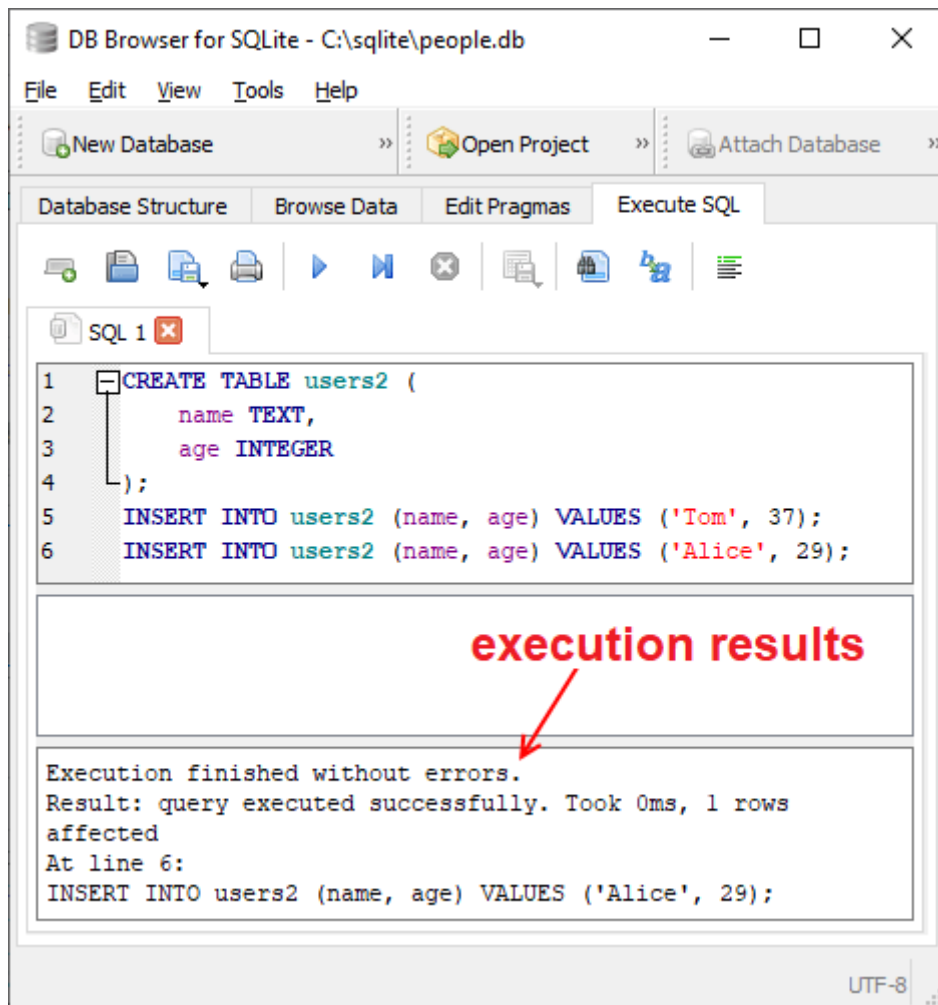
After adding we can get the data. To do this, enter the following code:

```
1   SELECT * FROM users2;
```

And also click on the SQL code execution button:

Or we can see the same data in the graphic designer: