JDBC INTEGRATED DEVELOPMENT ENVIRONMENT

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ABSTRACT-In this paper we discuss on creating a responsive UI for controlling and executing database and DBMS operations through root and server access. Shell access to a database for any server requires multiple rounds of testing and observation, to avoid this a UI can aid the developer for faster processing of the structure. This project uses a Java server for backend connection and shell access to the database. The queries will be executed in MySQL shell and the results will be taken from the shell. The user interface will be created using HTML, CSS, JS for frontend scripting. The data from the shell will be displayed in a responsive UI and gives the user complete control of the database server along with the proposed User Interface. This enables the user to control the connected database with complete root access. The project will be deployed using JDBC servers for easy access. The project will have user login system and provide the user a complete possibility to execute MySQL queries. It aims to provide the user an environment with ease to access and develop database environment.

Index Terms: JDBC servers, Database, GUI, IDE, SQL Queries, Shell.

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1. INTROCUCTION

An Integrated Development Environment (IDE) is a software application that provides comprehensive facilities to computer programmers for software development. An IDE normally consists of a source code editor, build automation tools, and a debugger. Most modern IDEs have intelligent code completion. Some IDEs, such as NetBeans and Eclipse, contain a compiler, interpreter, or both; others, such as Sharp-Develop and Lazarus, do not. The boundary between an integrated development environment and other parts of the broader software development environment is not well-defined. Sometimes a version control system, or various tools to simplify the construction of a graphical user interface (GUI), are integrated. Many modern IDEs also have a class browser, an object browser, and a class hierarchy diagram, for use in object-oriented software development.

Java Database Connectivity (JDBC) is a Java standard that provides the interface for connecting from Java to relational databases. The JDBC standard is defined and implemented through the standard java.sql interfaces. This enables individual providers to implement and extend the standard with their own JDBC drivers. JDBC is based on the X/Open SQL Call Level Interface (CLI). JDBC 4.0 complies with the SQL 2003 standard. This technology allows you to use the Java programming language to exploit "Write Once, Run Anywhere" capabilities for applications that require access to enterprise data. With a JDBC technology-enabled driver, you can connect all corporate data even in a heterogeneous environment.

MySQL is the world's most popular open source database. With its proven performance, reliability and ease-of-use, MySQL has become the leading database choice for web-based applications, used by high profile web properties including Facebook, Twitter, YouTube, Yahoo! and many more. It plays an important role in DBMS which is basically used for its ease to access data, tabular format data, easy deployment and platform independent.

Oracle drives MySQL innovation, delivering new capabilities to power next generation web, cloud, mobile and embedded applications.

2. LITERATURE SURVEY

Database IDE is a user-friendly database implementation tool which provides responsive and attractive UI for easy control over database.

HeidiSQL(Supported platforms: Windows XP, Vista, 7, 8, 10), previously known as MySQL-Front, is a FREE and open source client developed by German programmer Ansgar Becker and a few other contributors in Delphi in the year 2006. To manage databases with HeidiSQL, users must login to a local or remote MySQL server with acceptable credentials, creating a session. Within this session users may manage MySQL Databases within the connected MySQL server, disconnecting from the server when done. Its feature set is sufficient for most common and advanced database, table and data record operations but remains in active development to move towards the full functionality expected in a MySQL Frontend.

dbForge Studio (Supported platforms: Windows XP/7/8/8.1/10) for SQL Server is a powerful IDE for SQL Server administration, development, data reporting and analysis, manufactured by Devart in 1997. They mainly focus in creating database tools, ALM solutions, data providers, data integration and backup solutions as well as web and cloud services. The tool will help SQL developers to manipulate databases, speed up routine tasks, as well, as to make complex database changes. dbForge Studio for MySQL offers visual MySQL development and administration.

There are three editions: Express, Standard, and Professional:

Express is a FREE application that provides basic functionality for working with schema objects, user accounts, SQL scripts, and queries.

Standard includes additional tools for database administrators and developers, such as a debugger, Query Builder, code templates, object search, various export and maintenance wizards.

Professional is the most full-featured version and adds the following functionality: database projects, accurate comparison and synchronization of database structures (schema comparison) or database content (data comparison), debugging stored procedures and scripts, complex query creation.

Navicat for MySQL (Supported platforms: Microsoft Windows, Mac OS X, Linux, and iOS) was developed by PremiumSoft in the year 2002. It is both a database administration and development tool. It works with any MySQL database server from version 3.21 or above, and supports most of the latest MySQL features including triggers, stored procedures, functions, events, views, and user management. Features in Navicat are sophisticated enough to cater to professional developers' specific needs, yet easy to learn for users who are new to MySQL.

MySQL Workbench (Supported platforms: Microsoft Windows, Mac OS X and Linux) was developed by Sun Systems/Oracle. The first preview version of MySQL Workbench was released in 2005 but was not included in the MySQL GUI Tools Bundle. Development was started again in 2007 and stable release for users was made available in 2017. MySQL Workbench is a visual database design tool that integrates SQL development, administration, database design, creation and maintenance into a single development environment. It is the successor to DBDesigner 4 from fabFORCE.net and replaces the MySQL GUI Tools Bundle. The current version is 6.3, the earliest version being 5.0, which emphasized the fact that MySQL Workbench was developed as the successor to DBDesigner4. It provides DBAs and developers an integrated tools environment for:

➢ Database Design & Modeling
➢ SQL Development
➢ Database Administration
➢ Database Migration

Tobias Ratschiller, then an IT consultant and later founder of the software company Maguma, started to work on a PHP-based web front-end to MySQL in 1998, inspired by Peter Kuppelwieser's MySQL-Webadmin. He gave up the project (and phpAdsNew, of which he was also the original author) in 2000 because of lack of time. By that time, phpMyAdmin had already become one of the most popular PHP applications and MySQL administration tools, with a large community of users and contributors. In order to coordinate the growing number of patches, a group of three developers, Olivier Müller, Marc Delisle and Loïc Chapeaux, registered the phpMyAdmin project at SourceForge.net and took over the development in 2001. phpMyAdmin (Supported platforms: Microsoft Windows, Mac OS X and Linux, PHP 4 - 5 and MySQL 3 – 5) is a FREE software tool written in PHP intended to handle the administration of MySQL over the Internet. phpMyAdmin supports a wide range of operations with MySQL, the most frequently used being the managing of databases, tables, fields, relations, indexes, users, permissions. We still have the ability to execute SQL statements directly as well.

Table 3.1: Survey about the proposed work.

Name of the Author	Title of the Paper	Publications/ Year	Concept	Advantages	Disadvantages
Ansgar Becker	A basic approach to HeidiSQL	2006	Its feature set is sufficient for most common and advanced database, table and data record operations but remains in active development to move towards the full functionality expected in a MySQL Frontend.	Great and easy to use UI. Very comprehensive and intuitive interface. Ability to connect to MySQL database via an SSH tunnel, in case you don't have the default port open for remote connections.	Some users are reporting sudden crashes / bugs, but nothing that significantly interrupts the daily usage.
Devart	dbForge : A Documentary Overview	1997	They mainly focus in creating database tools, ALM solutions, data providers, data integration and backup solutions as well as web and cloud services. The tool will help SQL developers to manipulate databases, speed up routine tasks, as well, as to make complex database changes.	Built in query profiler that allows to profile the query and compare it with other queries. GUI query builder and database builder. Drag and drop to build your own custom queries and database schema.	The full version has a significant cost.
PremiumSoft	Introduction to	2002	It is both a	Ability to connect	The full version

	Navicat for MySQL and PostgreSQL		database administration and development tool. It works with any MySQL database server from version 3.21 or above, and supports most of the latest MySQL features including triggers, stored procedures, functions, events, views, and user management.	to MySQL database via an SSH tunnel, in case you don't have the default port open for remote connections. Visual schema and query builders.	has a significant cost.
Sun Systems/Oracle	MySQL WorkBench Documentary	2017	It is a visual database design tool that integrates SQL development, administration, database design, creation and maintenance into a single development environment.	Intuitive and very easy to use UI. Free to download, licensed under GPL.	The software is sometimes buggy and many software freezes / crashes are reported. Sometimes large queries can't be stopped and have to be forcefully killed (sometimes the entire application has to be killed).
Tobias Ratschiller	Mastering phpMyAdmin for Effective SQL Management	1998	phpMyAdmin is a free software tool written in PHP intended to handle the administration of MySQL over the Web. phpMyAdmin supports a wide range of operations on MySQL and MariaDB.	Intuitive web interface Support for most MySQL features: browse and drop databases, tables, views, fields and indexes create, copy, drop, rename and alter databases, tables, fields and indexes maintenance server, databases and tables, with proposals on server settings.	Browser dependant. Using a gui won't improve your sql skills it will improve your gui skills but won't help if you move to an environment where Toad (for example) is the development tool.

3. JDBC IDE

The system will be comprising mainly of two modules:

1.**LOGIN PAGE**
- ➢ Login Page is very first module of this project.
- ➢ Like every other Login Page, it's a page to create and record User's entry in our database.
- ➢ It has got a great background image.
- ➢ Ensuring personal database of User.
- ➢ Two text fields:
  - i. User Id or User name.
  - ii. Password for the account.

2.**MAIN PAGE**
- ➢ Main Page: User interface for further interaction with database.
- ➢ Page where user can create and manipulate his database.
- ➢ All basic operations of SQL database with similar operational features.
- ➢ Buttons for every operation.
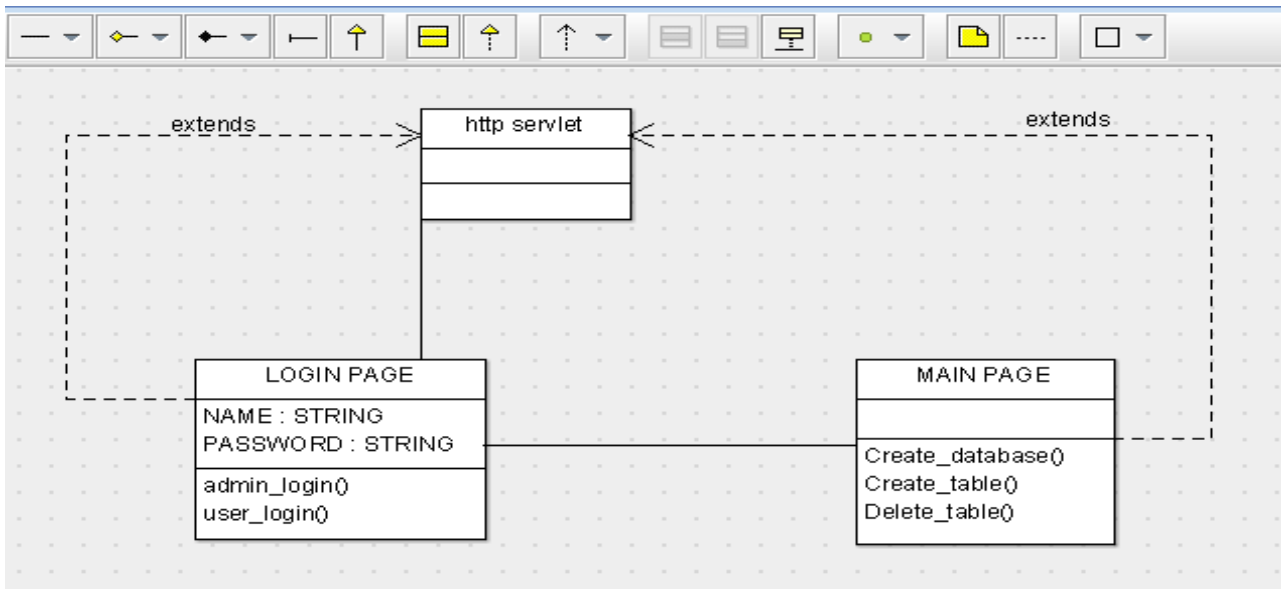- ➢ Easy language – No boring SQL queries.

Fig 1. Class Diagram of the UI

We have three components here:
- i.   User Interface
- ii.   SQL Shell
- iii.   JDK

➢ Through UI user input queries for creating and manipulating table content.
➢ JavaScript for interactive UI (Java application layer).
➢ A Database get created for user through JDBC.
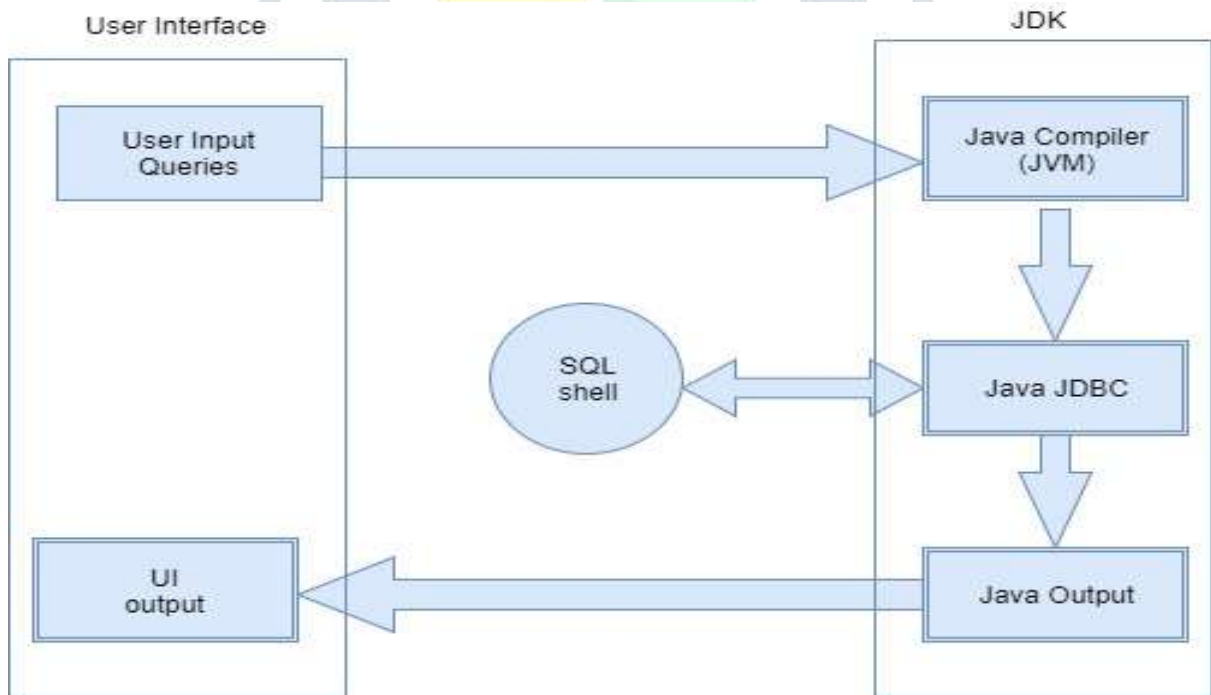➢ Java JDBC manager communicates with SQL shell and get feedback from it which is displayed on screen.

Fig 2. System Architecture

3.1 DATABASE GUI
➢ Database GUI helps a user to do all database operations through a GUI provided with minimal knowledge of the database. Here user can do all database activities like Creating Table, Inserting Data, Joining two tables etc. with minimal knowledge of queries without having the knowledge of whole database can access through GUI.
➢ More user-friendly database implementation tool with full featured working experience of SQL engine.

- ➢ This part of the system deals with generating, executing and listening to the queries through GUI created using Java.
- ➢ It can run anywhere java can.
- ➢ It is as platform independent as Java is.
- ➢ This application runs each query in a separate thread so the GUI remains alive while a query is running.
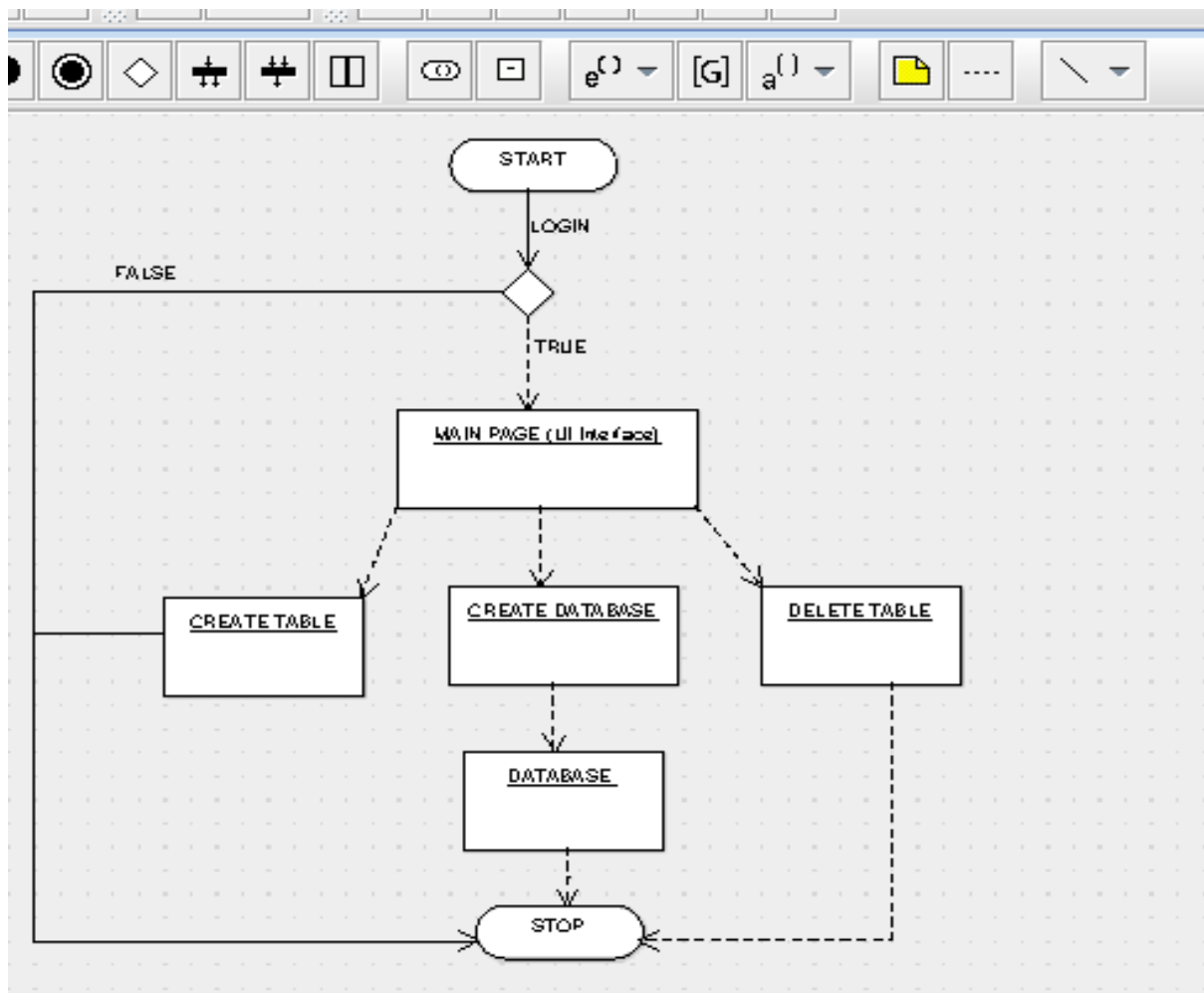

Fig 3. Data Flow Diagram

3.2 ALGORITHM, INPUT WORK AND OUTPUT WORK

3.2.1 LOGIN MODULE:

```
LoginPage(bool truth_value)
Input: user_id, password
Output: MainPage_UI(user_id)
{
if (truth_value == true) {
    MainPage_UI(user_id)
}else{
    exit()
    }
}
```

- • Two text fields:
  1. User Id or User name.
       2. Password for the account.
- • User gives input for the two text fields for logging in.
- • If user logging is successful, the user is directed to the MainPage_UI, else login fails.

3.2.2 MAIN PAGE MODULE:

```
MainPage(user_id)
Input: User input or queries
Output: Database/Table creation and manipulation
```

```
{
    (using JavaScript):
            create_table(SQL Queries)
            update_database(SQL Queries)
            show_table(SQL Queries)
            alter_table(SQL Queries)
            delete_table(SQL Queries)
            delete_database(SQL Queries)
    exit()
}
Example:
Create_table(SQL Queries) using JDBC
{
    Create new Table
    SQL_shell (UI_output)
}
```

- Main Page: User interface for further interaction with database.
- Page where user can create and manipulate his database.
- All basic operations of SQL database with similar operational features.
- Through UI user input queries for creating and manipulating table content.
- JavaScript for interactive UI (Java application layer).
- A Database get created for user through JDBC.
- Java JDBC manager communicates with SQL shell and get feedback from it which is displayed on screen.

4. RESULTS AND DISCUSSIONS

➢ Our proposed project aims on providing a simple access of database functionalities to more & more users.
➢ It is an integration of Html, JavaScript, bootstrap along with JDBC, Tomcat Server and the SQL environment.
➢ Broadens the SQL query knowledge of the user.
➢ Reduces hectic user interface and is an efficient GUI.
➢ Proper handling of storage.
➢ Enhanced security functionalities.
➢ This project can be enhanced and integrated with various other applications for further use.

It has all the features of RDBMS (Relational Database Management System). As it actually runs on SQL Engine. It also preserves data integrity such as Entity integrity and Domain integrity.

This system supports all the basic SQL Query **Functionalities** such as:

➢ Create Table: To Create table, user can assign name to this particular table.
➢ Update Table: updates table with new entries in terms of table modification.
➢ Show Database: Displays all contents of that particular database.
➢ Show Table: Displays whole table with all recorded entries.
➢ Delete Table: Deletes particular table.
➢ Delete Database: Deletes particular Database.
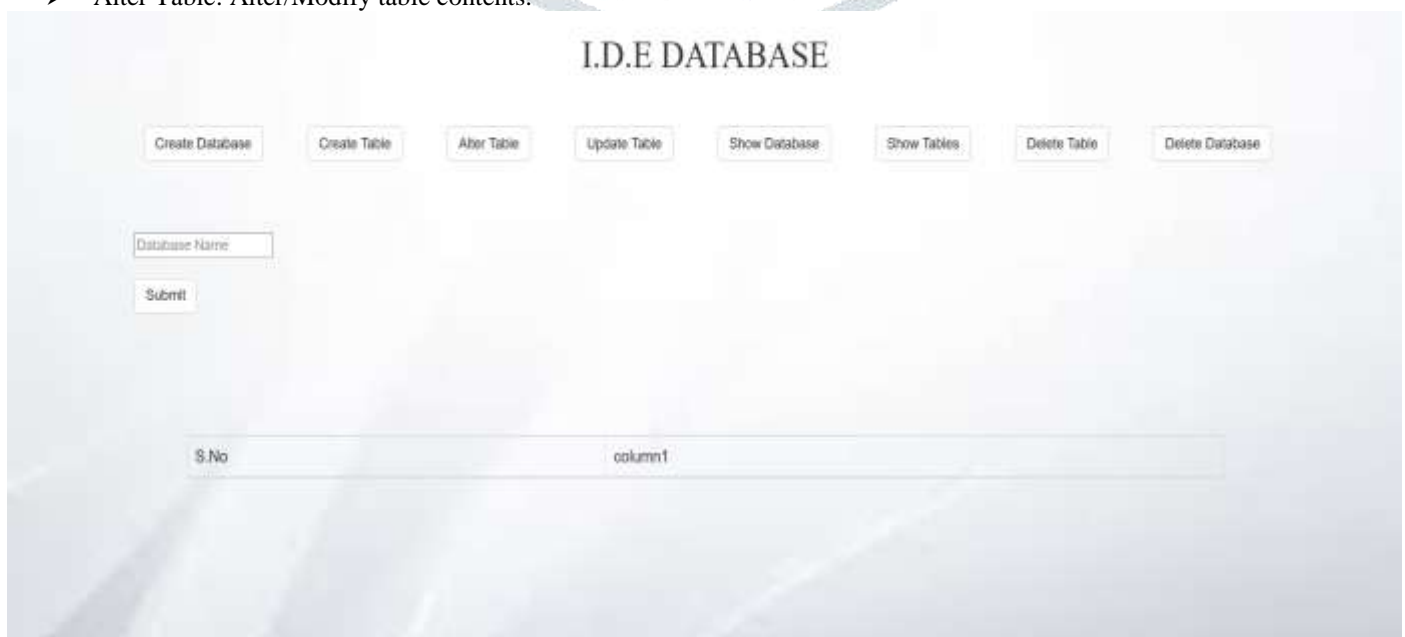➢ Alter Table: Alter/Modify table contents.

Fig 4. Functionalities UI

5. CONCLUSION

A responsive and user-friendly UI has been produced using JDBC and Database IDE. That is, the objective of the research of creating a database IDE with a GUI was achieved. This incorporated a fully scalable GUI database of MySQL Queries with different functionalities buttons where user can manage database tables; and lastly automation few survey computations. This GUI tool provides efficiency in many ways like database access time will be reduced significantly to those who are using it. It will not only reduce the complex user interface of using a database with sql queries but also help in broadening the user's knowledge in MySQL. Efficient storage handling is also achieved.

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