CS221: Programming II

Database Management System

Report

Team Members

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Introduction

Keeping data permanently on a non-volatile memory is an important issue in software development. Saving data in files is the solution thus database management systems appeared.

This is a database management system that allows the user to easily save data in tables and manipulate it by: insert new row, edit existing table, delete element from table, select items from table, drop table and create new tables in different database files.

Design Overview

The design is divided into 4 major parts:

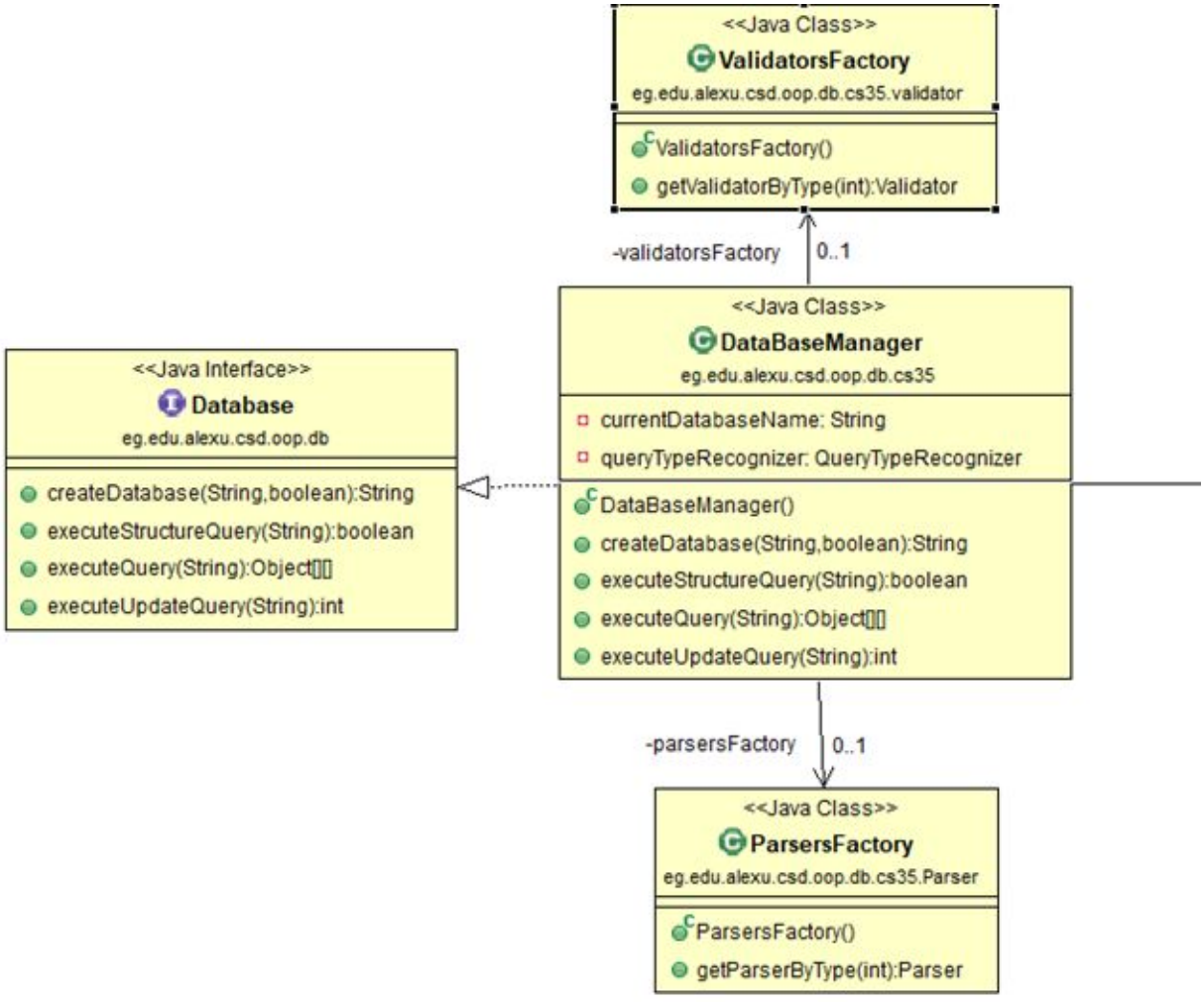
- Validation of the coming query.
- Parsing of the validated query.
- Synthesizing a command to perform the task.
- Executing the command.

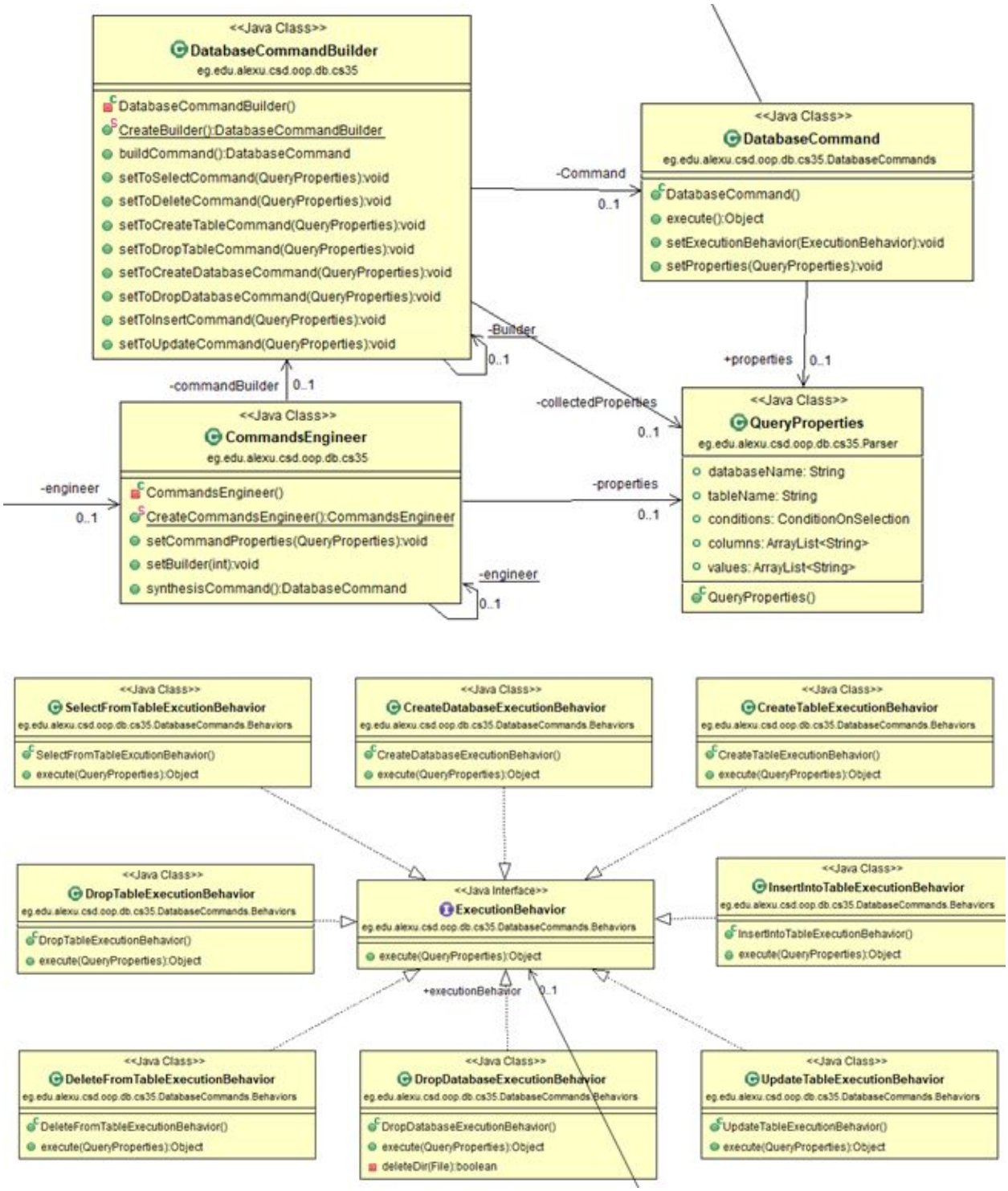
The validation part is made using “Pattern” class which use certain regex to validate each query. The validation of each query is kept in its own class and all the validator classes implements the same interface so by the means of a factory pattern any of this validators can be injected into the main class. There are some utilities common for all the validators so they are encapsulated in their own class. After validation parsing process takes place.
The parsers part is where the query is cut into parts where these parts form the query properties. The query properties is kept in a tailor made class for this purpose only and then is returned to continue and synthesis the command.
An engineer ”director” informs the command builder to build a certain command depending on the type of query sent. The command is built by injecting certain behavior into its structure “Strategy DP” where the behaviors are the lowest level operations in the design where the contact with files takes place.
Executing the command after synthesizing will perform the injected behavior and return certain values.

Design Patterns Used

- **Factory DP**: Used three times in the design to create validators and parsers; One with low level to create comparison behaviors depending on a certain condition.
- **Builder DP**: Used in the manufacturing of the command to be executed.
- **Strategy DP**: Used in injecting the execution behavior into the constructed command
- **Singleton DP**: Only one engineer and one builder are allowed at runtime.
- **Command DP**: “not implemented literally but with the same logic”. Common class with “execute ()” method that carries out certain algorithm.

UML Diagrams and Classes Relations

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DatabaseCommandBuilder
eg.edu.alexu.csd.oop.db.cs35
DatabaseCommandBuilder()
CreateBuilder():DatabaseCommandBuilder
buildCommand():DatabaseCommand
setToSelectCommand(QueryProperties):void
setToDeleteCommand(QueryProperties):void
setToCreateTableCommand(QueryProperties):void
setToDropTableCommand(QueryProperties):void
setToCreateDatabaseCommand(QueryProperties):void
setToDropDatabaseCommand(QueryProperties):void
setToInsertCommand(QueryProperties):void
setToUpdateCommand(QueryProperties):void
-Command
0..1
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DatabaseCommand
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setProperties(QueryProperties):void
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+properties
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-commandBuilder
0..1
-collectedProperties
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setBuilder(int):void
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-properties
0..1
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databaseName: String
tableName: String
conditions: ConditionOnSelection
columns: ArrayList<String>
values: ArrayList<String>
QueryProperties()
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SelectFromTableExcutionBehavior()
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CreateDatabaseExecutionBehavior
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CreateDatabaseExecutionBehavior()
execute(QueryProperties):Object
<<Java Class>>
CreateTableExecutionBehavior
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CreateTableExecutionBehavior()
execute(QueryProperties):Object
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DropTableExecutionBehavior
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+executionBehavior
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UpdateTableExecutionBehavior()
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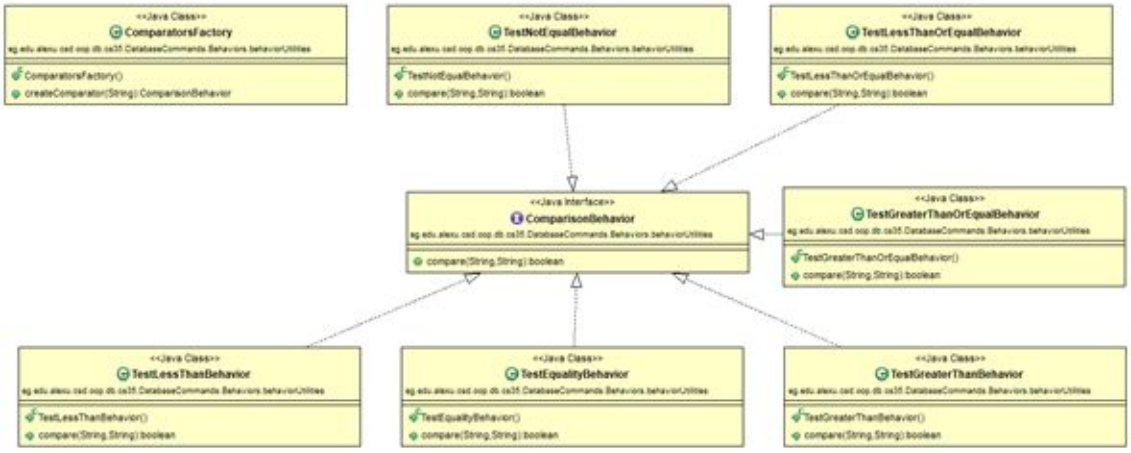
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TestLessThanOrEqualBehavior()
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TestLessThanBehavior()
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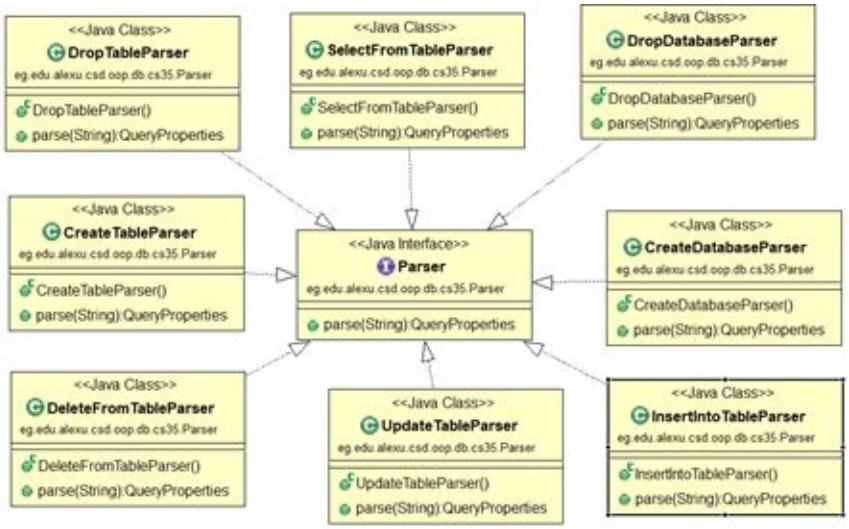
TestGreaterThanBehavior()
compare(String,String):boolean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DeleteFromTableParser()
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UpdateTableParser()
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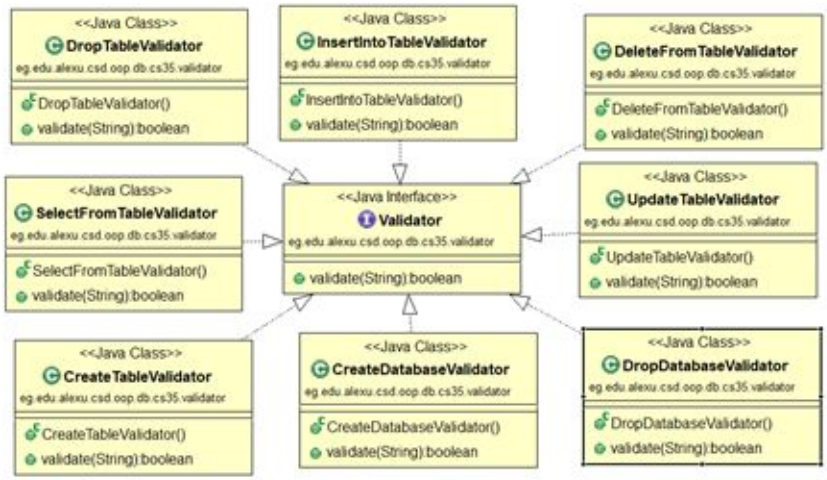
InsertIntoTableParser()
parse(String):QueryProperties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DropTableValidator()
validate(String):boolean
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Validator
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UpdateTableValidator()
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CreateTableValidator
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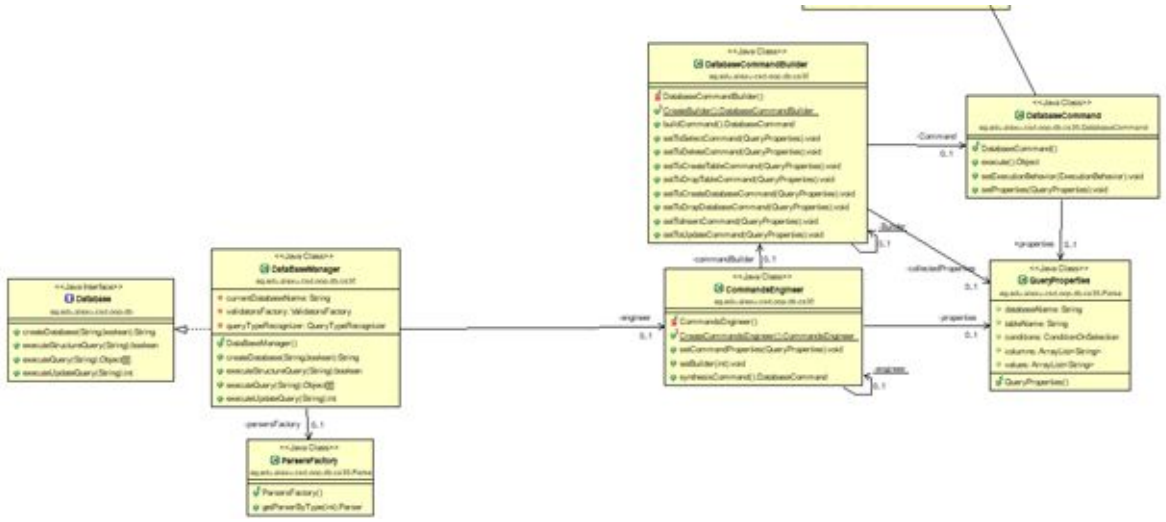
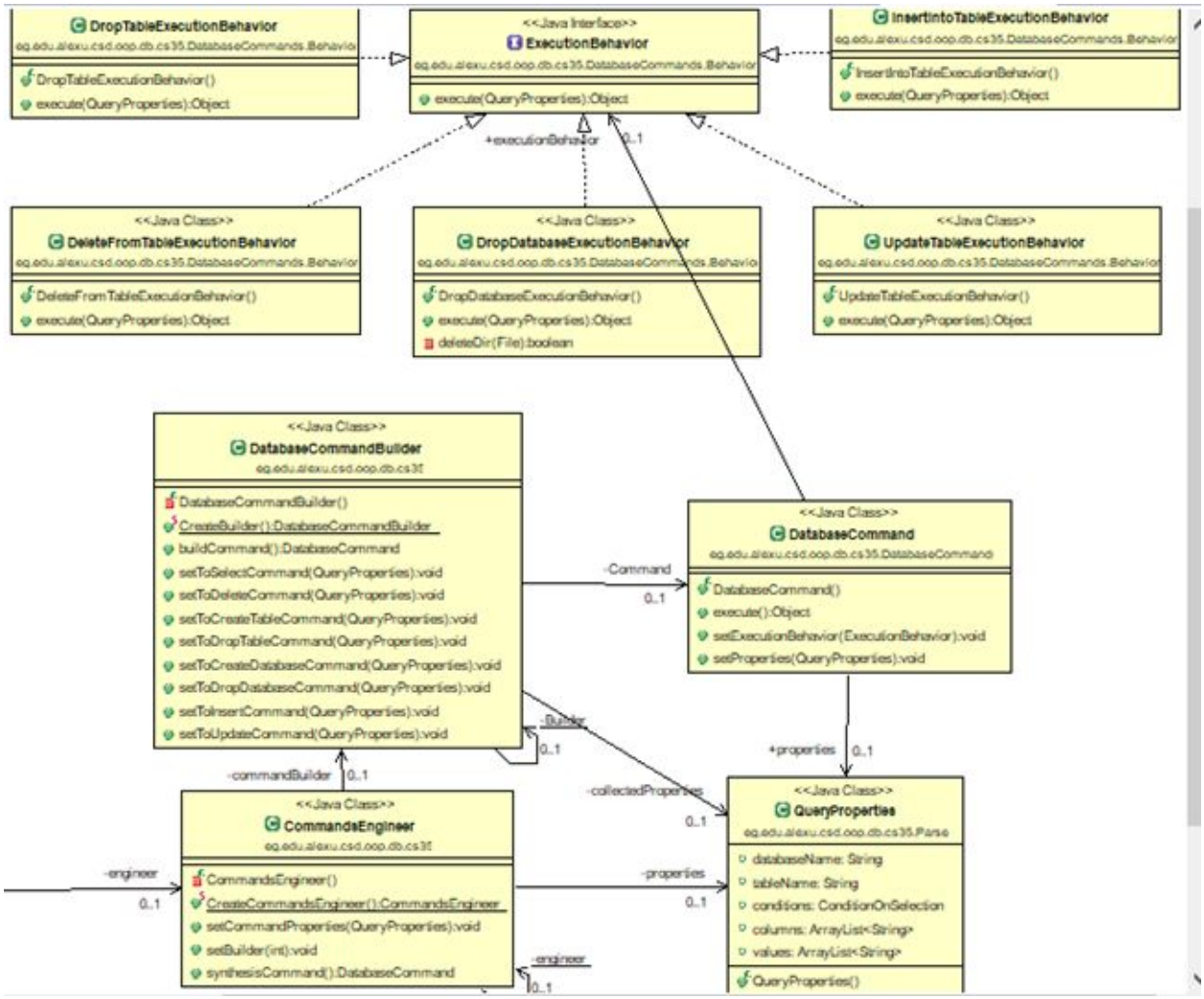
DropDatabaseValidator()
validate(String):boolean




DropTableExecutionBehavior
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DropTableExecutionBehavior()
execute(QueryProperties):Object
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ExecutionBehavior
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DatabaseCommand()
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+properties
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CommandsEngineer
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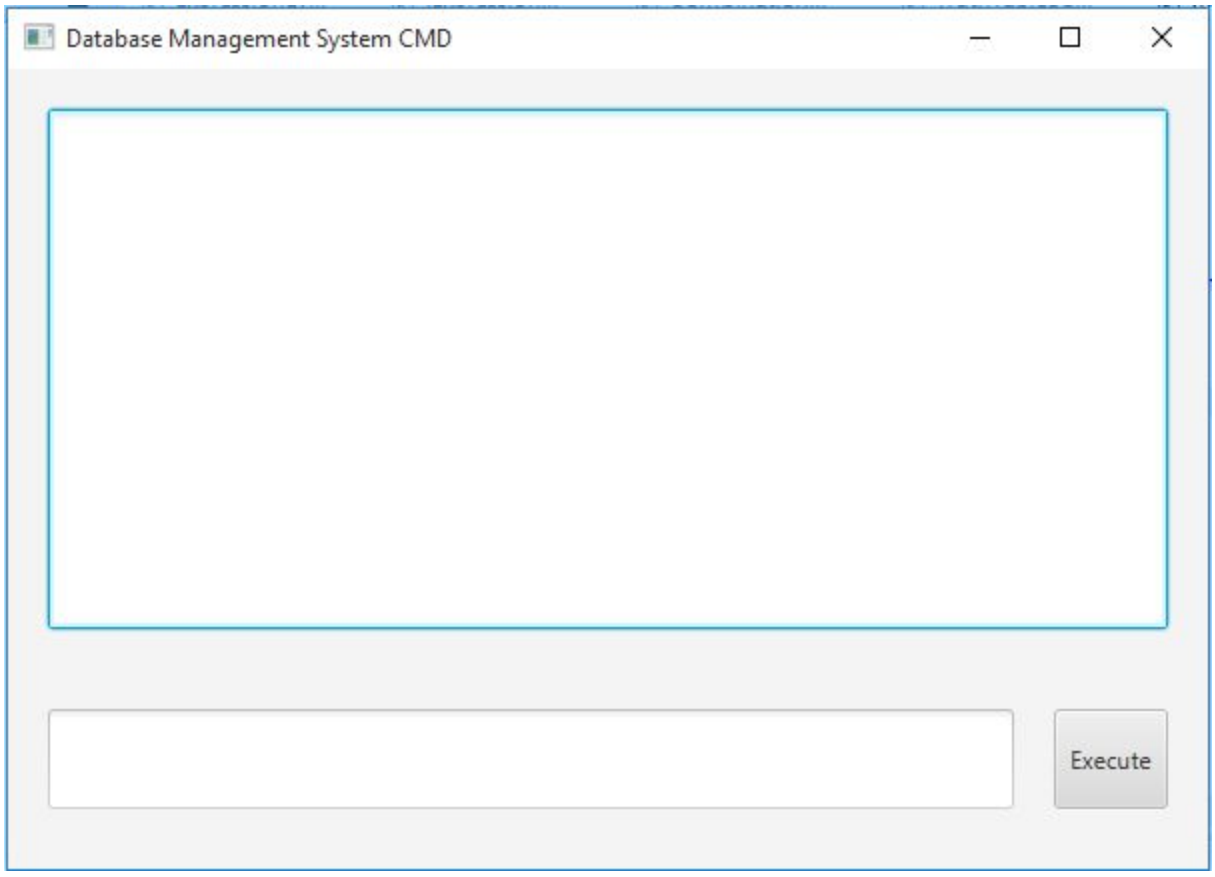
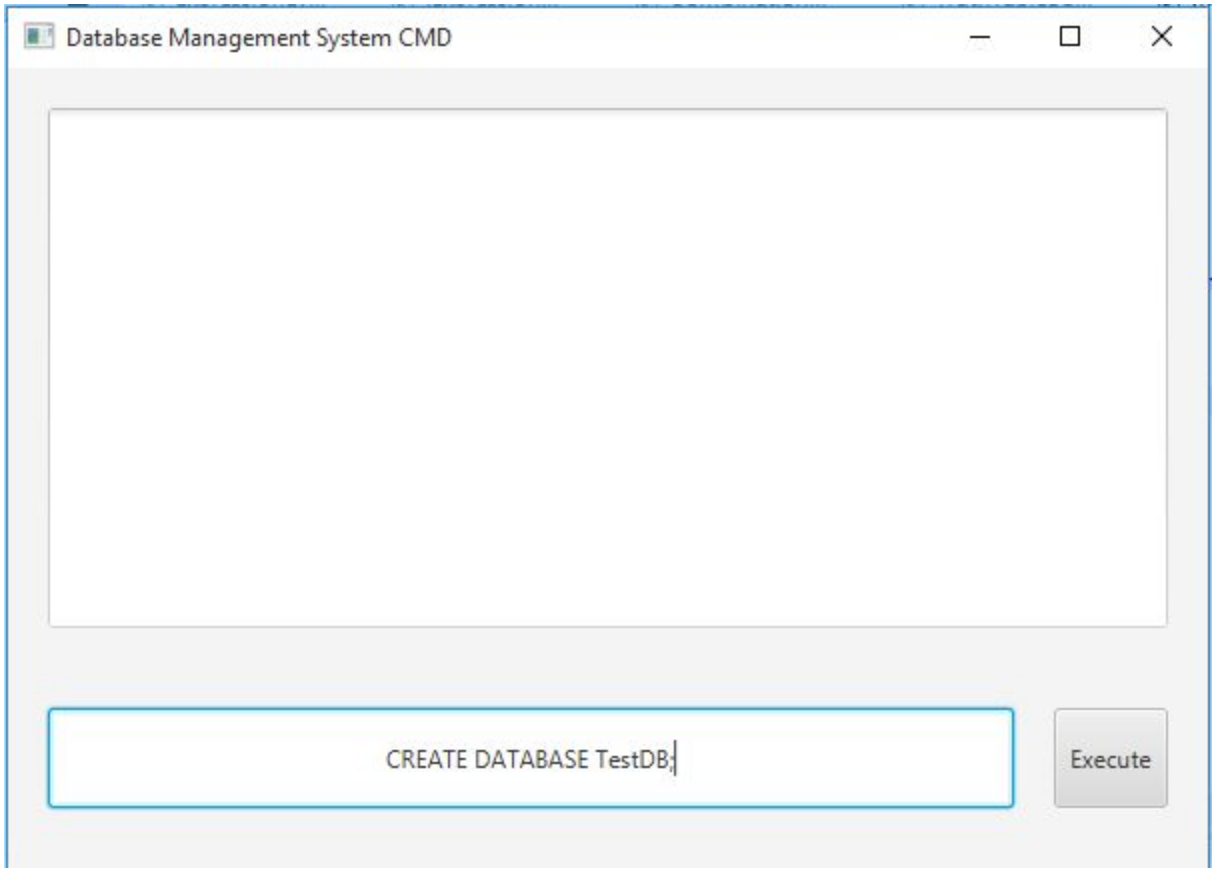
CommandsEngineer()
CreateCommandsEngineer():CommandsEngineer
setCommandProperties(QueryProperties):void
setBuilder(int):void
synthesisCommand():DatabaseCommand
-properties
0..1
-engineer
0..1
<<Java Class>>
QueryProperties
eg.edu.alexu.csd.oop.db.cs35.Parse
databaseName: String
tableName: String
conditions: ConditionOnSelection
columns: ArrayList<String>
values: ArrayList<String>
QueryProperties()

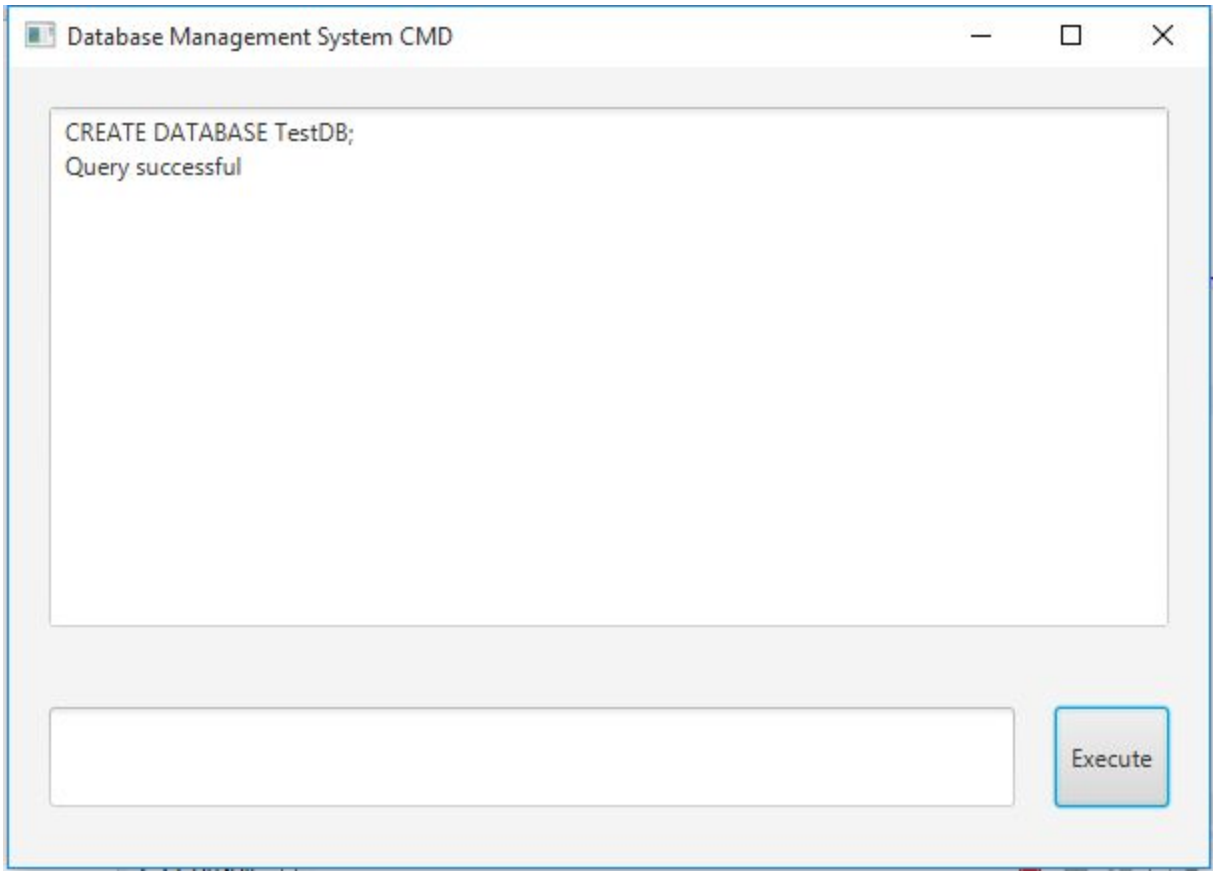
GUI Snapshots

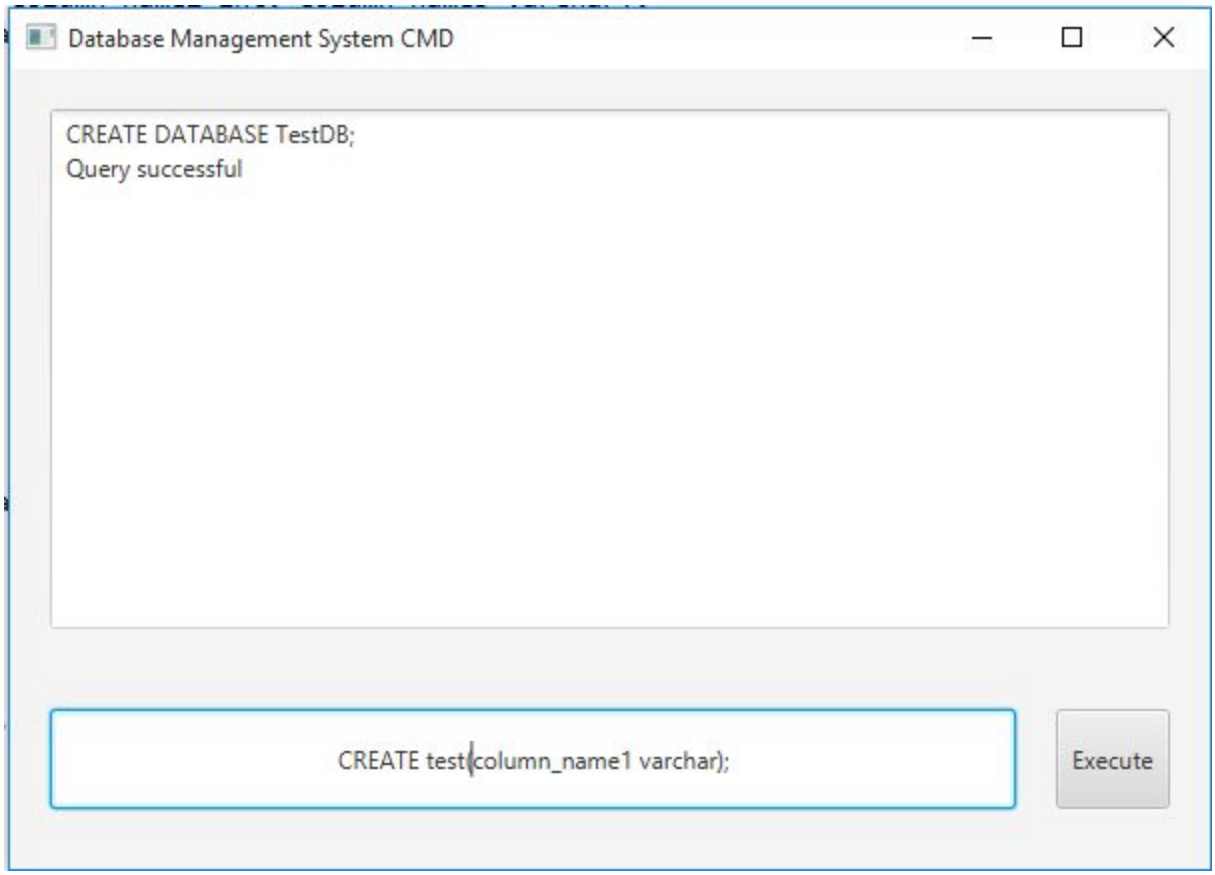
When you open the program, the following window will appear

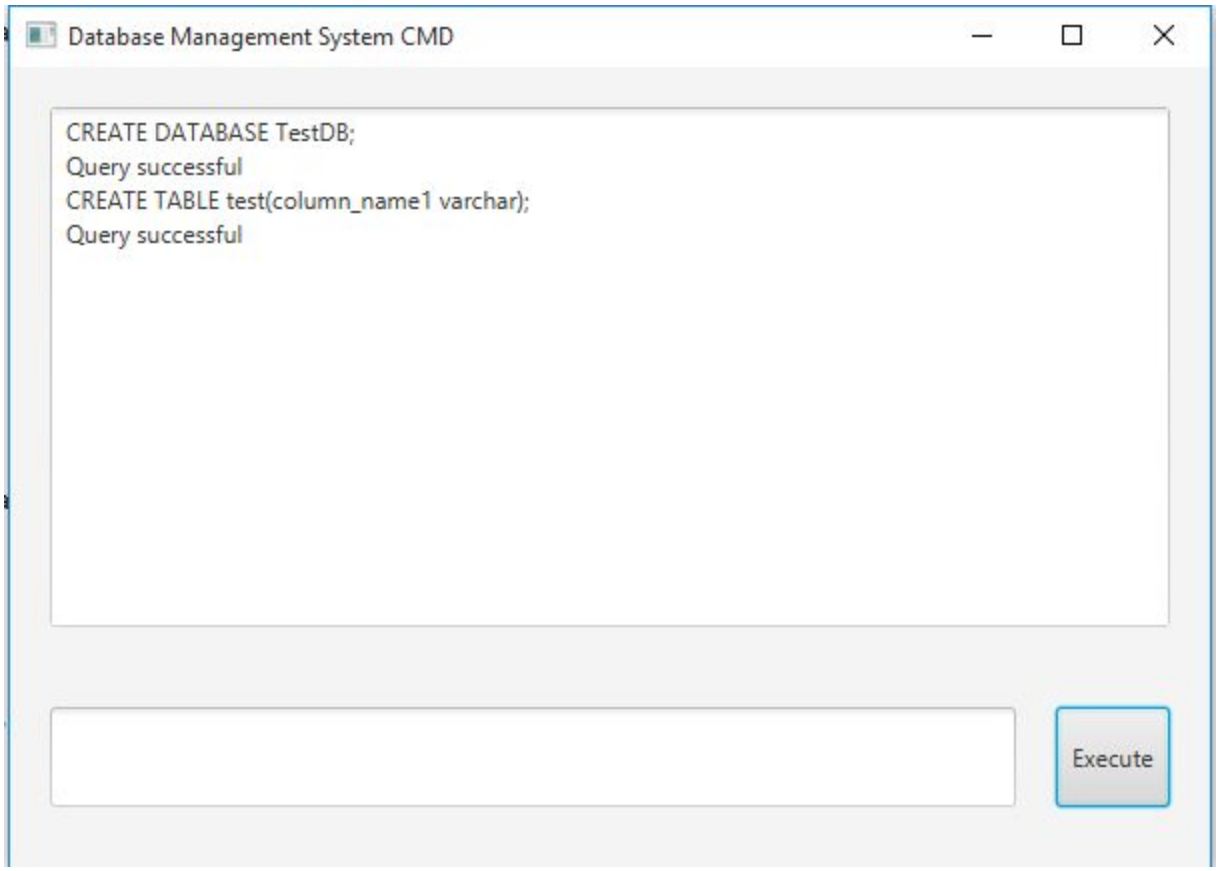


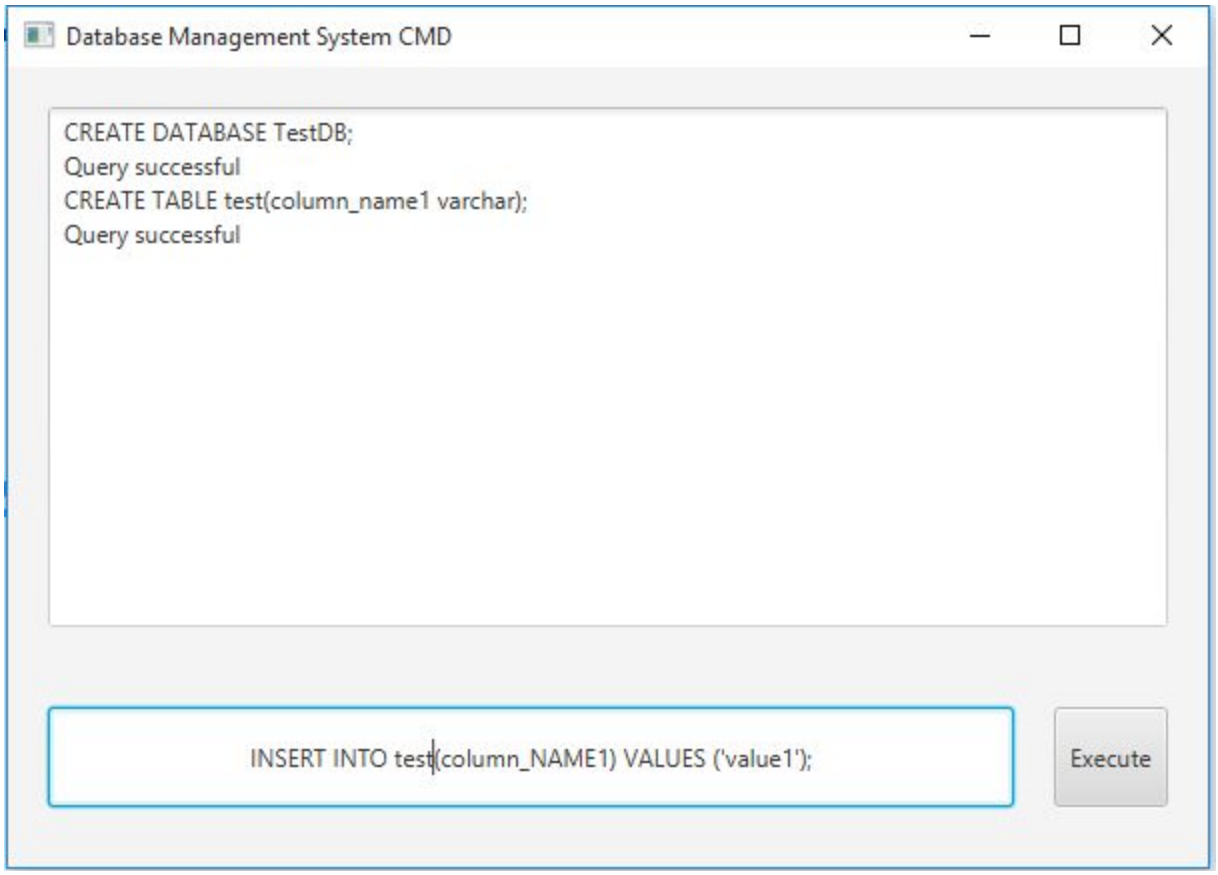
You can write the query in the text field at the bottom and the query status and result will be shown in the above panel, the following figures illustrates this

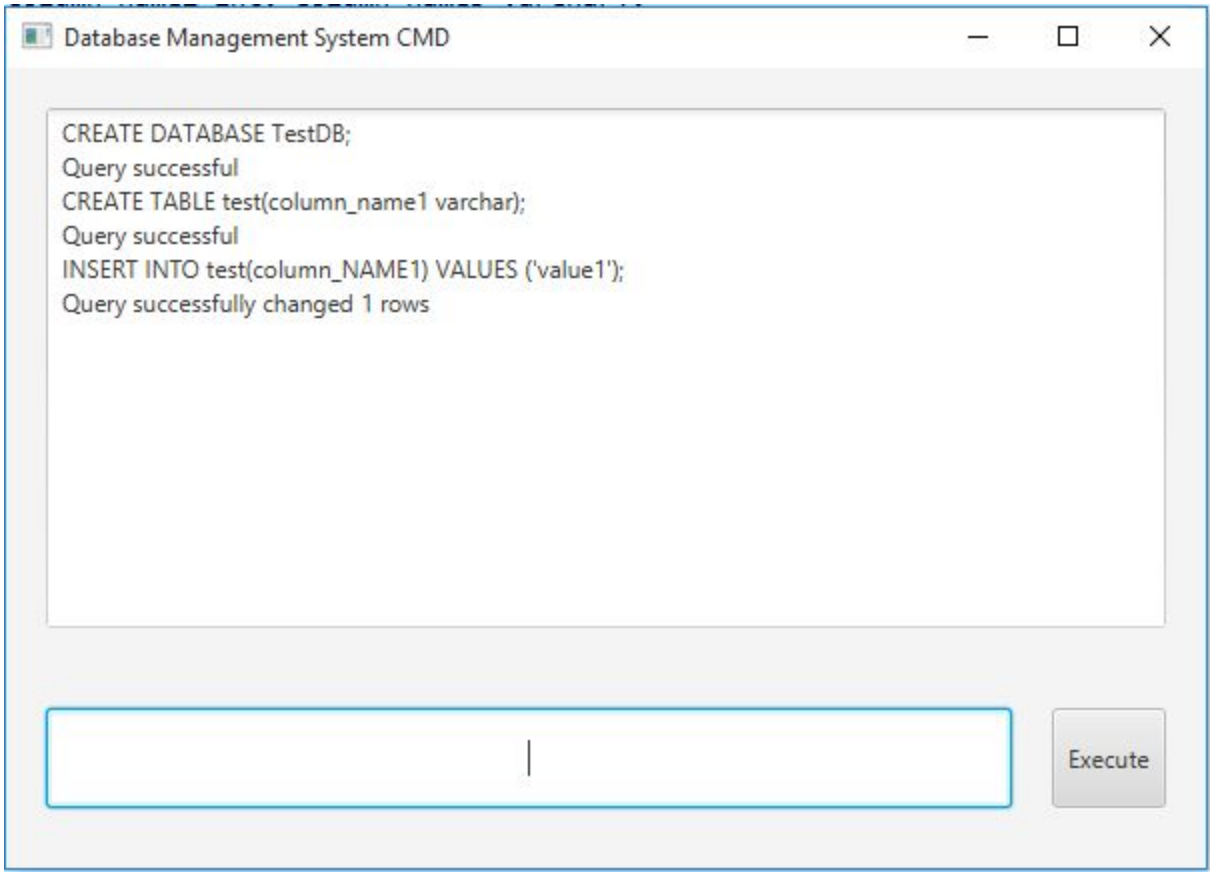


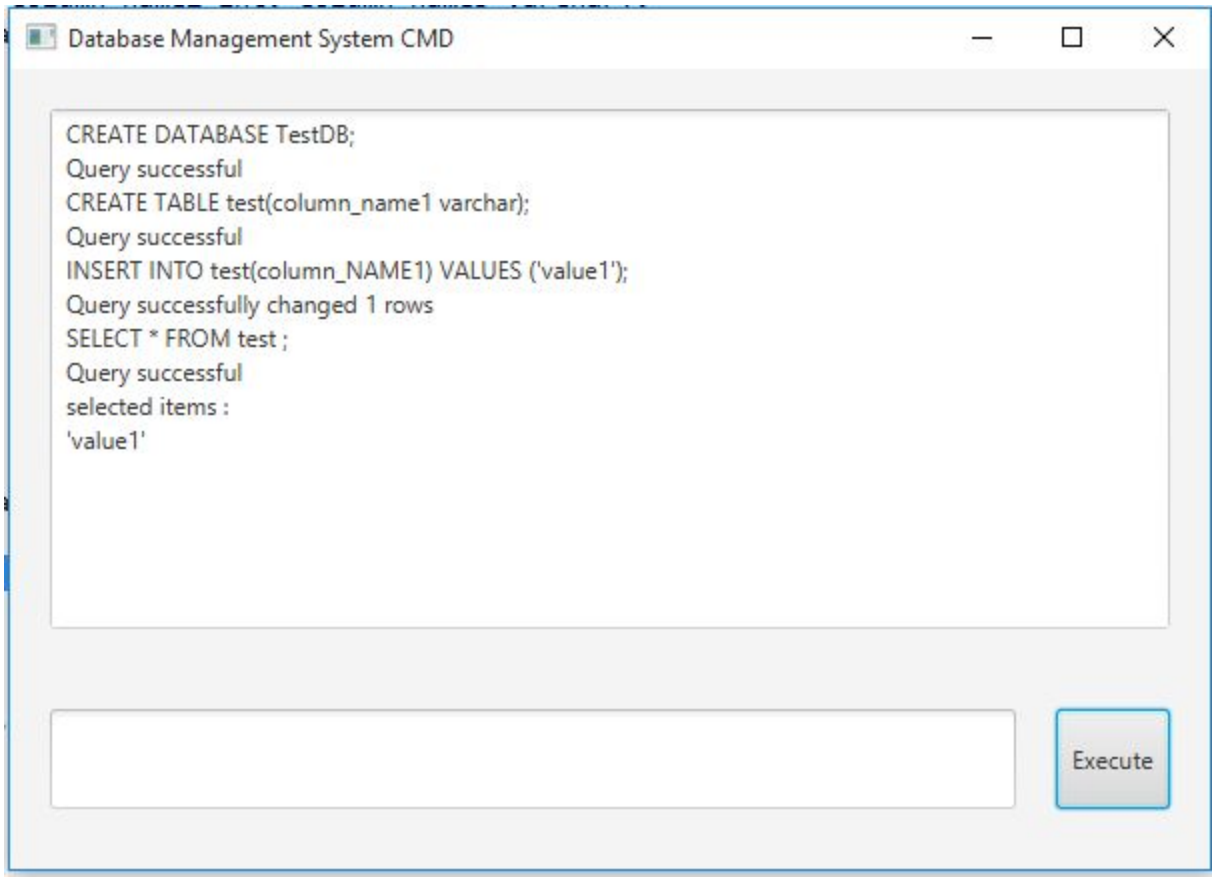

Database Management System CMD
CREATE DATABASE TestDB;
Query successful
Execute


Database Management System CMD
CREATE DATABASE TestDB;
Query successful
CREATE test(column_name1 varchar);
Execute


Database Management System CMD
CREATE DATABASE TestDB;
Query successful
CREATE TABLE test(column_name1 varchar);
Query successful
Execute


Database Management System CMD
CREATE DATABASE TestDB;
Query successful
CREATE TABLE test(column_name1 varchar);
Query successful
INSERT INTO test(column_NAME1) VALUES ('value1');
Execute


Database Management System CMD
CREATE DATABASE TestDB;
Query successful
CREATE TABLE test(column_name1 varchar);
Query successful
INSERT INTO test(column_NAME1) VALUES ('value1');
Query successfully changed 1 rows
Execute



References

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- http://www.vogella.com/tutorials/JavaRegularExpressions/article.html