

# Oracle Multimedia Lab

## Setup the Project

Download the [project template](#) [../download-oracle-project-template.zip] using Oracle JDBC to query the Oracle database server. Open the project template in your Java IDE (e.g., in NetBeans). Run also an SQL Developer and connect to the Oracle server.

## Product Table

In SQL Developer, write and submit a CREATE TABLE statement to create table `Product` with the following columns:

- `code` will be a number and a primary key of the table,
- `title` will be a string (e.g., VARCHAR2),
- `image` will be `ORDSYS.ORDImage`,
- `image_si` will be `ORDSYS.SI_StillImage`,
- `image_ac`, `image_ch`, `image_pc`, and `image_tx` will be `ORDSYS.SI_*` types for average color, color histogram, positional color, and texture, respectively.

For the solution, you can check the `product-init.sql` file in the [multimedia solution](#) [../download-oracle-lab-multimedia.zip].

## Product Class and the Main Method

### Product Class

Let us suppose, there is a `Product` class with the following declaration:

```
package dbs.oracle_project_template;

import oracle.jdbc.OraclePreparedStatement;
import oracle.jdbc.OracleResultSet;
import oracle.ord.im.OrdImage;

import java.io.IOException;
import java.sql.Connection;
import java.sql.PreparedStatement;
import java.sql.ResultSet;
import java.sql.SQLException;

public class Product {
    private int code;
    private String title;

    /**
     * Construct a new Product of the provided code and title.
     *
     * @param code    code of the product
     * @param title   title of the product
     */
    public Product(int code, String title) {
        throw new UnsupportedOperationException();
    }

    /**
     * Construct a new Product of the provided code and load the
     rest of its properties from a database.
     *
     * @param connection database connection
     * @param code        code of the product
     * @throws NotFoundException the product of this particular
code is not in the database
     * @throws SQLException      SQL error
     */
    public Product(Connection connection, int code) throws
NotFoundException, SQLException {
        throw new UnsupportedOperationException();
    }

    /**
     * Get a code of the product.
     *
     * @return code of the product
     */
    public int getCode() {
        return code;
    }
}
```

```
}

/**
 * Get a title of the product.
 *
 * @return title of the product
 */
public String getTitle() {
    return title;
}

/**
 * Set a new title of the product.
 *
 * @param title new title of the product
 */
public void setTitle(String title) {
    this.title = title;
}

/**
 * Load properties of the product based on its code from a
database.
 *
 * @param connection database connection
 * @throws SQLException SQL error
 * @throws NotFoundException the product of this particular
code is not in the database
 */
public void loadFromDb(Connection connection) throws
SQLException, NotFoundException {
    throw new UnsupportedOperationException();
}

/**
 * Save properties of the product to a database.
 *
 * @param connection database connection
 * @throws SQLException SQL error
 */
public void saveToDb(Connection connection) throws SQLException
{
    throw new UnsupportedOperationException();
}

/**
 * Load an image of the product from a database and save it to
a local file.
 *
 */
```

```

    * @param connection database connection
    * @param filename    file title where to save the image
    * @throws SQLException    SQL error
    * @throws NotFoundException the product of this particular
code is not in the database
    * @throws IOException    I/O error
    */
    public void loadImageFromDbToFile(Connection connection, String
filename) throws SQLException, NotFoundException, IOException {
        throw new UnsupportedOperationException();
    }

    /**
    * Load an image of the product from a local file and save it
in a database.
    *
    * @param connection database connection
    * @param filename    file title where to load the image from
    * @throws SQLException    SQL error
    * @throws NotFoundException the product of this particular
code is not in the database
    * @throws IOException    I/O error
    */
    public void saveImageToDbFromFile(Connection connection, String
filename) throws SQLException, NotFoundException, IOException {
        throw new UnsupportedOperationException();
    }

    /**
    * Find a product with the most similar image to the current
product based on several criteria.
    *
    * @param connection database connection
    * @param weightAC    average color criteria
    * @param weightCH    color histogram criteria
    * @param weightPC    positional color criteria
    * @param weightTX    texture criteria
    * @return object of the found product
    * @throws SQLException    SQL error
    * @throws NotFoundException the suitable product is not in the
database
    */
    public Product findTheMostSimilar(Connection connection, double
weightAC, double weightCH, double weightPC, double weightTX) throws
SQLException, NotFoundException {
        throw new UnsupportedOperationException();
    }

    public class NotFoundException extends Exception {

```

```

        // nothing to extend
    }

}

```

## Main Method

Moreover, let us suppose there is a `App` class with the following main method:

```

public static void main(String[] args) throws Exception {
    // create a OracleDataSource instance
    OracleDataSource ods = new OracleDataSource();

    ods.setURL("jdbc:oracle:thin:@//gort.fit.vutbr.cz:1521/orclpdb");
    /**
     * *
     * To set System properties, run the Java VM with the
following at
     * its command line: ... -Dlogin=LOGIN_TO_ORACLE_DB
     * -Dpassword=PASSWORD_TO_ORACLE_DB ... or set the
project
     * properties (in NetBeans: File / Project Properties /
Run / VM
     * Options)
     */
    ods.setUser(System.getProperty("login"));
    ods.setPassword(System.getProperty("password"));
    /**
     *
     */
    // connect to the database
    try (Connection conn = ods.getConnection()) {
        final List<Product> products = new ArrayList<>();
        // new products
        for (int i = 1; i <= 4; i++) {
            products.add(new Product(i, "car" + i));
        }
        // save to database
        for (Product product: products) {
            product.saveToDb(conn);
        }
        // set pictures
        for (Product product: products) {
            product.saveImageToDbFromFile(conn, "./car" +
product.getCode() + ".gif");
        }
    }
}

```

```
        // get pictures
        for (Product product: products) {
            product.loadImageFromDbToFile(conn, "./car" +
product.getCode() + "-out.gif");
        }
        // similarity search
        final Product firstProduct = products.get(0);
        final Product similarProduct =
firstProduct.findTheMostSimilar(conn, 0.3, 0.3, 0.1, 0.3);
        System.out.println("The most similar to " +
firstProduct.getCode() + " is " + similarProduct.getCode());
    }
}
```

## Persistence of Non-multimedia Data

Implement two constructors and `loadFromDb` and `saveToDb` methods of the `Product` class as described above. By the implementation, replace corresponding `throw new UnsupportedOperationException();` statements.

## Persistence of Multimedia Data

Implement `loadImageFromDbToFile` and `saveImageToDbFromFile` methods to retrieve and to store an image from/to a database as described above. By the implementation, replace corresponding `throw new UnsupportedOperationException();` statements.

## Image Similarity Search

Implement `findTheMostSimilar` method as described above. By the implementation, replace corresponding `throw new UnsupportedOperationException();` statements.

## Solution

The solution of this lab can be found in the [multimedia solution](https://rychly-edu.gitlab.io/dbs/multimedia/oracle-lab/) [../download-oracle-lab-multimedia.zip] project.