STARMAP

CS F212- DATABASE AND MANAGEMENT SYSTEM

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1.1 Problem Description

Our star map web app offers users an interactive journey through the night sky, tailored to their location. Users can explore the stars and constellations by tapping on them to access detailed information such as names, distances, and associated constellations. To enhance the learning experience, we are introducing a daily feature called "Question of the Day," providing interesting facts about highlighted celestial objects. This feature, along with guided tours and quizzes, aims to engage users in discovering the wonders of astronomy through their devices.

Additionally, the app includes features like personalized astronomical journeys through account sign-up and login, an achievement system where users can earn badges and points by participating in challenges and exploring new star systems, and a catalog system for accessing information on stars and constellations. Users can also favorite stars and constellations to curate their own celestial collection. Furthermore, to add a competitive element, we are integrating a leaderboard system that ranks users based on quiz scores, completed milestones, and in-app achievements. We plan to utilize libraries such as Swing, Prefuse, Processing, and Celestia in Java for modeling, visualization, and interaction, with flexibility to adapt our choices based on evolving requirements and challenges.

1.2 Features

1. Personalized Astronomical Journey

Our star map app offers users a personalized journey through the cosmos, starting with a user-friendly account sign-up and login process. Upon creating an account, users can customize their stargazing experience based on their preferences and location. The app provides an interactive night sky view that adjusts in real-time to reflect the user's current location and time. This feature allows users to explore the stars and constellations visible from their area, tapping on individual stars to access detailed information such as names, distances, and associated constellations. By personalizing their astronomical journey, users can deepen their understanding and appreciation of the celestial world around them.

2. Explore the Night Sky

The app's interactive night sky feature provides users with a window to the universe, allowing them to explore the stars and constellations from the comfort of their own device. Based on the user's location and time, the app generates a realistic depiction of the night sky, complete with accurate star positions and constellation outlines. Users can tap on stars to reveal detailed information such as names, distances, and associated constellations, enhancing their stargazing experience. Whether users are seasoned astronomers or casual sky enthusiasts, the explore the night sky feature offers a captivating and educational experience for all.

3. Engage with the Cosmos

To further enrich the user experience, our app includes a daily contest where users can test their knowledge and engage with the cosmos in a fun and interactive way. The contest presents users with questions about a specific constellation, challenging them to learn more about its history, mythology, and scientific significance. After answering the questions, users receive additional information about the constellation, fostering a deeper understanding of the night sky. This feature not only educates users about the wonders of astronomy but also encourages them to explore new constellations and expand their celestial knowledge.

4. Achievement System

Our app motivates users to explore the night sky and participate in daily challenges through an achievement system. By completing challenges and exploring new star systems, users can earn badges, points, and other rewards. This system encourages users to actively engage with the app, rewarding their curiosity and commitment to learning about the universe. Users can track their progress and achievements, providing a sense of accomplishment and motivating them to continue their journey of discovery.

5. Favoriting Option

The favoriting feature enables users to mark their favorite stars and constellations, creating a personalized collection of celestial objects. This feature adds a personal touch to the app, allowing users to curate their own celestial catalog based on their interests and preferences. Whether users are fascinated by a particular constellation's mythology or are drawn to a specific star's scientific significance, the favoriting option enables them to create a unique and meaningful collection of celestial objects.

6. Leaderboard

To add a competitive element to the app, we have integrated a leaderboard system that ranks users based on their quiz scores, completed milestones, and in-app achievements. The leaderboard provides users with a sense of accomplishment and encourages friendly competition among stargazers. Users can compare their progress with friends and other users, motivating them to explore the night sky and achieve new milestones in their astronomical journey.

7. Question of the Day

Our star map web app now includes a "Question of the Day" feature, presenting users with daily thought-provoking inquiries related to astronomy. These questions, designed to spark curiosity and deepen users' understanding of celestial phenomena, are accessible within the app's interface. Users can engage with the questions, learning more about stars, constellations, and space exploration with each daily prompt. This feature aims to encourage regular engagement with the app, fostering continuous learning and exploration of the cosmos in an accessible and interactive manner.

1.3 E-R Model

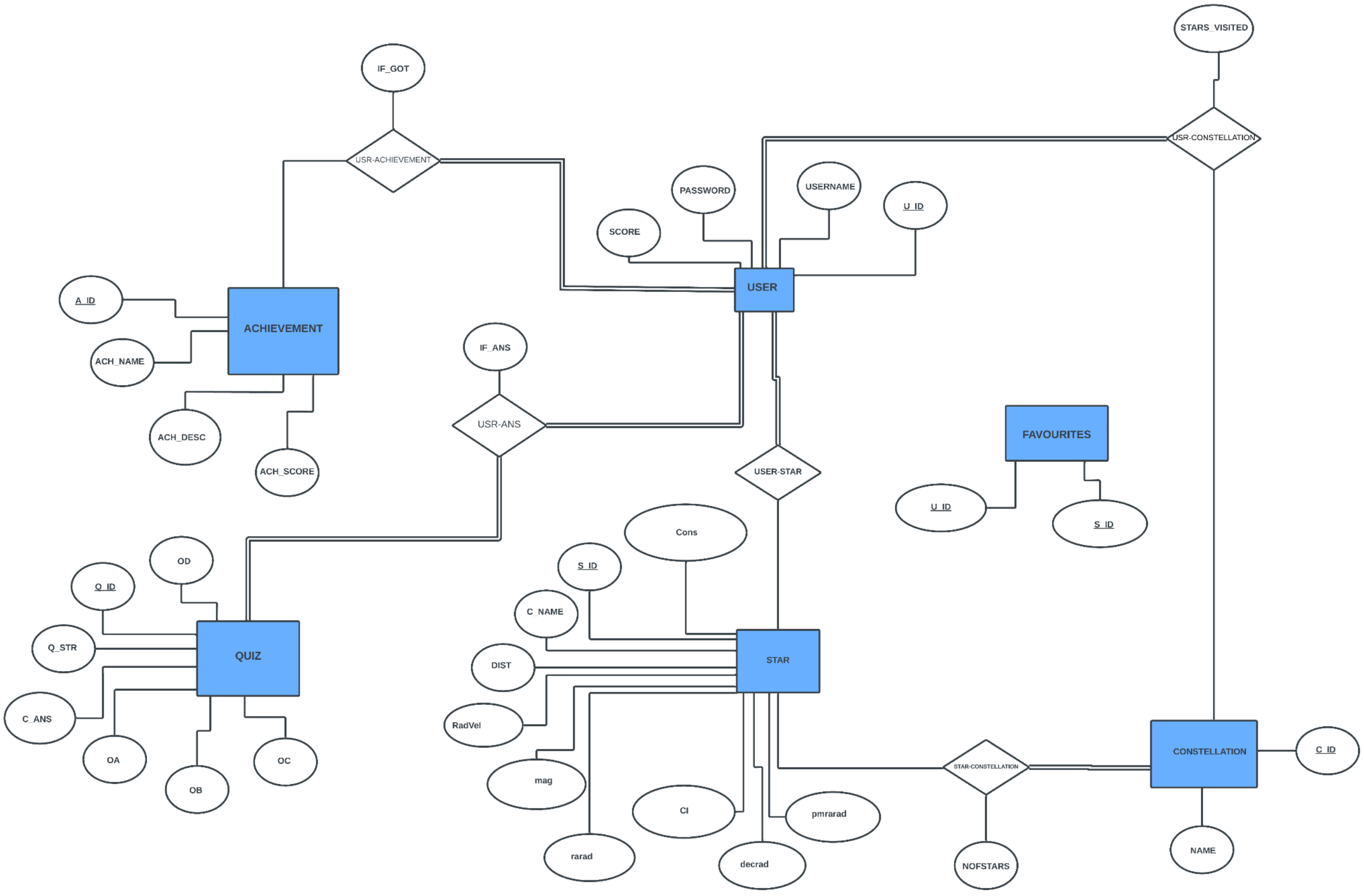


Fig - ER MODEL DIAGRAM

1.4 Relational Model

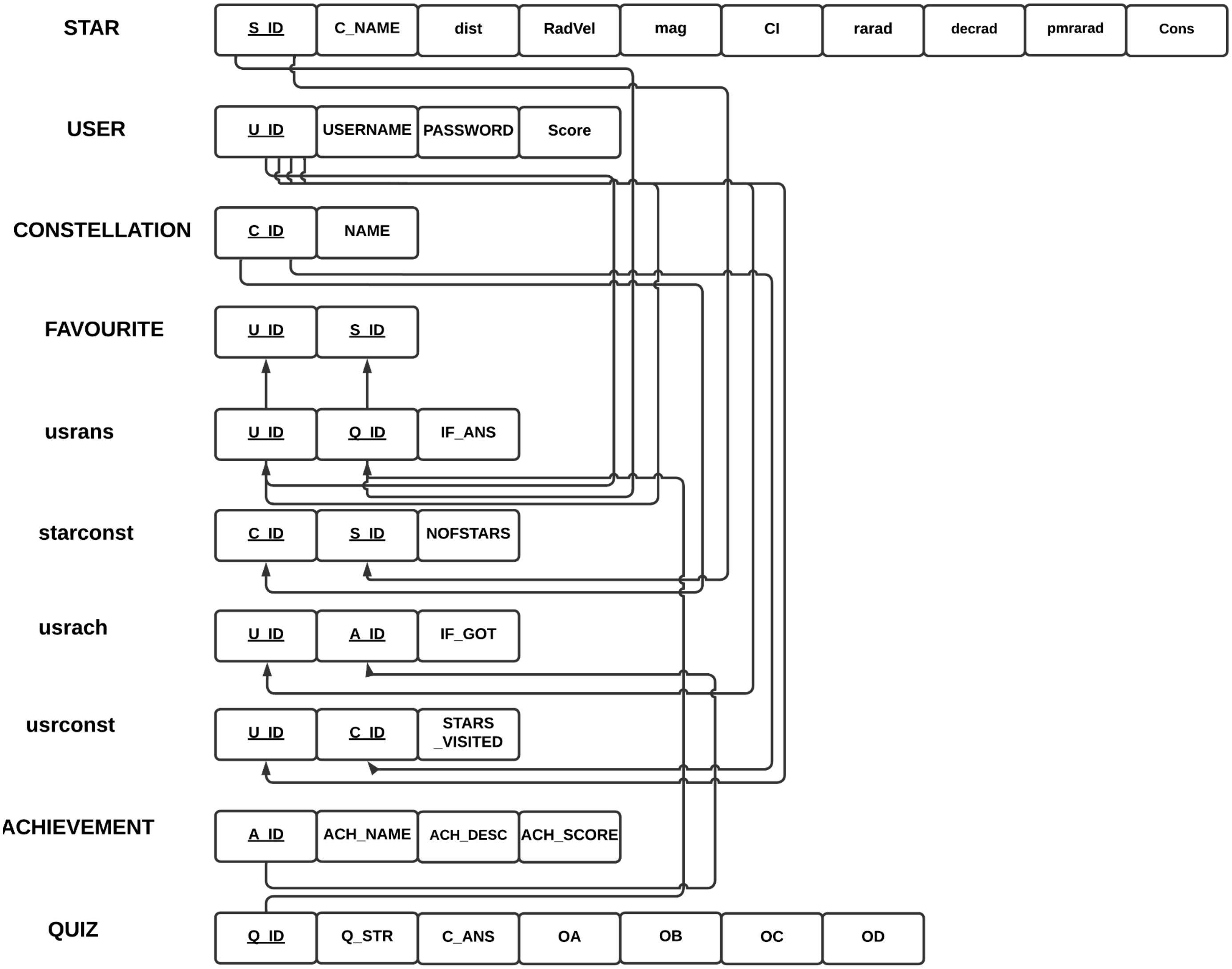
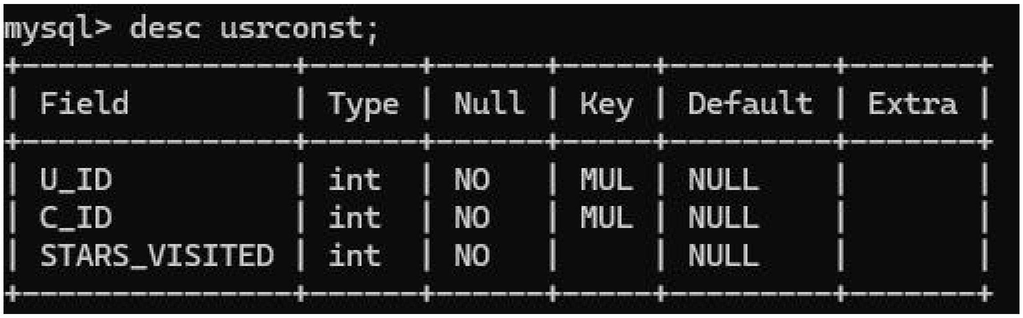


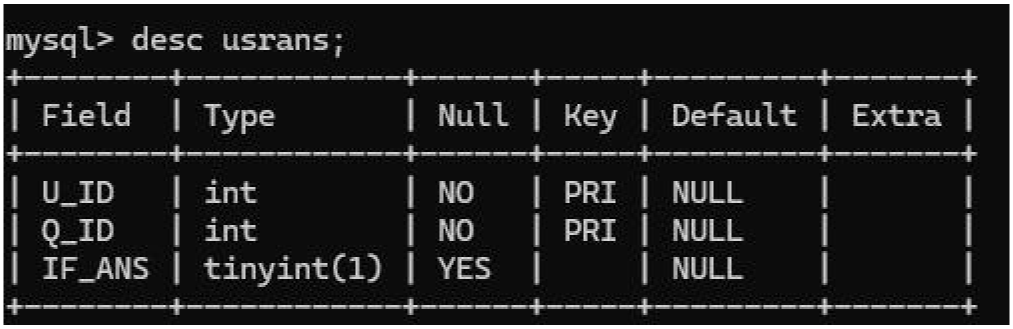
Fig - RELATIONAL MODEL DIAGRAM

1.5 Technical Details

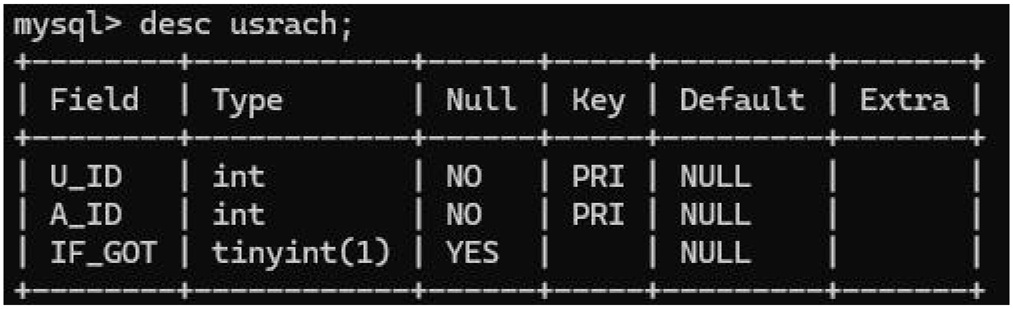
TABLE SNAPSHOTS



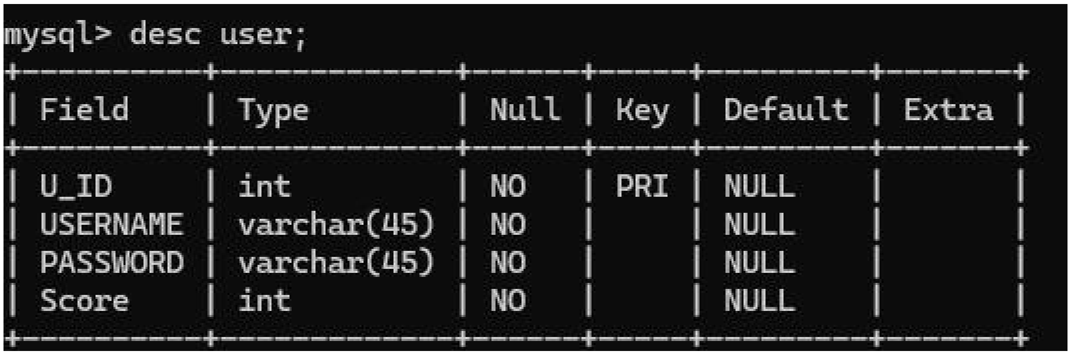
```
mysql> desc usrconst;
+---------------+------+------+-----+---------+-------+
| Field         | Type | Null | Key | Default | Extra |
+---------------+------+------+-----+---------+-------+
| U_ID          | int  | NO   | MUL | NULL    |       |
| C_ID          | int  | NO   | MUL | NULL    |       |
| STARS_VISITED | int  | NO   |     | NULL    |       |
+---------------+------+------+-----+---------+-------+
```



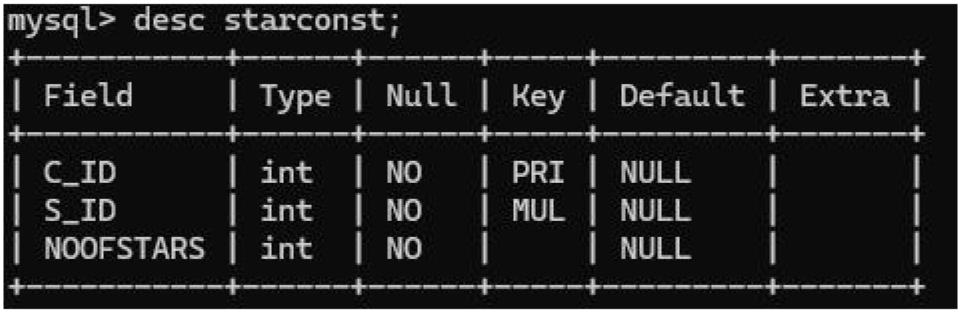
```
mysql> desc usrans;
+--------+------------+------+-----+---------+-------+
| Field  | Type       | Null | Key | Default | Extra |
+--------+------------+------+-----+---------+-------+
| U_ID   | int        | NO   | PRI | NULL    |       |
| Q_ID   | int        | NO   | PRI | NULL    |       |
| IF_ANS | tinyint(1) | YES  |     | NULL    |       |
+--------+------------+------+-----+---------+-------+
```



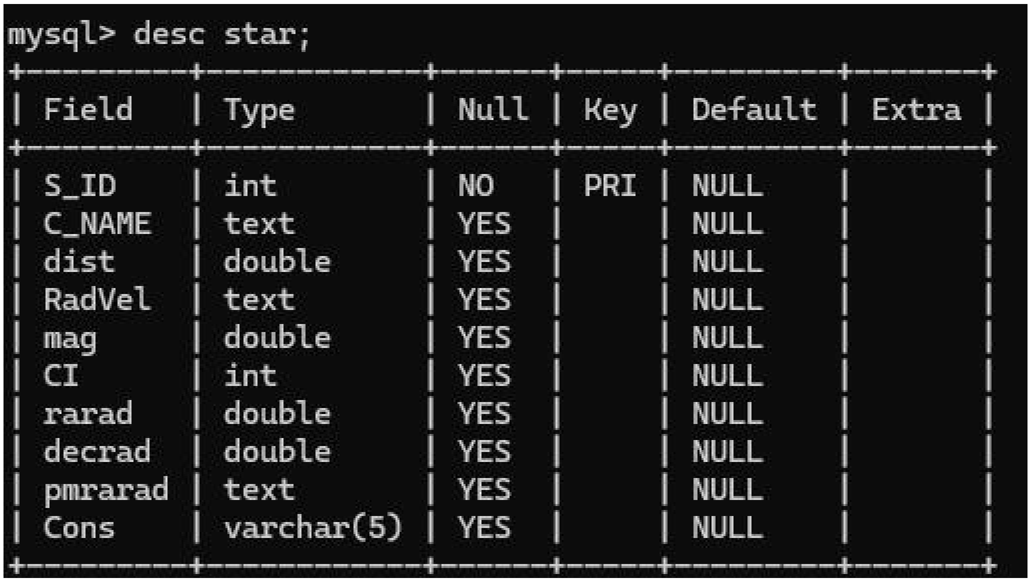
```
mysql> desc usrach;
+--------+------------+------+-----+---------+-------+
| Field  | Type       | Null | Key | Default | Extra |
+--------+------------+------+-----+---------+-------+
| U_ID   | int        | NO   | PRI | NULL    |       |
| A_ID   | int        | NO   | PRI | NULL    |       |
| IF_GOT | tinyint(1) | YES  |     | NULL    |       |
+--------+------------+------+-----+---------+-------+
```



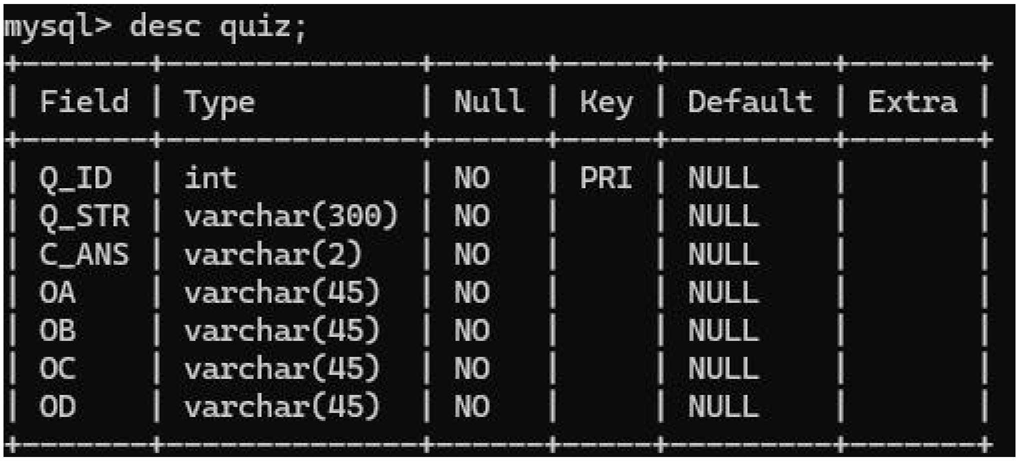
```
mysql> desc user;
+----------+-------------+------+-----+---------+-------+
| Field    | Type        | Null | Key | Default | Extra |
+----------+-------------+------+-----+---------+-------+
| U_ID     | int         | NO   | PRI | NULL    |       |
| USERNAME | varchar(45) | NO   |     | NULL    |       |
| PASSWORD | varchar(45) | NO   |     | NULL    |       |
| Score    | int         | NO   |     | NULL    |       |
+----------+-------------+------+-----+---------+-------+
```



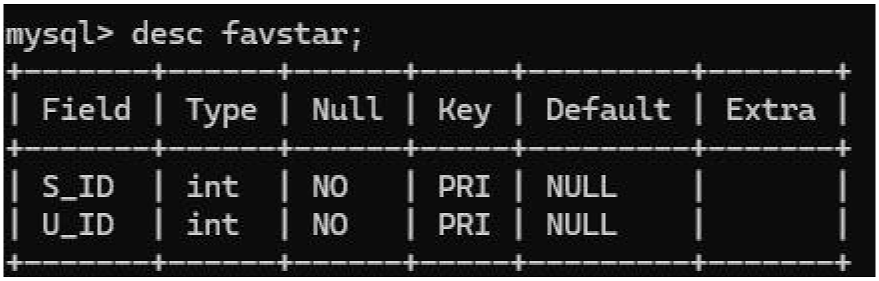
```
mysql> desc starconst;
+-----------+------+------+-----+---------+-------+
| Field     | Type | Null | Key | Default | Extra |
+-----------+------+------+-----+---------+-------+
| C_ID      | int  | NO   | PRI | NULL    |       |
| S_ID      | int  | NO   | MUL | NULL    |       |
| NOOFSTARS | int  | NO   |     | NULL    |       |
+-----------+------+------+-----+---------+-------+
```



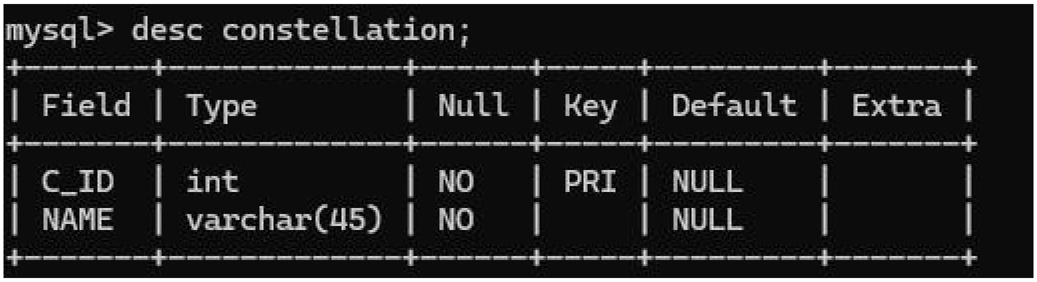
```
mysql> desc star;
+---------+------------+------+-----+---------+-------+
| Field   | Type       | Null | Key | Default | Extra |
+---------+------------+------+-----+---------+-------+
| S_ID    | int        | NO   | PRI | NULL    |       |
| C_NAME  | text       | YES  |     | NULL    |       |
| dist    | double     | YES  |     | NULL    |       |
| RadVel  | text       | YES  |     | NULL    |       |
| mag     | double     | YES  |     | NULL    |       |
| CI      | int        | YES  |     | NULL    |       |
| rarad   | double     | YES  |     | NULL    |       |
| decrad  | double     | YES  |     | NULL    |       |
| pmrarad | text       | YES  |     | NULL    |       |
| Cons    | varchar(5) | YES  |     | NULL    |       |
+---------+------------+------+-----+---------+-------+
```



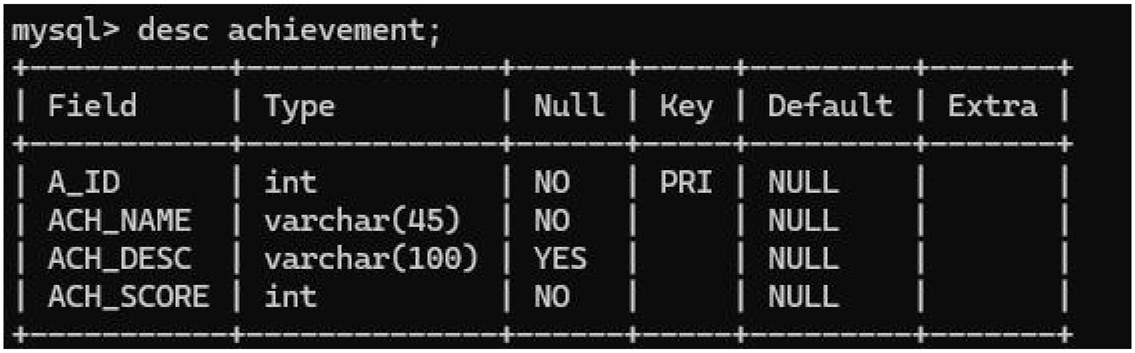
```
mysql> desc quiz;
+-------+--------------+------+-----+---------+-------+
| Field | Type         | Null | Key | Default | Extra |
+-------+--------------+------+-----+---------+-------+
| Q_ID  | int          | NO   | PRI | NULL    |       |
| Q_STR | varchar(300) | NO   |     | NULL    |       |
| C_ANS | varchar(2)   | NO   |     | NULL    |       |
| OA    | varchar(45)  | NO   |     | NULL    |       |
| OB    | varchar(45)  | NO   |     | NULL    |       |
| OC    | varchar(45)  | NO   |     | NULL    |       |
| OD    | varchar(45)  | NO   |     | NULL    |       |
+-------+--------------+------+-----+---------+-------+
```



```
mysql> desc favstar;
+-------+------+------+-----+---------+-------+
| Field | Type | Null | Key | Default | Extra |
+-------+------+------+-----+---------+-------+
| S_ID  | int  | NO   | PRI | NULL    |       |
| U_ID  | int  | NO   | PRI | NULL    |       |
+-------+------+------+-----+---------+-------+
```

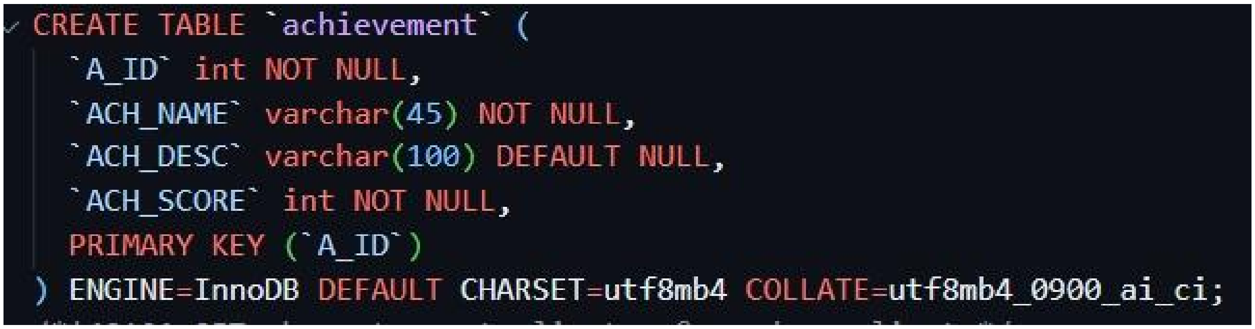


```
mysql> desc constellation;
+-------+-------------+------+-----+---------+-------+
| Field | Type        | Null | Key | Default | Extra |
+-------+-------------+------+-----+---------+-------+
| C_ID  | int         | NO   | PRI | NULL    |       |
| NAME  | varchar(45) | NO   |     | NULL    |       |
+-------+-------------+------+-----+---------+-------+
```

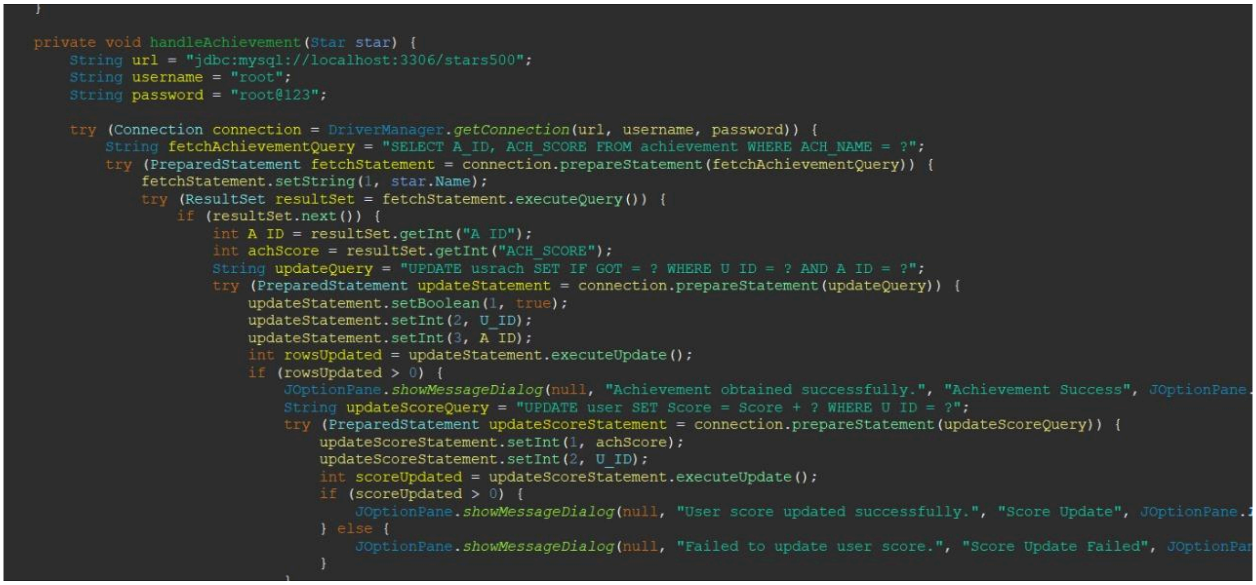


```
mysql> desc achievement;
+-----------+--------------+------+-----+---------+-------+
| Field     | Type         | Null | Key | Default | Extra |
+-----------+--------------+------+-----+---------+-------+
| A_ID      | int          | NO   | PRI | NULL    |       |
| ACH_NAME  | varchar(45)  | NO   |     | NULL    |       |
| ACH_DESC  | varchar(100) | YES  |     | NULL    |       |
| ACH_SCORE | int          | NO   |     | NULL    |       |
+-----------+--------------+------+-----+---------+-------+
```

CREATE, UPDATE, INSERT AND DELETE COMMANDS



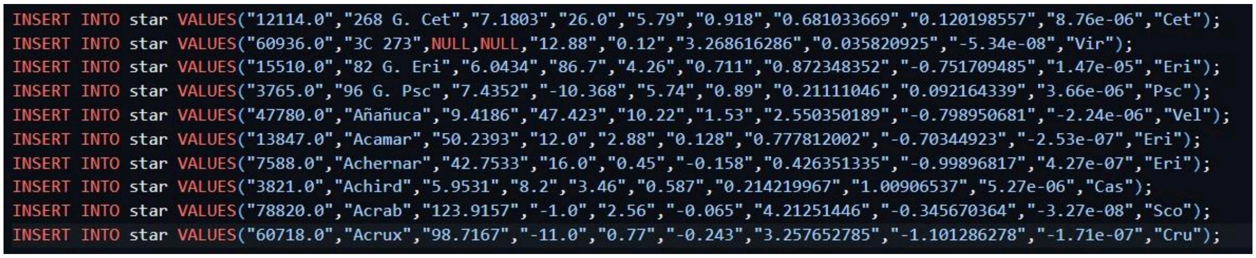
```
CREATE TABLE `achievement` (
  `A_ID` int NOT NULL,
  `ACH_NAME` varchar(45) NOT NULL,
  `ACH_DESC` varchar(100) DEFAULT NULL,
  `ACH_SCORE` int NOT NULL,
  PRIMARY KEY (`A_ID`)
) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_0900_ai_ci;
```



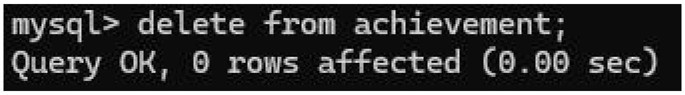
```
}

private void handleAchievement(Star star) {
    String url = "jdbc:mysql://localhost:3306/stars500";
    String username = "root";
    String password = "root@123";

    try (Connection connection = DriverManager.getConnection(url, username, password)) {
        String fetchAchievementQuery = "SELECT A_ID, ACH_SCORE FROM achievement WHERE ACH_NAME = ?";
        try (PreparedStatement fetchStatement = connection.prepareStatement(fetchAchievementQuery)) {
            fetchStatement.setString(1, star.Name);
            try (ResultSet resultSet = fetchStatement.executeQuery()) {
                if (resultSet.next()) {
                    int A_ID = resultSet.getInt("A_ID");
                    int achScore = resultSet.getInt("ACH_SCORE");
                    String updateQuery = "UPDATE usrach SET IF_GOT = ? WHERE U_ID = ? AND A_ID = ?";
                    try (PreparedStatement updateStatement = connection.prepareStatement(updateQuery)) {
                        updateStatement.setBoolean(1, true);
                        updateStatement.setInt(2, U_ID);
                        updateStatement.setInt(3, A_ID);
                        int rowsUpdated = updateStatement.executeUpdate();
                        if (rowsUpdated > 0) {
                            JOptionPane.showMessageDialog(null, "Achievement obtained successfully.", "Achievement Success", JOptionPane.
                            String updateScoreQuery = "UPDATE user SET Score = Score + ? WHERE U_ID = ?";
                            try (PreparedStatement updateScoreStatement = connection.prepareStatement(updateScoreQuery)) {
                                updateScoreStatement.setInt(1, achScore);
                                updateScoreStatement.setInt(2, U_ID);
                                int scoreUpdated = updateScoreStatement.executeUpdate();
                                if (scoreUpdated > 0) {
                                    JOptionPane.showMessageDialog(null, "User score updated successfully.", "Score Update", JOptionPane.I
                                } else {
                                    JOptionPane.showMessageDialog(null, "Failed to update user score.", "Score Update Failed", JOptionPar
                                }
                            }
```



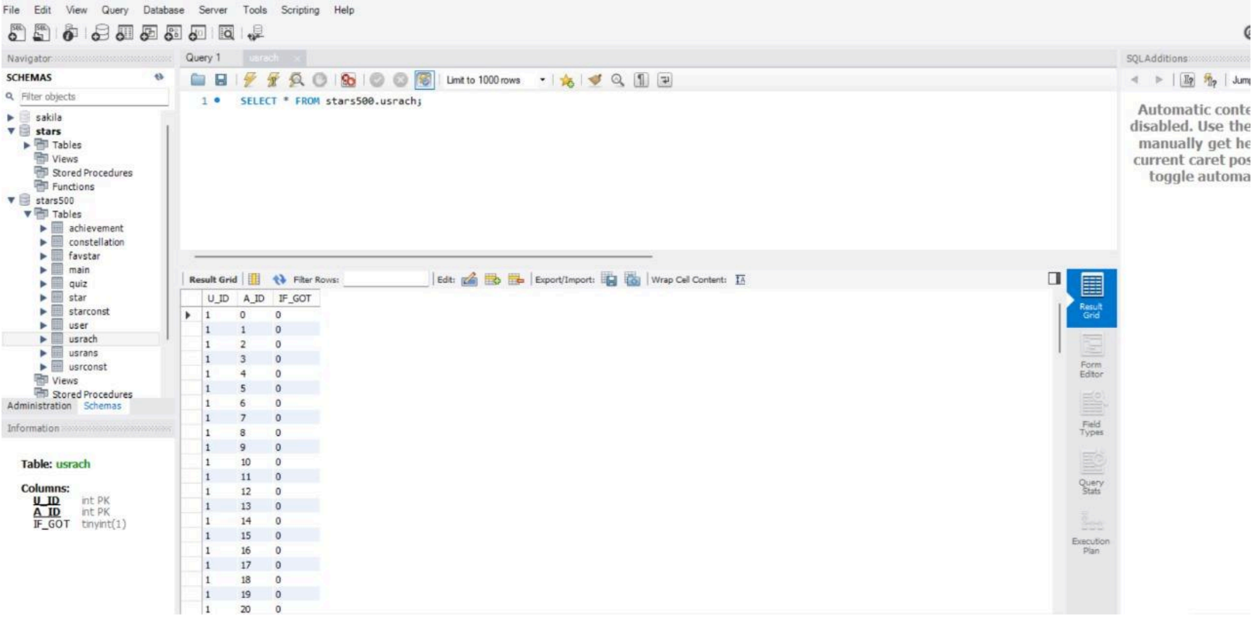
```
INSERT INTO star VALUES("12114.0","268 G. Cet","7.1803","26.0","5.79","0.918","0.681033669","0.120198557","8.76e-06","Cet");
INSERT INTO star VALUES("60936.0","3C 273",NULL,NULL,"12.88","0.12","3.268616286","0.035820925","-5.34e-08","Vir");
INSERT INTO star VALUES("15510.0","82 G. Eri","6.0434","86.7","4.26","0.711","0.872348352","-0.751709485","1.47e-05","Eri");
INSERT INTO star VALUES("3765.0","96 G. Psc","7.4352","-10.368","5.74","0.89","0.21111046","0.092164339","3.66e-06","Psc");
INSERT INTO star VALUES("47780.0","Añañuca","9.4186","47.423","10.22","1.53","2.550350189","-0.798950681","-2.24e-06","Vel");
INSERT INTO star VALUES("13847.0","Acamar","50.2393","12.0","2.88","0.128","0.777812002","-0.70344923","-2.53e-07","Eri");
INSERT INTO star VALUES("7588.0","Achernar","42.7533","16.0","0.45","-0.158","0.426351335","-0.99896817","4.27e-07","Eri");
INSERT INTO star VALUES("3821.0","Achird","5.9531","8.2","3.46","0.587","0.214219967","1.00906537","5.27e-06","Cas");
INSERT INTO star VALUES("78820.0","Acrab","123.9157","-1.0","2.56","-0.065","4.21251446","-0.345670364","-3.27e-08","Sco");
INSERT INTO star VALUES("60718.0","Acrux","98.7167","-11.0","0.77","-0.243","3.257652785","-1.101286278","-1.71e-07","Cru");
```



```
mysql> delete from achievement;
Query OK, 0 rows affected (0.00 sec)
```

COMPLEX QUERIES

1. Before running the complex query



```
1 ● SELECT * FROM stars500.usrach;
```

U_ID	A_ID	IF_GOT
1	0	0
1	1	0
1	2	0
1	3	0
1	4	0
1	5	0
1	6	0
1	7	0
1	8	0
1	9	0
1	10	0
1	11	0
1	12	0
1	13	0
1	14	0
1	15	0
1	16	0
1	17	0
1	18	0
1	19	0
1	20	0

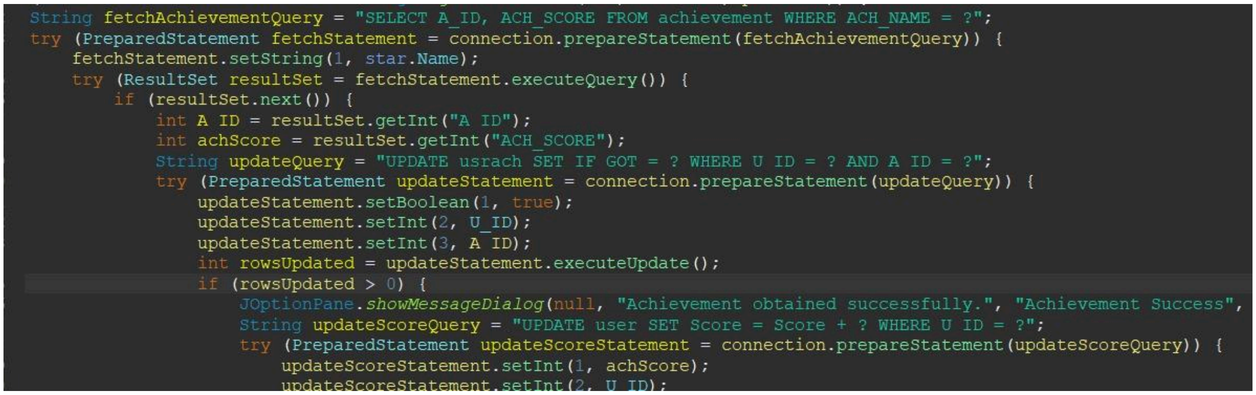
Table: usrach

Columns:

U_ID	int PK
A_ID	int PK
IF_GOT	tinyint(1)

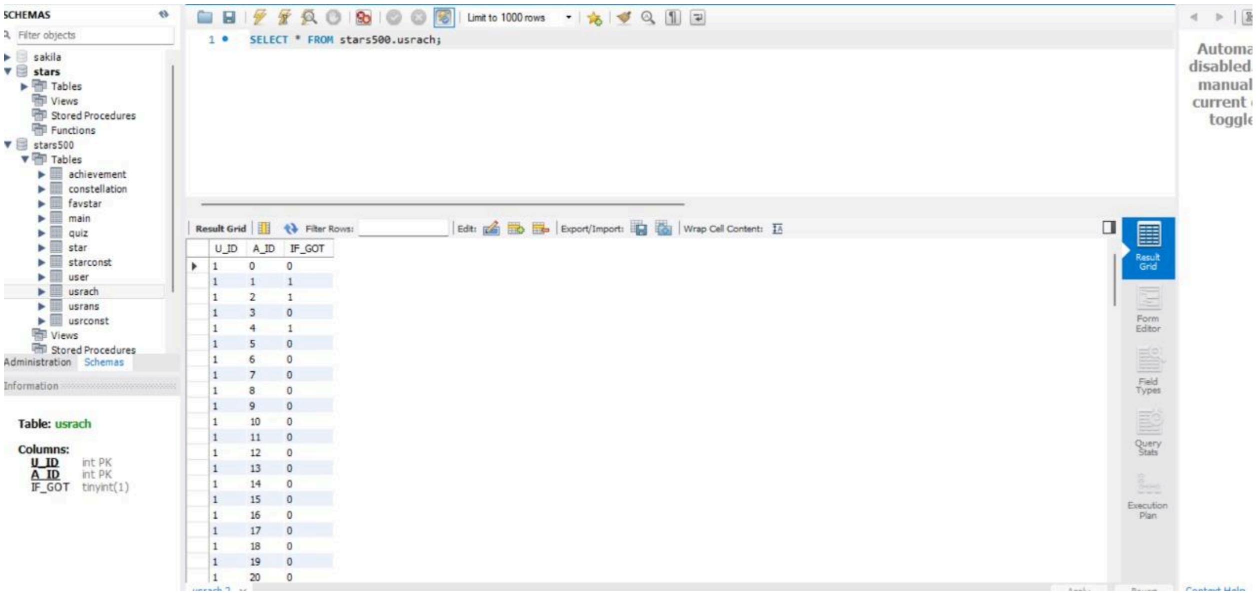
Automatic conte
disabled. Use the
manually get he
current caret pos
toggle automa

Query



```
String fetchAchievementQuery = "SELECT A_ID, ACH_SCORE FROM achievement WHERE ACH_NAME = ?";
try (PreparedStatement fetchStatement = connection.prepareStatement(fetchAchievementQuery)) {
    fetchStatement.setString(1, star.Name);
    try (ResultSet resultSet = fetchStatement.executeQuery()) {
        if (resultSet.next()) {
            int A_ID = resultSet.getInt("A_ID");
            int achScore = resultSet.getInt("ACH_SCORE");
            String updateQuery = "UPDATE usrach SET IF_GOT = ? WHERE U_ID = ? AND A_ID = ?";
            try (PreparedStatement updateStatement = connection.prepareStatement(updateQuery)) {
                updateStatement.setBoolean(1, true);
                updateStatement.setInt(2, U_ID);
                updateStatement.setInt(3, A_ID);
                int rowsUpdated = updateStatement.executeUpdate();
                if (rowsUpdated > 0) {
                    JOptionPane.showMessageDialog(null, "Achievement obtained successfully.", "Achievement Success",
                    String updateScoreQuery = "UPDATE user SET Score = Score + ? WHERE U_ID = ?";
                    try (PreparedStatement updateScoreStatement = connection.prepareStatement(updateScoreQuery)) {
                        updateScoreStatement.setInt(1, achScore);
                        updateScoreStatement.setInt(2, U_ID);
```

Output (after the complex query- when 3 star achievements were made)



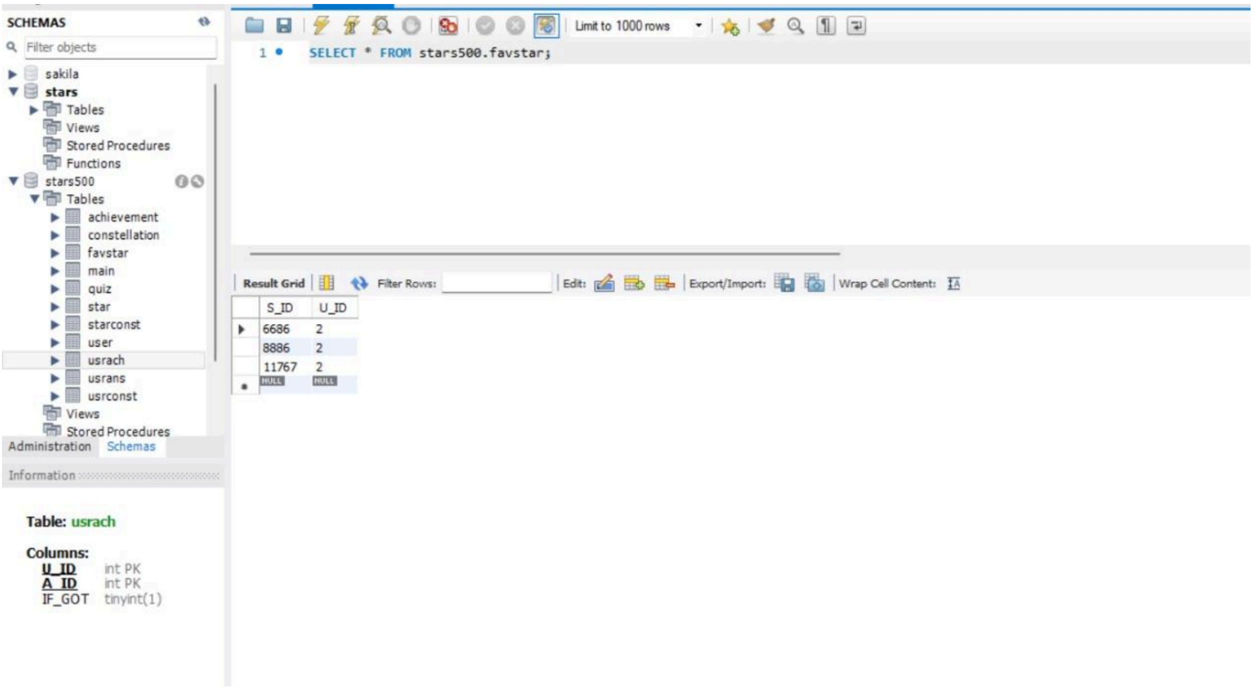
```
1 ● SELECT * FROM stars500.usrach;
```

U_ID	A_ID	IF_GOT
1	0	0
1	1	1
1	2	1
1	3	0
1	4	1
1	5	0
1	6	0
1	7	0
1	8	0
1	9	0
1	10	0
1	11	0
1	12	0
1	13	0
1	14	0
1	15	0
1	16	0
1	17	0
1	18	0
1	19	0
1	20	0

Table: usrach

Columns:
U_ID int PK
A_ID int PK
IF_GOT tinyint(1)

2. Before running the complex query



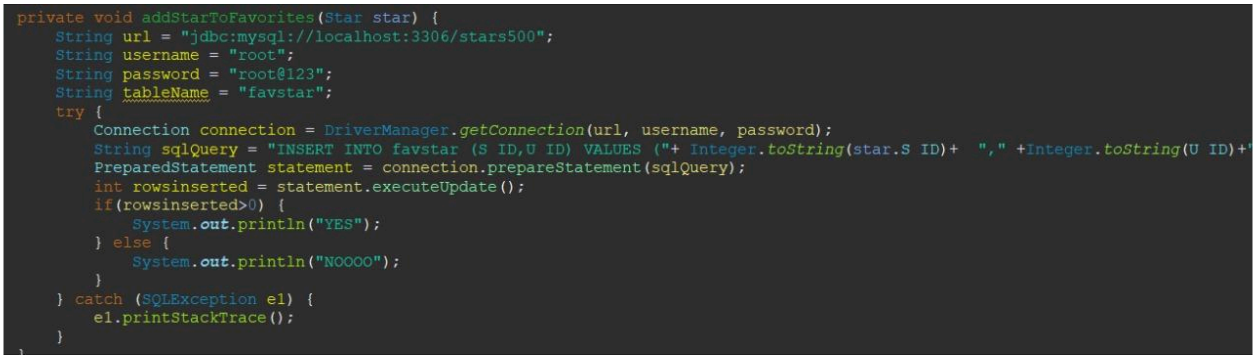
```
1 ● SELECT * FROM stars500.favstar;
```

S_ID	U_ID
6686	2
8886	2
11767	2
NULL	NULL

Table: usrach

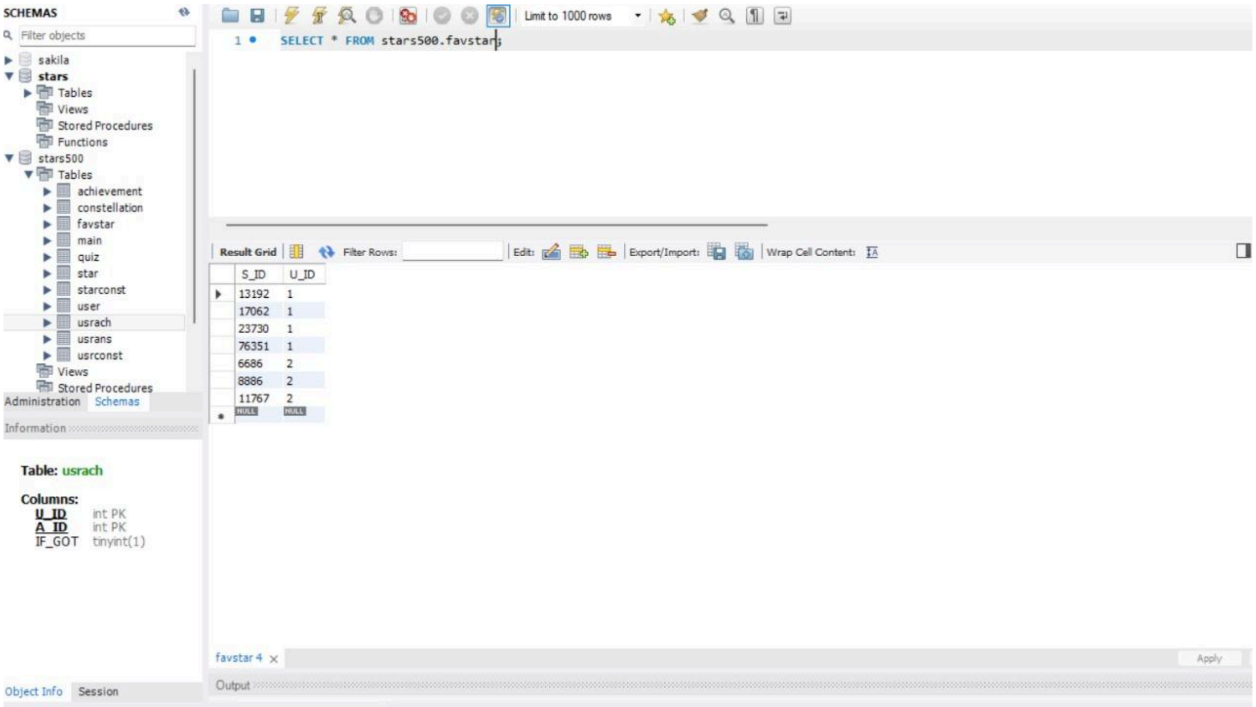
Columns:
U_ID int PK
A_ID int PK
IF_GOT tinyint(1)

Query



```
private void addStarToFavorites(Star star) {
    String url = "jdbc:mysql://localhost:3306/stars500";
    String username = "root";
    String password = "root@123";
    String tableName = "favstar";
    try {
        Connection connection = DriverManager.getConnection(url, username, password);
        String sqlQuery = "INSERT INTO favstar (S ID,U ID) VALUES ("+ Integer.toString(star.S ID)+  "," +Integer.toString(U ID)+"
        PreparedStatement statement = connection.prepareStatement(sqlQuery);
        int rowsinserted = statement.executeUpdate();
        if(rowsinserted>0) {
            System.out.println("YES");
        } else {
            System.out.println("NOOOO");
        }
    } catch (SQLException e1) {
        e1.printStackTrace();
    }
}
```

Output (after the complex query- when account1 made some favorites)



```
1 •  SELECT * FROM stars500.favstar;
```

S_ID	U_ID
13192	1
17062	1
23730	1
76351	1
6686	2
8886	2
11767	2
NULL	NULL

Table: usrach

Columns:

U_ID	int PK
A_ID	int PK
IF_GOT	tinyint(1)

2. Conclusion

In conclusion, the development of StarMap represents a significant milestone in providing users with an immersive and personalized journey through the celestial wonders above. With its array of features, from personalized astronomical journeys to engaging with the cosmos through daily challenges and quizzes, StarMap aims to inspire curiosity and deepen understanding of astronomy among users of all levels of expertise. The integration of features such as the leaderboard system and achievement system adds a competitive edge, motivating users to explore further and attain greater heights in their astronomical pursuits. The favoriting option allows users to create their own curated collection of celestial objects, adding a personal touch to their stargazing experience. Furthermore, the introduction of the "Question of the Day" feature not only serves to educate users but also fosters a habit of regular engagement with the app, ensuring continuous learning and exploration. As we continue to refine and expand StarMap, our commitment remains steadfast in providing a platform that not only educates but also inspires a sense of wonder and awe for the vastness of the cosmos. We look forward to the continued journey of discovery with our users, as we navigate the depths of space together.