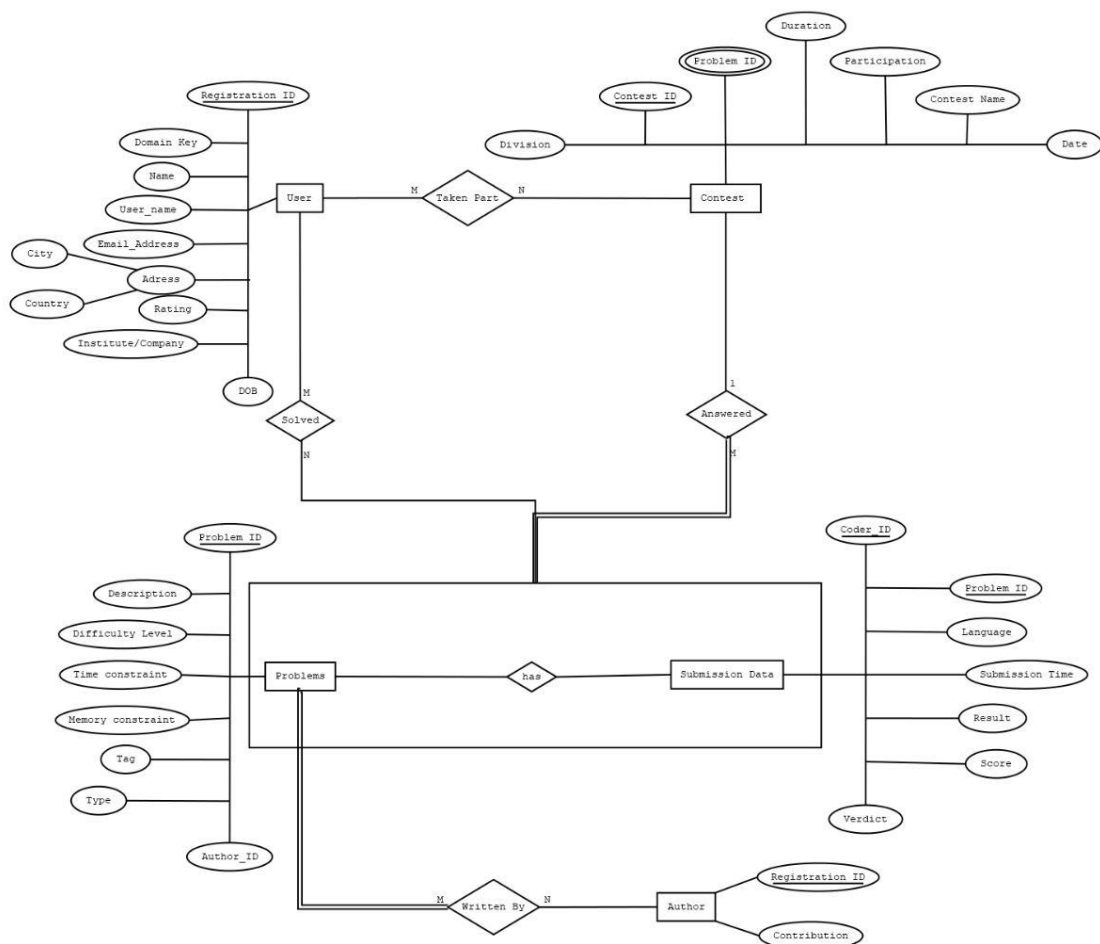# CONTEST MANAGEMENT SYSTEM

Database Management System
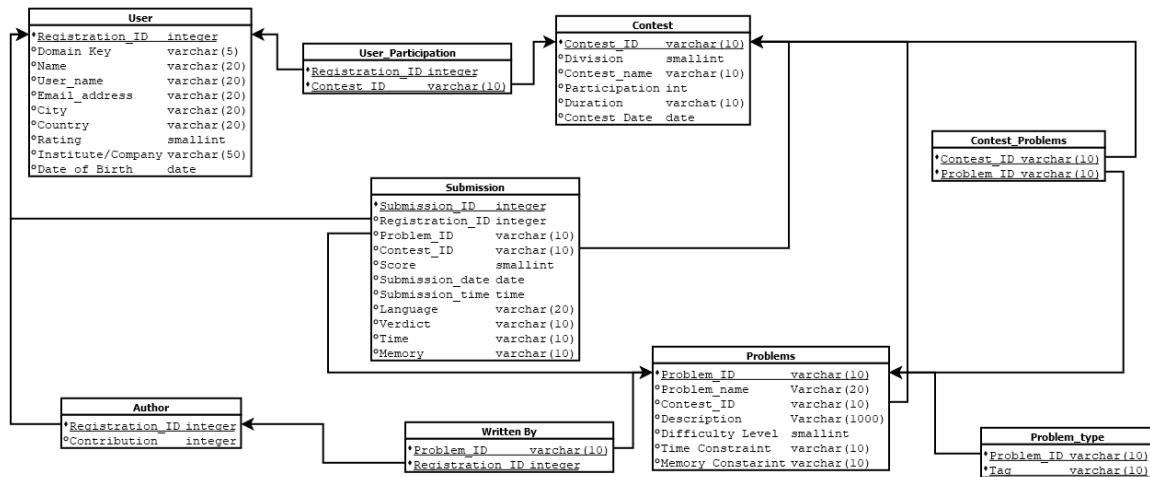
202101163 - Jay Dobariya

202103042 - Jay Rathod

ER-Diagram

Relational Schema

Minimal FD Set and Proof that relations are in BCNF

1. User Relation:

Attributes: {Registration_ID, Domain Key, Name, User_name, Email_address, City, Country, Rating, Institute/Company, Date of Birth}

Minimal FD set:

Registration_ID -> Domain Key

Registration_ID -> Name

Registration_ID -> User_name

Registration_ID ->Email_address

Registration_ID ->City

Registration_ID ->Country

Registration_ID ->Rating

Registration_ID ->Institute/ Company

Registration_ID ->Date of Birth

Here the *key* is Registration_ID.

 Let's assume it is 'A'.

The closure of A is: A⁺ = {Domain Key, Name, User_name, Email_address, City, Country, Rating, Institute/Company, Date of Birth, Registration_ID}

Which is the same as our original Table. So proven that this relation is BCNF.

2. Contest Relation:

Attributes: {Contest_ID, Division, Contest_name, Participation, Duration, Contest Date}

Minimal FD set:

Contest_ID -> Division

Contest_ID -> Contest_name

Contest_ID -> Participation

Contest_ID ->Duration

Contest_ID -> Contest Date

Here the *key* is Contest_ID. Let's assume it is 'A'.

The closure of A is: A⁺ = {Division, Contest_name, Participation, Duration, Contest Date, Contest_ID}

Which is the same as our original Table. So proven that this relation is BCNF.

3. Submission Relation:

Attributes: {Submission_ID, Registartion_ID, Problem_ID, Contest_ID, Score, Submission_date, Submission_time, Language, Verdict, Time, Memory}

Minimal FD set:

Submission_ID -> Registration_ID

Submission_ID -> Problem_ID

Submission_ID -> Contest_ID

Submission_ID -> Score

Submission_ID -> Submission_date

Submission_ID -> Submission_time

Submission_ID -> Language

Submission_ID -> Verdict

Submission_ID -> Time

Submission_ID -> Memory

Here the **key** is Submission_ID. Let's assume it is 'A'.

The closure of A is: A$^+$ = {Registartion_ID, Problem_ID, Contest_ID, Score, Submission_date, Submission_time, Language, Verdict, Time, Memory, Submission_ID}

Which is the same as our original Table. So proven that this relation is BCNF.

4. Problems Relation:

Attributes: {Problem_ID, Problem_name, Contest_ID, Description, Difficulty Level, Time Constraint, Memory Constraint}

Minimal FD set:

Problem_ID -> Problem_name

Problem_ID -> Contest_ID

Problem_ID -> Description

Problem_ID -> Difficulty Level

Problem_ID -> Time Constraint

Problem_ID -> Memory Constraint

Here the **key** is Problem_ID. Let's assume it is 'A'.

The closure of A is: A$^+$ = {Problem_name, Contest_ID, Description, Difficulty Level, Time Constraint, Memory Constraint, Problem_ID}

Which is the same as our original Table. So proven that this relation is BCNF.

5. Author Relation:

Attributes: {Registration_ID, Contribution}

Minimal FD set:

Registration_ID ->Contribution

Here the **key** is Registration _ID. Let's assume it is 'A'.

The closure of A is: A$^+$ = {Contribution, Registration _ID}

Which is the same as our original Table. So proven that this relation is BCNF.

6. Problem_type Relation:

Attributes: {Problem_ID, Tag}

Minimal FD set:

Problem_ID -> Tag

Here the **key** is Problem _ID. Let's assume it as 'A'.

The closure of A is: A^+ = {Tag, Problem _ID}

Which is the same as our original Table. So proven that this relation is BCNF.

7. Written_By Relation:

Attributes: {Problem_ID, Registration_ID}

Key: {Problem_ID, Registration_ID}

Since both combined are the Primary key and include no extra attributes, this is a minimal set and is BCNF.

8. User_Participation Relation:

Attributes: {Registration_ID, Contest_ID}

Key: {Registration_ID, Contest_ID}

Since both combined are the Primary key and include no extra attributes, this is a minimal set and is BCNF.

9. Contest_Problems Relation:

Attributes: {Contest_ID, Problem_ID}

Key: {Contest_ID, Problem_ID}

Since both combined are the Primary key and include no extra attributes, this is a minimal set and is BCNF.