PROJECT PHASE-1: MOTORSPORTS

TEAM 27
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Introduction and Purpose

For our project, we have chosen our mini-world to be the world of motorsports. This database would store details about the teams and drivers which take part in the different motorsport championships, and it also stores details about the results of the races which have taken place.

The purpose of this database is to allow users to access information about all motorsport championships in a generalized manner. The user need not access multiple databases/mini-worlds which would have represented different championships, and instead can obtain all the information under a single roof.

The expected users of the database are the general public who wish to obtain information, and a database administrator who is responsible for updating the database.

Data Requirements

Entities

1. VEHICLE
   a. CHAMPIONSHIP (single-valued)
   b. VEHICLE TYPE (single-valued)

2. DRIVER (key – (DRIVER NUMBER, DRIVER NAME))
   a. DRIVER NUMBER (single-valued)
   b. DRIVER NAME (composite- (first name, last name))
   c. CONSTRUCTOR (single-valued)
   d. CHAMPIONSHIP (single-valued)

3. CONSTRUCTOR (key – (NAME, ENGINE MANUFACTURER))
   a. NAME (single-valued)
   b. ENGINE MANUFACTURER (single-valued)
   c. VEHICLE (single-valued)

4. DRIVERS’ CHAMPIONSHIP (key - (DRIVER NUMBER, DRIVER NAME))
   a. POSITION (single-valued)
   b. DRIVER NUMBER (single-valued)
   c. DRIVER NAME (composite- (first name, last name))
   d. POINTS (single-valued)

e. YEAR (single-valued)

5. CONSTRUCTORS' CHAMPIONSHIP
(key – (CHAMPIONSHIP, CONSTRUCTOR NAME))
   a. CHAMPIONSHIP (single-valued)
   b. POSITION (single-valued)
   c. CONSTRUCTOR NAME (Single-valued)
   d. POINTS (single-valued)
   e. YEAR (Single-valued)

6. DRIVERS' HALL OF FAME (weak entity)
(partial key – (DRIVER NAME, CHAMPIONSHIP, YEAR))
   a. DRIVER NAME (composite – (first name, last name))
   b. POINTS (single-valued)
   c. YEAR (multi-valued)
   d. CHAMPIONSHIP (Single-valued)

7. CONSTRUCTORS' HALL OF FAME (weak entity)
(partial key – (CONSTRUCTOR NAME, CHAMPIONSHIP, YEAR))
   a. CONSTRUCTOR NAME (single-valued)
   b. POINTS (single-valued)
   c. YEAR (multi-valued)
   d. CHAMPIONSHIP (single-valued)

8. RACE (weak entity)
(partial key – (CIRCUIT NAME, CHAMPIONSHIP))
   a. RACE NUMBER (single-valued)
   b. CIRCUIT NAME (composite – (sponsor, name))
   c. CHAMPIONSHIP (single-valued)
   d. COUNTRY (single-valued)
   e. DATE OF RACE (composite – (day, month, year))
   f. NO. OF LAPS (single-valued)
   g. SUBCLASSES

      I) PRACTICE
      II) QUALIFYING
      III)FEATURE RACE

9. CIRCUIT (key – (CIRCUIT NAME, CHAMPIONSHIP))
   a. CIRCUIT NAME (composite – (sponsor, name))
   b. COUNTRY (single-valued)

c. CHAMPIONSHIP (single-valued)
d. TRACK LENGTH (single-valued)
e. NO. OF CORNERS (single-valued)

10. RESULTS (key – (DRIVER NAME, CHAMPIONSHIP, RACE))

a. DRIVER NAME (composite – (first name, last name))
b. CONSTRUCTOR (single-valued)
c. CHAMPIONSHIP (single-valued)
d. RACE (single-valued)
e. POSITION (single-valued)
f. POINTS (single-valued)

Constraints on Entities:

- A DRIVER can only take part in one CHAMPIONSHIP in DRIVERS' CHAMPIONSHIP at a time.
- Two DRIVERs in the same CHAMPIONSHIP (attribute) in cannot have the same DRIVER NUMBER.
- Two DRIVERs in the same CHAMPIONSHIP cannot have the same position in the DRIVERS' CHAMPIONSHIP. The same constraint applies for CONSTRUCTORs in the CONSTRUCTORS' CHAMPIONSHIP.
- Two DRIVERs in the same CHAMPIONSHIP cannot have the same pair of values for (RACE, POSITION) in RESULTS.

Relationships

1. DRIVES

   a. Binary relationship between:

      i. DRIVER (1,1)
      ii. VEHICLE (1,1)

   b. This relationship tells us about the VEHICLE which is used by the DRIVER during races.

2. DESIGNS

   a. Binary relationship between:

      i. CONSTRUCTOR (1,1)
      ii. VEHICLE (1, N)

   b. This relationship just tells us about the VEHICLE which is designed by the CONSTRUCTOR for the races.

3. DRIVES FOR
    a. Binary relationship between:
        i. DRIVER (1, N)
        ii. CONSTRUCTOR (1,1)
    b. This relationship provides the relation between the DRIVER and the CONSTRUCTOR which he/she represents. It can be used to get the list of all DRIVERs which represent a particular CONSTRUCTOR.

4. CONSISTS OF
    a. Binary relationship between
        i.
        →DRIVERS' CHAMPIONSHIP (1,1)
        →RACES (0,N)
        ii.
        →CONSTRUCTORS' CHAMPIONSHIP (1,1)
        →RACES (0,N)
    b. Through this relationship, we can find out the list of RACEs which take place in a particular DRIVERS' CHAMPIONSHIP/CONSTRUCTORS' CHAMPIONSHIP and we could also obtain a calendar of RACEs.

5. HELD IN
    a. Binary relationship between
        i. RACES (0,N)
        ii. CIRCUITS (1,1)
    b. This relationship tells us on which circuit a particular race is organized.

6. PARTICIPATES
    a. Binary relationship between
        i.
        →DRIVERS (1,1)
        → RACES (1,N)
        ii.
        →CONSTRUCTORS (1,1)

→RACES (1,N)

b. This relationship tells us about a DRIVER and a constructor participating in a RACE

7. WINS

   a. Quaternary relationship between

      I. DRIVER (1,1)
      ii. CHAMPIONSHIP (1,1)
      iii. CONSTRUCTOR (1,1)
      iv. CIRCUIT (1,1)

   b. Tells us that a DRIVER wins a CHAMPIONSHIP representing a CONSTRUCTOR at a CIRCUIT.

8. FINISHES

   a. Ternary relationship between

      i. DRIVER (1,1)
      ii. RACE (1,N)
      iiI. RESULT (1,1)

   b. Tells us that a DRIVER *finishes* a RACE with RESULT. It can be used to tabulate the list of finishes and points scored for a given driver in a particular season.

9. INDUCTED TO

   a. Binary relationship between
      i.
         ➔ DRIVER (1,1)
         ➔ DRIVERS' HALL OF FAME (1,1)
      ii.
         ➔ CONSTRUCTOR (1,1)
         ➔ CONSTRUCTORS' HALL OF FAME (1,1)

   b. When a DRIVER wins a DRIVERS' CHAMPIONSHIP, he/she is inducted into DRIVERS' HALL OF FAME. Similarly, when a CONSTRUCTOR wins a CONSTRUCTORS' CHAMPIONSHIP, they are inducted into the CONSTRUCTORS' HALL OF FAME.

FUNCTIONAL REQUIREMENTS

User:

1. **Selection:** To retrieve all drivers in ‘F1’ championship who drive for ‘Red Bull Racing’

2. **Projection:** Project all unique drivers inducted into the ‘Hall of Fame’ with 2 or more championship wins

3. **Aggregate:** Retrieve the driver inducted into ‘Hall of Fame’ with minimum championship wins, in case of a tie take the one with minimum points, in case of another tie take the one designed by the constructor with least points among them.

    Analysis:

    - ➔ Here, we are basically trying to find the biggest underdog among those in the Hall of Fame already.
    - ➔ We use the count aggregate function to find number of championship wins for each unique driver.
    - ➔ In case >1 drivers have the least championship wins, we join it to the ‘Drivers’ Championship’ entity which has the points attribute. Then, we select the driver with least championship points from this subset of data.
    - ➔ Again, if >1 drivers get selected, we look into the ‘Constructors’ Championship’ entity and select the one with lowest constructor points.
    - ➔ Hence, we are joining 3 entities – Drivers’ Hall of Fame, Drivers’ Championship & Constructors’ Championship

4. **Search:** Search for driver names staring with letter L
    - ➔ Lando Norris, Lewis Hamilton, etc

Database administrator:

1. **Insertion:** Driver X finishes 2nd in the US Grand Prix of the F1 championship in 2022
    - ➔ Here, if X = ‘Charles Leclerc’ i.e. X is present in the ‘Drivers’ entity, then we can update the ‘Results’ entity with the above given data as a tuple. (Follows integrity constraints)
    - ➔ If X = ‘Virat Kohli’, i.e. X is NOT present in the ‘Drivers’ entity, then referential integrity fails in the case of the ternary relationship between Drivers, Races and Results. Thus, this insertion is not possible

2. **Update:** Let's say that 'Max Verstappen' wins the US Grand Prix in 2022, then we update his points in the entity 'Drivers' Championship' by incrementing it by 25/26

3. **Delete:** At the start of 2022, a Russian GP was scheduled to take place. However, after the Russian invasion of Ukraine, FOM decided to cancel the race in Russia.

    ➔ So here, we would modify the 'Races' entity by deleting the tuple which is identified by the name 'Russian Grand Prix'