CSS 461

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I revise my E/R diagram from assignment 6.a a bit in order to better represent my ideas. I change the type of the attribute pardoned_date in member entity to multivalued attribute. I change the type of the attribute time_slot in reserved relationship to multivalued attribute. I add the attribute court_ID in Court entity and take court_ID as primary key of in Court. For each court, there is only one unique court ID. (See Figure 1)
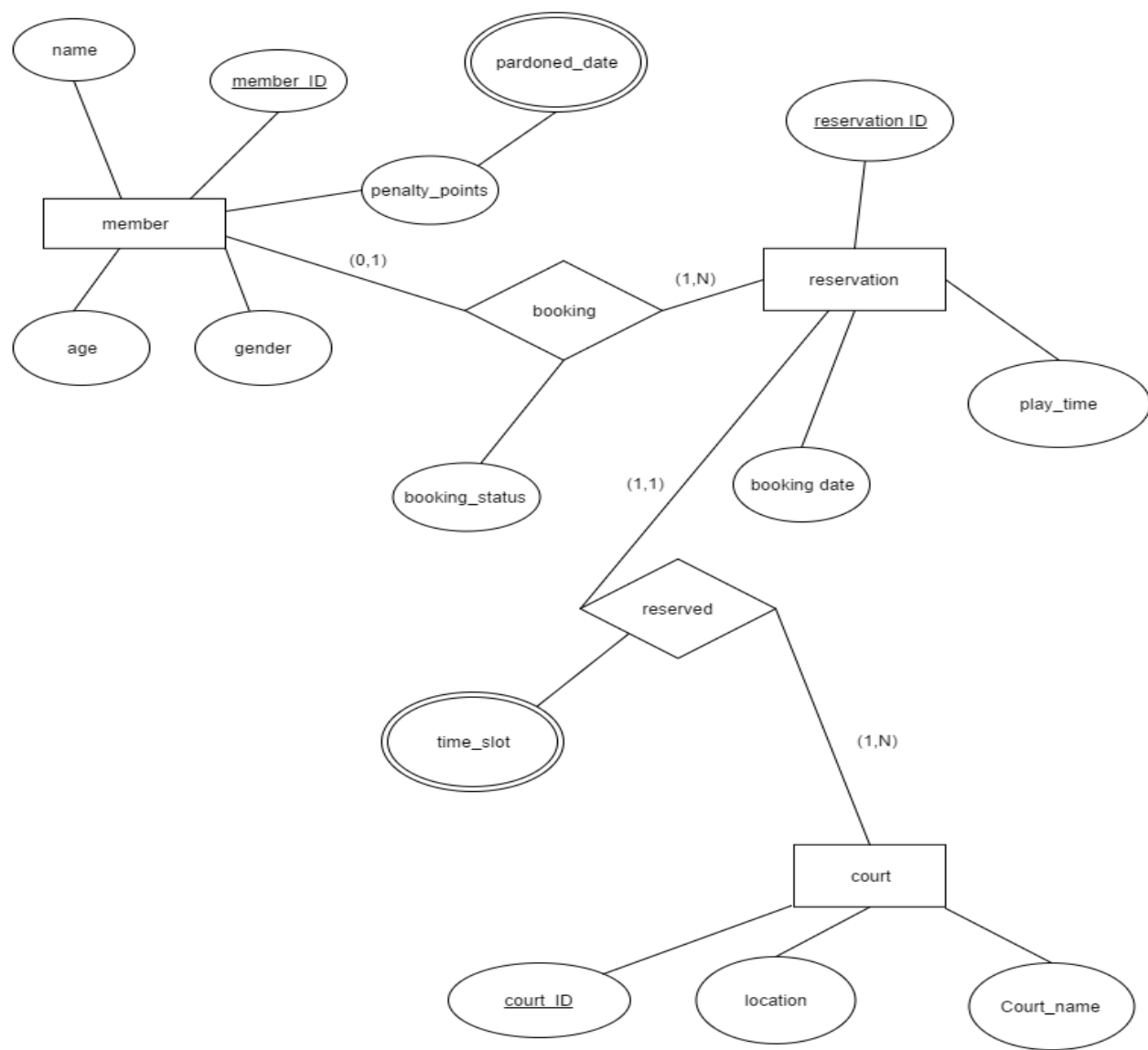

Figure 1 E/R diagram

Task 1: Given the Entity/Relationship Diagram you created in Asmt 6.a, follow the steps in Chapter 9 of the textbook to convert your E/R diagram to a relational schema.

Document what you did (and why, if you had choices) for every step.

Step 1: Mapping of Regular Entity Types

I create the relations *Court, Member, and Reservation* to correspond to the regular entity types *Court, Member, and Reservation* in my E/R diagram. The foreign key and relationship attributes are not included yet; they will be added during subsequent steps. I choose *court_ID, member_ID*, and *reservation_ID* as primary keys for the relations *Court, Member, and Reservation*, respectively.

Step 2: Mapping of Weak Entity Types.

For step 2, I omit step 2 since there is no weak entity types in my E/R diagram.

Step 3: Mapping of Binary 1:1 Relationship Types.

For step 3, I omit step 3 since there is no 1:1 Relationship Types in my E/R diagram.

Step 4: Mapping of Binary 1:N Relationship Types.

To apply Foreign key approach to my E/R diagram, I map the 1:N relationship types *booking*, *reserved* from Figure 1. For *booking*, I include the primary key *member_ID* of the *member* relation as foreign key in the *reservation* relation and call it *MID*. Also, I include the simple attribute *booking_status* of *booking* relationship type in the reservation relation. For *reserved*, I include the primary key *reservation_ID* of the *reservation* relation as foreign key in the *Court_schedule* relation and call it RID.

Step 5: Mapping of Binary M:N Relationship Types.

For step 5, I omit step 5 since there is no M:N Relationship Types in my E/R diagram.

Step 6: Mapping of Multivalued Attributes.

In my E/R diagram, I create a relation *pardon_history*. The attribute *pardoned_date* represents the multivalued attribute *pardoned_date*, whereas *member_ID*—as foreign key—represents the primary key of *Member* relation. The primary key of *pardon_history* is the combination of {*member_ID, pardoned_date*}

I create a relation *Court_schedule*. The attribute *time_slot* represents the multivalued attribute *time_slot*, whereas *court_ID*—as foreign key—represents the primary key of *Court* relation. I include the primary key *reservation_ID* of the *reservation* relation as foreign key in the *Court_schedule* relation and call it *RID*. The primary key of *Court_schedule* is the combination of {*court_ID, time_slot*, *RID*}

Step 7: Mapping of *N*-ary Relationship Types.

For step 7, I omit step 7 since there is no *N*-ary Relationship Types in my E/R diagram.

Results are shown in dbsys-461-jzheng8-asmt-6b-final-schema.pdf.

Task 2: Determine the functional dependencies in effect in your relational model.

According to my final relational schema, we have such following relations:

Member (member_ID, name, gender, age, penalty_points)

    member_ID→ name gender age penalty_points

Pardon_history (member_ID, pardoned_date)

    No FD, since {member_ID, pardoned_date} is a key

Reservation (reservation_ID, booking_date, play_time, MID, booking_status)

    reservation_ID→ booking_date play_time MID booking_status

Court (court_ID, location, name)

    court_ID→ location name

Court_schedule (court_ID, time_slot, RID)

    No FD, since {court_ID, time_slot, RID} is a key.

Task 3: Prove that your relational schema is in Boyce-Codd Normal Form (BCNF) minimally. If it isn't initially, then document what changes you need, and why, in your relational schema in order to make it BCNF or better.

See FDs which I wrote in Task 2. For the relation *member*, the primary key *member_ID* determines other attributes in relation *member*. Same situations could be seen in *Reservation* and *Court*. Only keys are in relations *Pardon_history* and *Court_schedule*, respectively. So my relational schema is in Boyce-Codd Normal Form (BCNF) minimally.