CS4221: Database Design

Tutorial 4: The Entity-Relationship Model

19 March 2015

Note: Due to the time constraint, we will only discuss some of the questions

1. Construct an ER diagram for the following database as described in Tutorial 1. Make sure the ER diagram constructed is in ER-NF. (Hints: What are the entity types? Are there EX and ID relationship types and weak entity types?)

   Translate the ER diagram constructed to a relational database schema. What are the essential differences between the relational database schema obtained and the original given relational database schema?

PATIENT

Code	Surname	FirstName
A102	Harris	Lucy
B372	Rossini	Peter
B543	Johnson	Nadia
B444	Johnson	Luigi
S555	Rose	Jean

ADMISSION

Patient	Admitted	Discharged	Ward
A102	2/05/94	9/05/94	A
A102	2/12/94	2/01/95	A
S555	5/10/94	3/12/94	B
B444	1/12/94	1/01/95	B
S555	5/10/95	1/11/95	A

DOCTOR

Number	Surname	FirstName	Ward
203	Black	Peter	A
574	Bisi	Mavis	B
461	Boyne	Steve	B
530	Clark	Nicola	C
405	Mizzi	Nicola	A
501	Mount	Mavis	A

WARD

Code	Name	Head
A	Surgical	203
B	Paediatric	574
C	Medical	530

Figure 1. Database One.

2. You are asked to design a database for a travel agency containing the following information about their tours, customers and their tour bookings:

- The travel agency offers many tours. Each tour organized by the travel agency has a unique tour ID, a start date to an end date of the tour, and a price.

- Customers book tours. Each tour booking by a customer has a unique booking number.

- Each customer has a unique passport number with country of issue, name, address, and contact number.

- Each tour booking may have several accompanying persons. The system needs to store the names and passport information of all the accompanying persons of the same booking.

- Flight itinerary and hotel reservation information of each tour organized.

Draw an ER diagram for this database. You may make reasonable assumptions.

Hint. Do you design a tour booking as an entity, or a relationship, or a high level entity, i.e. an aggregation?

3. Construct an ER diagram for a restaurant ordering and payment system. The information to be included in the system should at least include the below:

- a menu which consists of food item numbers, title of each item, and prices for each food item with different sizes, i.e. small, medium, and large;

- an order with date, and a list of food items and sizes ordered, waiter/waitress name, table number, number of persons, etc.;

- the bill and payment should also include payment type (i.e. by cash or by credit card), service charge 10%, GST 7%, total bill amount, total amount paid with extra tip if any. Also with credit card number, credit card holder name, date, time, and payment approval code, etc. if the payment is made by credit card.

You may make some other reasonable assumptions.

4. Assume we live in a world of pet ownership as shown in the following ER diagram. Each person owns at least one pet.
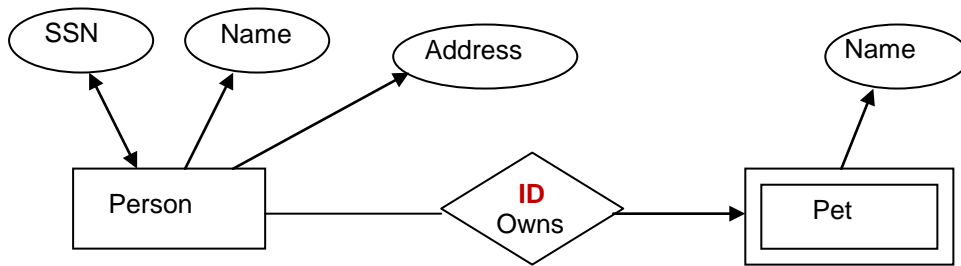
For each of the following facts, state whether or not it can be represented and why:

(a) There is a pet named Fluffy who is not owned by anyone.

(b) There is a person with SSN 123456789 and name Harry living at 123 Maple St. and Harry does not own any pets.

(c) There is a person with SSN 123456789 and name Harry living at 123 Maple Street who owns a pet Fluffy and a pet Turtle.

(d) There is a person with SSN 912345678 and name Sally with no address who owns a pet Salamander.

(e) There is a person with SSN 891234567 and name Edward living at 123 Maple St. who owns a pet Fluffy. Another person with SSN 789123456 and name Joseph living at 123 Maple St. who owns a pet Fluffy.

(f) There is a person with SSN 891234567 and name Edward living at 123 Maple St. who owns a pet Fluffy, and another person with SSN 891234567 and name Joseph living at 82 Walnut St. who owns a pet Scruffy.

5. A university registrar's office maintains data about the following entities:

    - courses, including course number, title, credits, syllabus, and prerequisites;

    - course offerings, including course number, year, semester, instructor(s);

    - students, including student-id, name, and program;

    - instructors, including identification number, name, department, and title.

    Further, the enrolment of students in courses and grades awarded to students in each course they are enrolled for must be appropriately modelled.

    Construct an ER diagram for the registrar's office system.
    You may make some other reasonable assumptions.

6. Design an ER diagram for a geographical information system. The information to be recorded should include:

    - Country information which consists of the name of the country and its head of state.

    - City information which includes the name of the city and its population. City names are unique within countries, but two cities in different countries may have the same name.

    - Embassy that represents its country in foreign countries. For each embassy, its name and street address in the city are recorded.

    - Each country represented by an embassy has an ambassador, who is represented only by a name. Occasionally, an embassy may represent more than one country. For example country A may not have diplomatic relations with country B, so country A will ask country C to represent country A's interests in country B at the embassy of country C in country B.

    You may make some other reasonable assumptions.