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# HW 3 – Practical Databases

Question 1 – Database intro [10 points]:

The scenario we will refer to is that of a particularly innovative flower shop in Tel-Aviv that decided to use the services of drones. The store delivers flowers that are in its inventory to the entire city. In addition, over time the store decided to use the "dead time" of the drones it bought to make food deliveries. Unlike the flower deliveries that are in the store, in food deliveries the drone must collect the food from a business that has agreed to process it with the store. We assume that the food business allways can supply the delivery. The store has a relatively small number of drones, so it is important to perform their tasks efficiently and quickly, and for the benefit of this purpose, the store owner decided to test two different navigation algorithms: NavGar and NavFree. The owner of the store wants to expand her business, so she looks for new opportunities. Recently, to attract new customers the owner of the store decided to give a benefit in which everyone who received a bouquet of flowers, can buy a discounted gift card to purchase food at one of the food businesses that works with the flower shop. In addition, married couples get discount for sending flowers to each other.

We will define the entities and relations in our model as follow:

Entities:

1. Drone
2. Navigation Algorithm
3. Costumer
4. Product
   1. Food (FoodID , CatalogNumber(FK), Calories , Vegan, Cosher)
   2. Flowers (FlowerID , CatalogNumber(FK), Name, Color, LightNeed, WaterNeed, Inventory)
5. Flowers inventory
6. Food Business

Relations:

1. Costumer is **married** to another costumer - **Unary**
2. Costumer **made an order** of food or flowers - Binary
3. Flowers **available** at flowers inventory - **Binary**
4. Food is **sold in** the food business - **Binary**
5. Drone **operated by** navigation algorithms - **Binary**
6. Drone made a **delivery** of product to a costumer – **Trinary**
7. Drone **visited** a Costumer – Binary
8. Drone **carried** a product - Binary

We defined more relations than entities, as required.

Based on the entities and the relations we defined we will create this scheme:

1. Drones (DroneID, Manufacturer, Model, PayloadCapacity, AlgoUses(FK) )
2. Algorithms (AlgoName, License, NeedInternet, BasedGPS)
3. Costumers (ID, FullName, Gender, Address, DateOfBirth, PartnerID(FK), GiftCardEligible)
4. Products (CatalogNumber, Type, Price, weight)

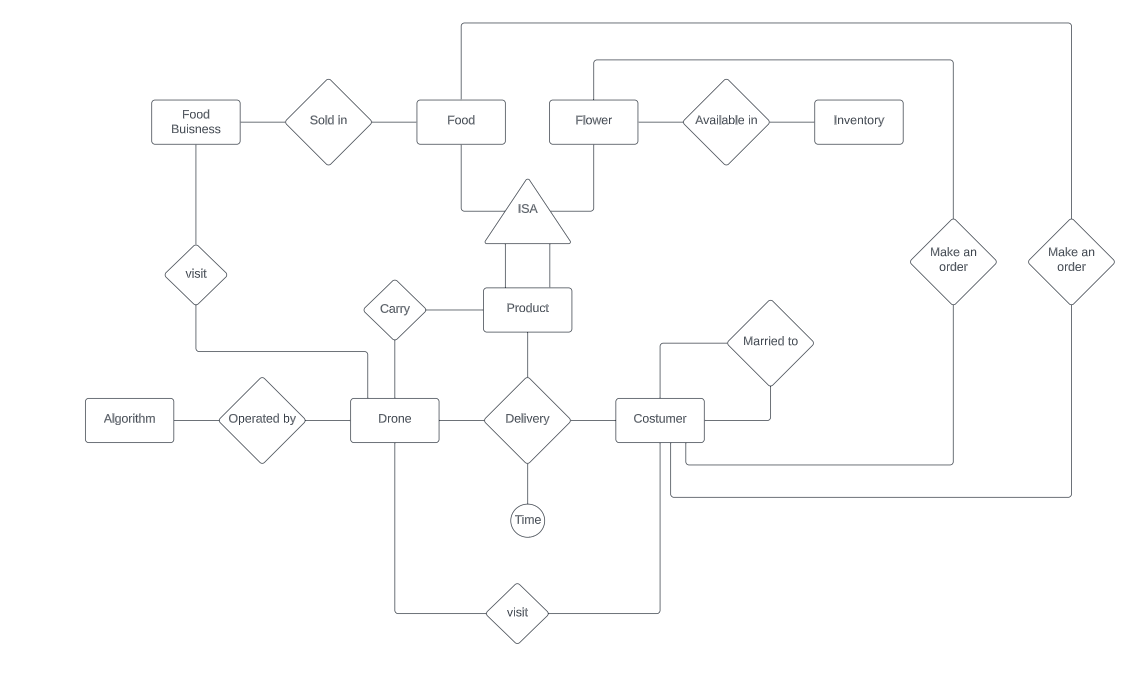
(The *type* attribute determine rather it is subclass *Food* or *Flowers* – exclusive generalization)

* 1. Foods (FoodID , CatalogNumber(FK), Calories , Vegan, Cosher)
  2. Flowers (FlowerID , CatalogNumber(FK), Name, Color, LightNeed, WaterNeed, Inventory)

1. Orders (CostumerID, TimeDate, CatalogNumber, DroneID (FK), Quantity, TotalPrice)
2. Food Business (BuisnessName, Address, Phone)

Regarding the primary key in all the entities it is straight forward, except order, flowers inventory, food business and product:

1. **Order** is represented by the Costumer ID and the catalog number, but it is possible for the same person to make some different order for the same catalog number and therefore we need the date too as part of the primary key.
2. To implement the exclusive generalization, we make that the primary key of **product** will be the same for **flowers** and **food business**. It allows them to share some attributes like prices and weight but have their unique attributes like "is kosher?" and "water needed?".
3. In the **flowers inventory** we don't keep a unique record for each flower, but just the quantity that we currently have from each catalog number. We don't do it strait in the Product table to avoid null for food.
4. In **food business** we added the address to the key in order to be able to distinguish between two branches of the same chain store.

Question 2 – ERD [30 points]:

We may note some consideration regarding this ERD:

1. The core relation here is the trinary delivery relation. We had some debates how this relation should be defined: what are the entities takes place in it and what should be the primary key of the correspond table? We decided that while the product, costumer and draw are the entities that are part of the relation, the time is an attribute of this relation, and it allows us to define primary key over costumer, time, and product.
2. Although it may look like the separation of Flower and Food into two different entities is artificial, it has a business logic regarding the supply chain. While flowers should be managed in an inner inventory of the owner of the shop, in the case of food we don't need to manage the inventory because the drone just go the business that is available.
3. The unary relation of being married is important to determine discount. For the sake of simplicity, we ignored divorcements.
4. For the sake of simplicity we didn’t put all the attributes of all entities on the chart.

Executive Summary

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Create the database using sqllite3 (using the notebook from lecture 9). Give seven meaningful insights from your created dataset. You need to use at least once with

joins,

aggregation operations,

summarize functions, and the like operator for your insights.

You should note the following:

* You need to determine the database scheme. The relations number should be greater than the number of entities.
* You need data to insert it to the relations (please view Creativity section).

Bonus Operations

Business opportunity on

Make two (each 5 point) more operations on the created dataset that aren’t showed at class (each need to be of a different kind). Please state whether you do this section. (More operations won’t resolve in more points…)

Question 3 – Code the database [50 points]:

Create the database using sqllite3 (using the notebook from lecture 9). Give seven meaningful insights from your created dataset. You need to use at least once with joins, aggregation operations, summarize functions, and the like operator for your insights.

You should note the following:

* You need to determine the database scheme. The relations number should be greater than the number of entities.
* You need data to insert it to the relations (please view Creativity section).

Make sure you are submitting two files; one is a pdf file that covers question 1 and 2. This file should also contain an executive summary (at most two pages long) of what you did in the code (question 3) and what was creative in your dataset and whether you choose to do the bonus section or not.

**In addition, provide the notebook file (ipynb).**