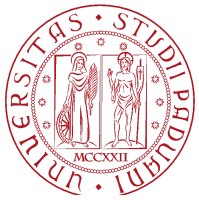

UNIVERSITÀ DEGLI STUDI DI PADOVA

Database Management Systems, A.Y. 2018/2019
Master Degree in Computer Engineering
Master Degree in Telecommunication Engineering

Homework 1 – Requirements Analysis

Deadline: March 13, 2019

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Objectives of the System

Nutritional disorders are on the rise, since many people have trouble maintaining a balanced diet. This problem is in part caused by a difficulty in scheduling a proper eating plan and to align it to everyday shopping due to time constraints. This has also increased the problem of food waste since many households tend to buy more products than they actually need. Moreover, most people tend to have little to no variation in their weekly diet and do not manage to reach the recommended doses of nutrients (this is especially true for individuals with special dietary needs such as gluten intolerance, veganism, etc.).

These issues could be resolved by planning in advance which food should be consumed for each meal (taking into consideration calories and eventual allergens) and, subsequently, write down the corresponding shopping list according to the ingredients needed. This could ensure that every meal is in the correct caloric intake range and that leftovers are minimized after the end of the plan.

Given the time-consuming nature of manually performing this task, the process is often skipped by most. AutoChef is an application designed to automate this process. To allow the proper management of its functions, a Database Management System (DBMS) is needed. Its objectives are to:

1. Collect and store user-shared recipes and their ingredients.
2. Manage users' data such as credentials and basic personal information connected to their nutrition (for example: sex, weight, height, allergies, etc.).
3. Collect and store information about groceries that can be bought by users.
4. Manage each user's personal pantry data, in order to suggest recipes that use leftovers.
5. Store the computed meal plan for each user.
6. Allow the management of user generated groups (representing different households).

Interviews

It has been decided to interview different types of entities in order to take the best ideas from each party and to create an application as reliable, complete and user friendly as possible. In particular the following stakeholders have been interviewed:

- Leading companies: different interviews with leading companies like under armor (that owned a similar application called “myfitnesspal”) were made in order to understand the main characteristics and functions of this type of application.
- Common people: several people especially nutritionist’s patients were interview to ask them what features they expect and what characteristics they like to be implemented in this application.
- Nutritionist: a very accurate interview was conducted with the nutritionist who set the main requirements of the system. Further interviews will be scheduled in order to accomplish the request of the owner of the application.

Users and Stakeholders of the System

The main users of the system are:

- Subscribers: people and nutritionist’s patients that subscribe to the application. They can control in real time what they ate previously and edit the planned recipes for the week.
- Moderators: subscribers that control the general behaviour of users and can eventually ban them. In addition they can add, delete or edit public recipes and ingredients and once a month they upgrade their price.

Natural Language Sentences

A nutritionist wants to help their patients planning their weekly menu with an Android application. This app will guarantee them a simple way to manage their diets and nutritional disorders. Furthermore, AutoChef will suggest recipes that use ingredients already owned by the user. This will reduce both food wastes and costs at the same time. With AutoChef users can easily change their diet and eating habits according to sudden changes in their lifestyles.

To use this app the user has to register by inserting some private information: first name, last name, birth date, allergies, food preferences, sex, weight and height. The application automatically generates their food requirements based on the information provided and then it enables the user to modify them as needed.

The app also allows registered users to upload their own recipes and to make them private or visible to all of the app users. A user can create a personal recipe book with recipes chosen from the database. Depending on this they can manually make an eating plan, with the possibility of different choices for every meal. He/she can choose the duration of the plan. Recipes are

suggested to the user based on their own food requirements and on the products contained in the pantry.

A product is either some raw material or a processed food. It is characterized by its seasonality, its perishability and the possibility to consider a single product as a meal (instead of a recipe). It is also possible to create a meal plan for a group of users considering the information of all of them and to modify the single component of a meal. If in the group there are some people that aren't registered in the app, it is possible to create new virtual users (profiles) for them. When the eating plan is created the application automatically generates the corresponding shopping list with all the products necessary for the plan that are not already present in the pantry and then the total price is computed. When the user confirms the list the app automatically considers its products bought and updates the pantry. If the plan is created by a group of users, the app calculates the average price for a single user. The eating plan is made by different menus, one for each meal of the day, that contain at most five courses each.

With this app users can also create groups of users that share the same pantry.

A user can evaluate the public recipes present on the database of the application by assigning them a rating between 1 and 5 stars. On the database app there is a list of products that can be considered during the creation of the food plan like a meal. Each product is identified by a name, an average duration, an average cost, the type of food, its amount of kcal and nutrients. There are particular users called moderators that have some characteristics that normal subscribers don't have: they have access to the list of products and public recipes not only to read them, but also to modify or to remove them if they are not suitable for the app. If users want to add a product to the list they have to wait for approval by a moderator.

When a user uploads a recipe on the app he/she has to specify the name, the level of difficulty (from 1 to 5) and obviously the set of instructions to complete it. Then the app automatically calculates the amount of kcal, the food preferences and allergies on it and the tools that the users need to prepare it. It also generates the list of ingredients necessary and their total cost.

Filtered Sentences

Subscriber, a person subscribed to Autochef who wants to manage their pantry and food purchases while monitoring their food habits and cooking skill:

- Each subscriber is identified by her/his name, surname, username, birthday, weight, height, sex.
- Each subscriber can log in with a username/email and password.
- Each subscriber can specify his/her allergies (lactose, gluten, nickel, …) and food preferences (vegetarian, fruitarian, vegan).
- Each subscriber can modify their food requirements (composed by the amount of kcal and nutrients for each meal), which were computed automatically by the app looking at his/her registration fields.
- Each subscriber can modify and register what are the products in his/her pantry.
- Each subscriber can read all public recipes and add them to his/her recipe book.
- Each subscriber can add private recipes to their personal recipe book and modify them.
- Each subscriber can make his/her personal recipe visible to all other users.

- Each subscriber can create groups with other people in which they will share pantry, planning and shopping cart, which can all be modified by everybody.
- Each subscriber can define his/her personal eating plan and modify it.
- Each subscriber can see his/her shopping cart.
- Each subscriber can evaluate public recipes.
- Each subscriber can ask to moderators to add a product to the public product list.
- Each subscriber can read public products and use them to define new personal recipes.
- Each subscriber can notify some errors or improvements in already existing recipes to moderators.
- Each subscriber can modify his/her personal settings.
- Each subscriber can create virtual users inside groups in order to establish a menu for a single group in a simple way.

Moderator, a subscriber with some privileges that allow him/her to manage and guarantee the correct behaviour of subscribers:

- Each moderator can read public recipes and then modify/delete those that aren't suitable or that can be improved by comments of subscribers.
- Each moderator notifies the modification and the removal of a recipe to its author.
- Each moderator can add new products suggested by subscribers to the public product list.
- Each moderator can reject subscribers' suggestions.
- Each moderator can limit the actions of subscribers if their behaviour is inappropriate.
- Each moderator can ban subscribers if they maintain an inappropriate behaviour for a long time.

Virtual user, a user created by a subscriber (inside a group) that does not have all the account fields:

- Each virtual user is identified by a name.
- Each virtual user specifies allergies and food preferences.
- Each virtual user can be managed by the users of the group in which the profile was created.

Recipe, a set of instructions that subscribers can follow to transform a set of products into the courses that compose a meal:

- Each recipe is identified by a name, the author's username, its date of creation and its user rating (number of stars from 1 to 5).
- Each recipe specifies level of difficulty (from 1 to 5), food preferences, allergies, tools that users need, cooking time, cost, list of products with their quantities and a list of instructions, season of its ingredients.
- Each recipe can be private (for a single user) or public for all users.
- Each recipe can be added to the private recipe book of a single user.

Menu, a set of dishes that are served during a meal:

- Each menu must contain at most five courses (Starter, First Course, Second Course, Side, Dessert).

- Each menu is inserted in the plan by a user who can select recipes from his/her recipe book following the app's suggestions. These help by respecting food requirements and minimizing the waste of products in the user's pantry).
- Each menu can be defined by one or more recipes/products for each course.

Plan, an ordered sequence of menus that are organized for a certain time frame:

- Each plan is created by a user who can modify/delete it at any time.
- Each plan is defined by: start date, number of days, number of people.
- Each plan specifies a list of ordered menus inserted by the user.
- Each plan can also be shared by more than one subscriber (inside groups).

Group, a set of one or more users:

- Each group has specific pantry, plan and shopping list.
- Each group can be defined by a list of subscribers.
- Each group can also be defined by a list of profiles that are created by a single user of the group. This simplifies the creation of plans for groups of people where not everybody may be subscribed to the app.
- Each group can manage its virtual users.

Shopping list, a list of products that one user (or more in the case of groups) needs to buy:

- Each shopping list is generated from a plan if there aren't enough products in the pantry to guarantee that users can complete it during the specified period.
- Each shopping list shows users the average amount of money that they need to spend to buy all the products.
- Each shopping cart, once confirmed, automatically considers its list of products as bought and adds it to the pantry.

Pantry, a list of products that each user (or group) already has and doesn't need to buy:

- Each pantry is defined by a user or group of users.
- Each pantry is updated automatically when confirming a shopping list.
- Each pantry can be modified manually by the user whenever he/she wants.

Product, raw material or processed food:

- Each product is identified by its name, average duration, average cost, amount of Kcal and nutrients
- Each product is defined by a type of food (vegetable,meat,fruit,dairy,…).
- Each month a moderator updates the cost of each product.

Term Glossary

Term	Description	Synonyms	Connection
Subscriber	Person subscribed to Autochef who wants to manage his pantry and food purchases.	Registered user	Moderator, Recipe, Plan, Group, Shopping list, Pantry,Virtual User
Moderator	Subscriber with special privileges that allow him to manage and guarantee the correct behaviour of subscribers.		Subscriber, Recipe, Plan, Group, Shopping cart, Pantry
Virtual User	User created by a subscriber (inside a group) that does not have all the account fields		Subscriber, Group
Product	Raw material or processed food.	Ingredient	Subscriber, Moderator, Recipe, Shopping cart, Group, Pantry
Recipe	Set of instructions that subscribers can follow to transform a set of products into courses.		Subscriber, Moderator, Group, Menu, Product
Menu	Set of dishes that are served during a meal.		Plan, Recipe, Product

Eating plan	Ordered sequence of menus that are organized for a certain period.	Schedule, food plan	Subscriber, Moderator, Group, Menu, Shopping cart, Pantry
Group	Set of one or more users.		Subscriber, Moderator, Shopping cart, Plan, Pantry, Virtual User
Shopping list	List of products that one or more users need to buy.	Shopping cart	Subscriber, Moderator, Group, Plan, Pantry
Pantry	List of products that a user (or group) already has and doesn't need to buy.	Storage	Subscriber, Moderator, Group, Plan, Shopping cart

Functional Requirements

The DBMS has the following functional requirements:

- Manage two account types: users and moderators.
- Store user data: name, surname, date of birth, username, password, e-mail, allergies, food preferences, weight, height, nutrient needs.
- Store recipe information: name, author, creation date, difficulty, tools, product list, course, allergens, cost, rating, suitable food preferences, preparation time, procedure, season.
- Manage a personal recipe book, with the possibility to add existing recipes, create new ones and remove those already present.
- Allow users to share their created recipes with the community after confirmation from a moderator.
- Manage the creation and deletion of user groups.
- Allow users to create fake accounts identified only by: name, allergies, food preferences, nutrient needs.
- Store schedule data: start date, duration, menu list, number of people, user list.
- Manage the creation by users of an eating plan, both for themselves and for a group.
- Assist users during plan creation by considering their personal settings: personal recipe book, allergies, food preferences, nutrient needs, pantry, group members, seasonal products and average expiration times.

- Allow users to modify and delete their plans at any time.
- Create a shopping list based on the plan and on the remaining items in the pantry.
- Compute the average cost for the shopping list. If it is a shared shopping list divide this cost between all users in the group.
- Manage adding and removing items from the pantry.
- Allow users to rate recipes.
- Allow users to modify their settings at any time.
- Allow users to add public products, after confirmation from a moderator.
- Manage user permissions: users can read both public and their personal recipes but can only edit personal ones. They can only access the groups they are in and modify the ones they created. They can read the product list and read/modify their personal storage.
- Manage moderator permissions: they can access and edit all public recipes and products. They can see recipe sharing and suggestion proposals and accept/reject them.
- Allow user suggestions on recipes. These must be confirmed by a moderator.

Non Functional Requirements

The DBMS has the following non-functional requirements:

- Backup of all contents to prevent data loss.
- Efficiency in plan creation and in recipe suggestions.
- Extensive documentation to ease management and maintenance operations.
- Up-to-date prices managed by moderators at least once per month.
- Interoperability to make the system able to work with different applications and systems.
- Fault tolerance to guarantee continuous operation in case of malfunctions.
- Privacy and security functionalities to protect users' private data.
- Ensure high quality contents through moderator control.
- Easily scalable with the increase of the number of users through moderator control.
- Usability of the site by allowing users to login with both their username or e-mail address.

Constraints

The DBMS application should satisfy the following constraints:

- Be implemented with PostgreSQL.
- It should use Java with the JDBC library.s
- Client side implemented as an Android application.
- The server side will be implemented with Tomcat, java servlet, JSP, MVC and REST web services.
- Operating system: linux.