Project Track1 Stage2: Database Design for HealthTrack

Team008
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1 ER Diagram

The ER Diagram of our database is shown in Figure 1.

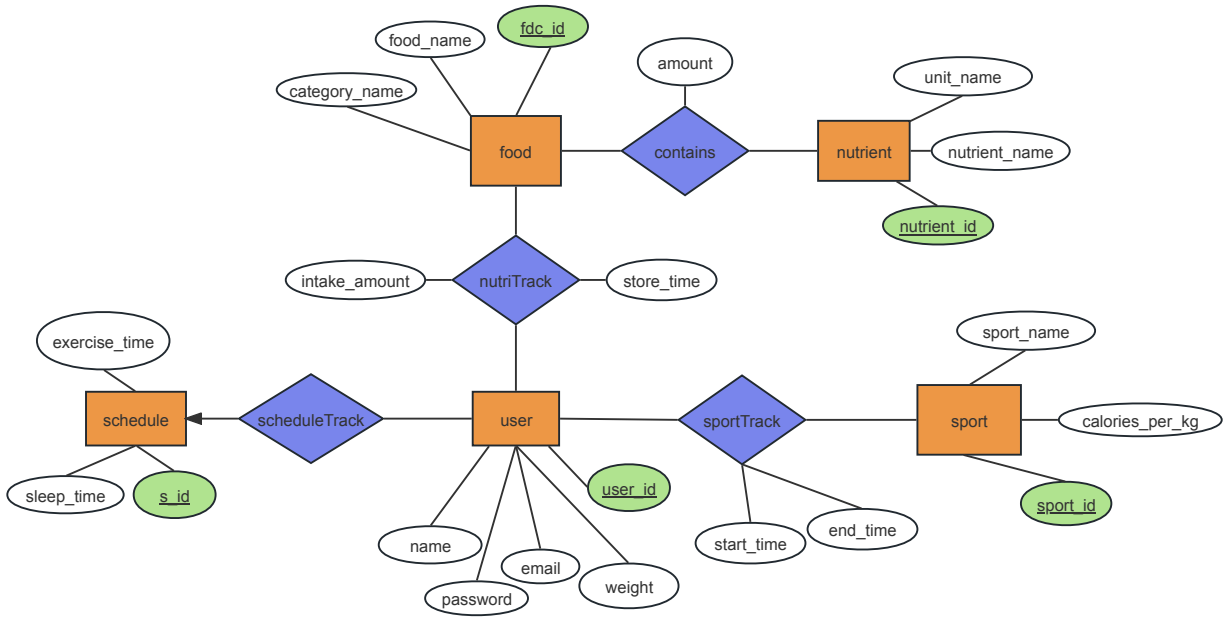

Figure 1: ER Diagram of HealthTrack database

2 Assumptions for Each Entity and Relationship

2.1 Entities

- **user:** It represents primary actors in the system with attributes including user_id(primary key), name, email, password and weight(kg).
- **food:** It represents different food items, including a unique identifier (fdc_id), food name and category it belongs to.
- **nutrient:** It represents information of various nutrients, including nutrient_id(primary key), nutrient name and unit for recording its amount(like g or kcal).
- **sport:** It represents information of various sports, including sport_id(primary key), sport name, calories burned per kg when doing the sport.
- **schedule:** It represents predefined lifestyle schedules, each with specific plan of sleep time and exercise time. Users can select one schedule as their health target and reminder.å

2.2 Relationships

- **scheduleTrack:** A one-to-many relationship from schedule to user. One user can select one schedule as their health plan, one health plan can be selected by many different users.
- **nutriTrack:** A many-to-many relationship between user and food. It lets each user to log each food they have intaked, with intake amount(g) and time.
- **sportTrack:** A many-to-many relationship between user and sport. It lets each user to record each sport they have done, with start time and end time.
- **contains:** A many-to-many relationship between food and nutrient. It records the nutritional content of each food per 100g, detailing the amount of each nutrient present in the food items.

3 Entity and Relationship Requirement of ER diagram

Our ER diagram satisfies the following two requirements.

3.1 Entity Requirement

There are five entities in our database: **user**, **schedule**, **sport**, **nutrient**, **food**, with only the **user** entity being used to represent user account information.

3.2 Relationship Requirement

Our database design includes two types of relationships, including 1-1 and 1-many.

1-many relationship:

- user – schedule

many-many relationship:

- food – nutrient
- food – user
- user – sport

4 Database Normalization

4.1 Define Tables:

1. User Table
2. Nutrient Table
3. Food Table
4. Sport Table
5. Schedule Table
6. NutriTrack Table (to track nutrient intake per user)
7. SportTrack Table (to track sports activities per user)
8. Contains Table

4.2 3NF Normalization:

3NF Definition:

A relation R is in 3rd normal form if : Whenever there is a nontrivial dependency A1, A2, ..., An $->$ B for R, then A1,A2,...,An is a super-key for R,OR B is part of a key.

Decomposition Process:

(a) Get a "minimal basis" G of given FDs

(b) For each FD A $->$ B in the minimal basis G, use AB as the schema of a new relation.

(c) If none of the schemas from Step 2 is a superkey, add another relation whose schema is a key for the original relation.

4.2.1 User Table

Original Schema: user(user_id, name, email, password, weight, s_id)
Minimal Basis: user_id $->$name, email, password, weight, s_id
3NF Decomposition: user(user_id, name, email, password, weight, s_id)

4.2.2 Nutrient Table

Original Schema: nutrient(nutrient_id, nutrient_name, unit_name)
Minimal Basis: nutrient_id $->$nutrient_name, unit_name
3NF Decomposition: nutrient(nutrient_id, nutrient_name, unit_name)

4.2.3 Food Table

Original Schema: food(fdc_id, food_name, category_name)
Minimal Basis: fdc_id $->$food_name, category_name
3NF Decomposition: food(fdc_id, food_name, category_name)

4.2.4 Sport Table

Original Schema: sport(sport_id, sport_name, calories_per_kg)
Minimal Basis: sport_id $->$ sport_name, calories_per_kg
3NF Decomposition: sport(sport_id, sport_name, calories_per_kg)

4.2.5 Schedule Table

Original Schema: schedule(s_id , sleep_time, exercise_time)
Minimal Basis: s_id $->$ sleep_time, exercise_time
3NF Decomposition: schedule(s_id , sleep_time, exercise_time)

4.2.6 NutriTrack Table

Original Schema: nutriTrack(user_id, fdc_id, intake_amount,store_time)
Minimal Basis: user_id, fdc_id$->$intake_amount,store_time
3NF Decomposition: nutrient(user_id, fdc_id, intake_amount,store_time)

4.2.7 SportTrack Table

Original Schema: sportTrack(user_id, sport_id, start_time, end_time)
Minimal Basis: user_id, sport_id$->$ start_time, end_time
3NF Decomposition: sportTrack(user_id, sport_id, start_time, end_time)

4.2.8 Contains Table

Original Schema: contains(fcd_id, nutrient_id, amount)
Minimal Basis: fcd_id,nutrient_id− > amount
3NF Decomposition: contains(fcd_id, nutrient_id, amount)

5 Logical design (Relational Schema)

- **food**(*fcd_id* : INT [PK], *food_name* : VARCHAR(255), *category_name* : VARCHAR(255))
- **contains**(*fdc_id* : INT [PK], *nutrient_id* : INT [PK], *amount* : FLOAT, *fdc_id*: INT [FK to food.fdc_id], *nutrient_id* : INT [FK to nutrient.nutrient_id])
- **nutrient**(*nutrient_id* : INT [PK], *nutrient_name* : VARCHAR(255), *unit_name* : VARCHAR(255))
- **sport**(*sport_id* : INT [PK], *calories_per_kg* : FLOAT, *sport_name*: VARCHAR(255))
- **sportTrack**(*sport_id*: INT [PK], *user_id* : INT [PK], *start_time*: TIMESTAMP, *end_time*: TIMESTAMP, *sport_id*: INT [FK to sport.sport_id], *user_id* : INT [FK to user.user_id])
- **user**(*user_id* : INT [PK], *weight* : FLOAT, *email* : VARCHAR(255), *password* : VARCHAR(255), *name* : VARCHAR(255), *s_id* : INT [FK to schedule.s_id])
- **nutriTrack**(*fdc_id* : INT [PK], *user_id* : INT [PK], *store_time* : TIMESTAMP, *intake_amount* : TIMESTAMP, *fdc_id* : INT [FK to food.fdc_id], *user_id* : INT [FK to user.user_id])
- **schedule**(*s_id* : INT [PK], *sleep_time* : FLOAT, *exercise_time* : FLOAT)

6 Clarification of Updates on Proposal

- Removed the data source Open Food Facts and we will only use data source USDA's FoodData Central because the requirement of 5 entities can be satisfied by using USDA's FoodData Central (Section 5)
- Added more details to all 4 points of creative component in terms of visual features (Section 3)
- Added explicit and detailed description of our UI design (Section 7)
- Added more detailed comparisons between HealthCheck and two other existing diet-related apps including MyFitnessPal and Yazio (Section 4)