Morphological analysis of GLUKOZA's conversational agent elements over functionalities-vs-data breakdown

Design considerations for The Alexa Diabetes Challenge competition entry GLUKOZA

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May 2017

The next pages of this document have a Morphological analysis table that gives the breakdown of GLUKOZA's different Conversational Agent (CA) elements for a set of functionalities over different types of data. The breakdown axes are:

- CA functionalities, and
- the types of data CA has access to.

Each cell of the table gives examples of the types of queries, commands, or dialogs CA would use to provide the functionalities. The content of each cell can be expanded and completed in the spirit of cell's item.

The table is going to be further expanded and filled-in during GLUKOZA's development.

Brief explanations of the considered functionalities and data types follow.

Functionalities

The functionalities are mainly in two groups:

- a user personal point of view,
- a researcher (physician, developer) perspective over all users.

Data

Personal demographic data

This is personal data that the user provides at the enrollment stage and during use. That would include age, race, height, weight, geographical location, and other demographic data.

GLUKOZA should obfuscate and anonymize the personal data to a reasonable degree. There should be some dialogs and explanations to what degree a user wants to share data. (For example: no sharing, sharing only physical activity, share everything.)

Personal physical activity logs

The physical activities the user engages on. This data might contain records with timestamps, time intervals, physical activity name and description, and other related data. (For example, total number of steps, or total number of kilograms lifted.)

Personal nutrition logs

Records of how much and what kind and brand of food the user consumes at what time and where.

Personal medicine prescriptions

The prescriptions written by a physician for the user.

Nutrition database of foods

Calories content and breakdown of different foods, dishes, drinks.

Energy database for different physical activities

What physical activity requires what amount of energy (in calories.)

All users data

For all types of personal data we can consider records of all users. (The records of users that do not want to share them are not included.)

Data type / Functionality	Personal demographic data and preferences	Personal physical activity logs	Personal nutrition logs	Personal medicine prescriptions	All users data (demographic, app usage, medical conditions)	All users physical activity logs	All user nutrition logs	Nutrition database of foods	Energy database for different physical activities
The general diabetes management algorithm	Direct use in the algorithm.	Direct use in the algorithm.	Direct use in the algorithm.	Direct use in the algorithm.	Find and report general algorithm flow patterns across users.			Use to monitor and predict low/high sugar levels.	
Personal evolution statistics in view of reduced weight, BMI, waist-hip ratio, etc.	— How many people have my BMI? — What it the time series evolution of the BMIs for my demographic?	Evolution statistics.	Evolution statistics.	When (at what BMI point) I can quite taking this medicine?	— What is the evolution of the BMIs for each demographic group? — What trends are observed per demographic group?				
Facilitation of physical and nutrition activities data entry and monitoring		— Dialogs for activity data entry. — Using / hooking-up external systems (apps) for physical activity monitoring.	— Dialogs for food consumption entry. — Using / hooking-up external systems (apps) for food consumption monitoring.			Leveraging the network effect for exercise diary entry. (E.g. calories per exercise name.)	Leveraging the network effect for food by name and/or brand diary entry.	— Dialogs for entry of consumed food. — Cross correlations for finding habits and trends.	— Dialogs of entry of performed physical activities. — Cross correlations for finding habits and trends.
Nutrition and medicine taking reminders based on prescribed schedules	— How many people take this kind of medicine? — What people pay on average over lifetime for this medicine?		Recommendations and reminders of foods (snacks) to have handy.	Dialogs of prescription data entry.					
Facilitation of game-like usage: — competitions between users; — financial incentives; — a score for being a "good user".	Search/find/connect users with the same demographics, hight, and weight (or BMI) to compete with.	Used to derive and proclaim metrics of the competition evaluation.	Used to derive and proclaim metrics of the competition evaluation.		— How do I score compared to others? — Forming competing groups and answering queries about them.	Used to derive and proclaim metrics of the competition evaluation.	Used to derive and proclaim metrics of the competition evaluation.	— Which competing person / group consumes less sugars? — Which competing person / group consumes more vegetables?	— Which competing person / group sits less? — Which competing person / group does aerobics the most?
General "where am I at" statistics queries	How many people (users) are like me?	Where I place with other people of my demographic?	Where I place with other people of my demographic?			How many people train more than me?	How many diabetes people drink as much coke as me?		
"What will happen if" scenarios play-outs for a person			When I going to recover from eating a dozen macaroons right now?	— What will happen with stop taking a given medicine? — What will happen if I take a given medicine with large intervals?				How my diet would change if I stop being vegetarian?	How many kilograms I will lose if eat the same and run 5 kilometers every day?

Data type / Functionality	Personal demographic data and preferences	Personal physical activity logs	Personal nutrition logs	Personal medicine prescriptions	All users data (demographic, app usage, medical conditions)	All users physical activity logs	All user nutrition logs	Nutrition database of foods	Energy database for different physical activities
"What will happen if" scenarios play-outs for all users or cohorts of users				— What is the price elasticity for a given medicine?	If male users with BMI greater than 30 reduce their weight with 20% what is their average predicted lifetime extension?	— How the total medicine payments would change if all users increase their physical activities by 20%? — How many people would be kicked-out of the program if there is a minimal weekly threshold?	How diabetes conditions would change if: — sugar is removed from all bread products; — all soft drinks are banned; — all chocolate and ice-cream prices are increased by 20%?	What would be the total weight loss of all users if Coca Cola cans have 10% less sugar?	What would be average weight reduction in males older than 60 if they run 2 kilometers more in a week?
Statistical queries over all users or cohorts of users					— Distributions and trends over different population breakdowns. — Clustering of user based on consistency of their diabetes or calorie intake management.	What fraction of users with BMI greater than 29 exercise at least 5 hours a week?	What is the average calorie intake of Florida male users with BMI greater than 30?		
Financial queries	— How much type 2 diabetes costs to someone like me?		What insurance adjustments according to risk should be made: — for a given person, — for a given group?	— How much I spend on diabetes medicine per given time period? — How much people of given location or demographic spend on a given medicine?	— How much type 2 diabetes costs to a given demographic group?		What are cost of living changes if following (or not) the program nutrition guidelines?	— Wha is the lifetime impact of drinking a can of Coca Cola every day?	— What it lifetime financial impact of running 12 miles every week?
Recommendation system	Recommend users to be friends with or compete with.	— Recommend other users to train with. — Recommend exercises that done by successful (improving) similar users.	— Recommend foods. — Recommend meals in restaurants.		— Find cluster similar users. — Find users high risk users.	Recommend exercises to be adopted across user clusters based in success of individual representative users.	Use to make collaborative filtering recommendations.	Use to tune and explain recommendations.	Use to tune and explain recommendations.