InsuLink

Documentation

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Table of Contents

1 Idea **2**
- 1.1 Main Goal . . . 2

2 Functionalities **3**
- 2.1 Food Scan . . . 3
- 2.2 Glycemia . . . 3
- 2.3 Insulin Calculator . . . 3
- 2.4 Calendar . . . 3

3 Screens and Navigation **4**
- 3.1 Home . . . 4
- 3.2 Search . . . 5
- 3.3 Glycemia PopUp . . . 5
- 3.4 Meal Diary . . . 6
- 3.5 Calendar . . . 6

4 Architecture **7**
- 4.1 Folder Structure . . . 7

5 API doc **9**
- 5.1 Nutritionix . . . 9
- 5.2 Firebase . . . 9

6 Redux States **10**

7 Insulin Calculator **10**

8 Testing **11**
- 8.1 Folders . . . 11

9 Future Implementations **12**
- 9.1 API . . . 12
- 9.2 Machine Learning and AI . . . 12
- 9.3 NFC Glucose Meter . . . 13

10 References **14**

24 References **14**

SECTION 1

Idea

When Type 1 Diabetes[1] is diagnosed, a patient starts a new life with different eyes. From now on, the conception of food is completely different from the normal one, and the patient has to assimilate the big change and learn how to handle the disease. One of the most difficult but at the same time important things that the patient must learn, is the ***carbohydrates count*** and subsequently the correct insulin dose for a bolus [2]. InsuLink has been designed with the main purpose of giving an hand to Type 1 Diabetes patient with the calculation of the correct ***insulin doses*** and storing Glycemia values.

1.1 Main Goal

InsuLink main goal is to give a first support to the patient but only if combined with the doctor supervision. It is important to underline that this application is only defined by an algorithm, and in this kind of diseases ***each patient needs ad hoc treatments***.

```
\usepackage
```

or

```
\usepackage{package}
```

SECTION 2

Functionalities

Insulink offers some useful tools to keep track of the daily routine of a patient.

2.1 Food Scan

It is possible to to scan a given Food BarCode and be redirectd to the FoodDetails page with all necessary data.

2.2 Glycemia

Keep track of your daily Glycemia with intuitive charts and easly with the glycemia insertion tool.

2.3 Insulin Calculator

An algorithm (inside Insulin Calculator class) will retrieve last Glycemia, total amount of carbohydrates, sport activity and all essential data to calculate the optimal insulin dose for the given meal. A more detailed explaintation can be fount in the Insulin Calculator Section.

2.4 Calendar

The user can see a well detailed sight of all previous data, just choosing a date from the InsuLink calendar, that will retrieve all the informations about that day from the database.

SECTION 3

Screens and Navigation

The following provides a screenshot of the pages with a brief description of their use.

3.1 Home

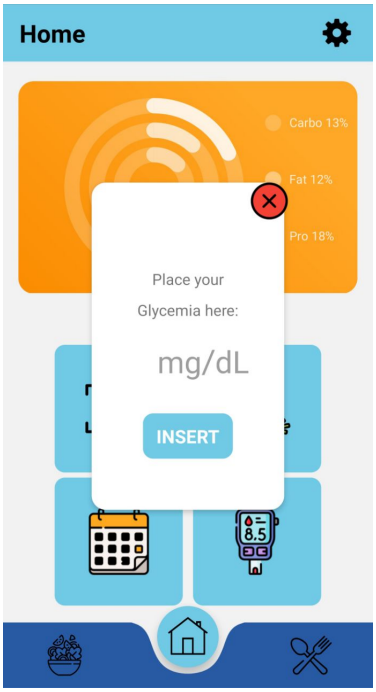
Home menu offers shortcuts to the main functionalities and a quick sight of the today glycemia with its intuitive charts.

3.2 Search

Search food or recipe for nutritional details or to add it in meal diary. User can easly modify the unit measure and quantity of food.

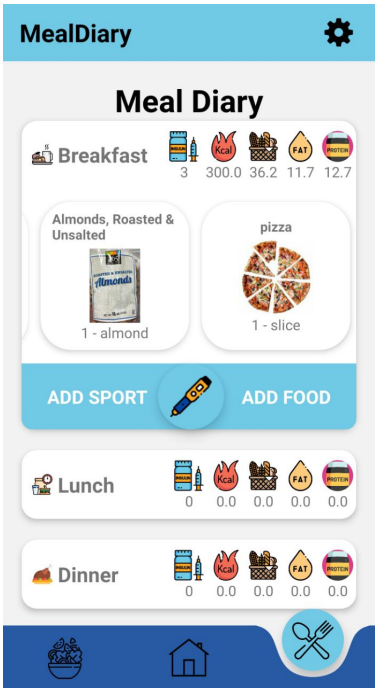
3.3 Glycemia PopUp

Add glycemia quickly just using the menu shortcut or during the insulin caluclation procedure. The value will automatically stored in Firebase.



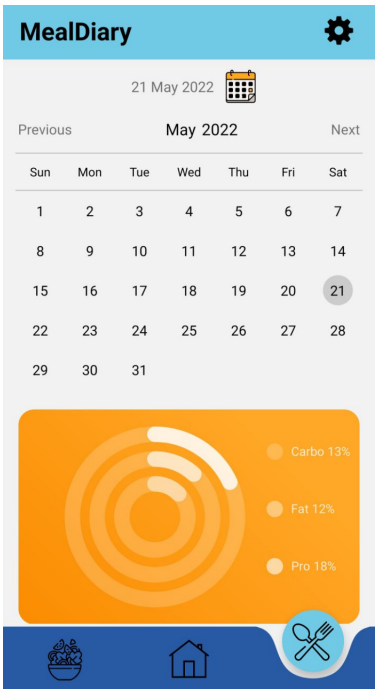
3.4 Meal Diary

Meal Diary can be used for both calulating daily total macro nutrients and insuline dose of each meal.



3.5 Calendar

In calendar it will be possible to retrieve historical data by clicking on a date.

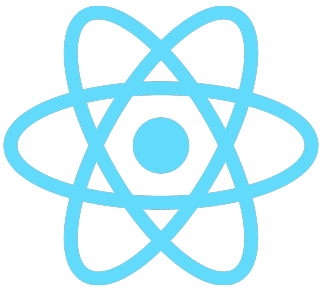


4

SECTION

Architecture

The technology used to make this app is react native [3].



4.1 Folder Structure

`\assets`

Contains all images and component with a proper mapping.

`\constants`

All constants concerning the design and states of the app.

`\customComponents`

All buttons, charts and pickers specifically designed for the pages.

`\pages`

Folder with all pages of the app, using the custom components

`\stateManager`

Redux States for data managing with actions and reducers: macroTracker for meals and userReducer for the patient.

`\utils`

Logic of API, authentication, Firebase and Insulin Calculator

5

SECTION

API doc

5.1 Nutritionix

Nutritionix [4] is the API used to have a food database-

5.2 Firebase

Firebase [6] is a Google serverless platorm for application development.

7

SECTION

Insulin Calculator

Inserting grap

Insert

8

SECTION

Testing

To perform automated and personalized testing it was used Jest [5]. It is a JavaScript Testing Framework that supports React Native. Tests were performed on:

`\__tests__`

Where to overcome some technological barriers, mock objects were used instead of not supported libraries.

8.1 Folders

`\api-test`

Local storage and API calls from Firebase and Nutritionix.

`\redux-test`

Redux and user actions such as: adding food to meal or removing it.

`\renders-test`

Checks correct Pages rendering. Makes snapshots of all pages and compares them with expected result.

`\utils`

Checks User input and Insulin Calculator

SECTION 9

Future Implementations

Insulink has been structured with the possibility of implementing new technologies inside it.

9.1 API

The API utils section of the code is easly changeble from one provider to another. Using a premium API would affect the performance but also the usability of the app.

9.2 Machine Learning and AI

Calculating the correct insulin dose is a really difficult problem. The factor that influences the output is not only the amount of carbohydrates eaten, but many other features: fats, sport activity, emotional condition and sometimes even the weather.
Moreover each patient needs specific treatments, and has a different resistance to insulin.
Using Machine Learning in this field could be a smart way to correctly predict the optimal insulin dose.

9.3 NFC Glucose Meter

Some Glucose Meters use new technologies to simplify diabetic patients life. One famous example is FreeStyle Libre [7]. Using the NFC technology to retrieve glycemia helps not only in terms of time but also in visualization and store of data.
Once implemented, the user has just to bring the phone closer to the sensor and the app will check the glucose (and store it).

10

SECTION

References

[1] Diabetes Definition
https://en.wikipedia.org/wiki/Type_1_diabetes

[2] Bolus Definition
https://en.wikipedia.org/wiki/Bolus_(medicine)

[3] React Native
https://reactnative.dev

[4] Nutritionix
https://www.nutritionix.com

[5] Jest
https://jestjs.io

[6] Firebase
https://firebase.google.com

[7] FreeStyle Libre
https://www.freestyle.abbott/us-en/home.html