

SmartNutri

A web-based tool for you to monitor nutrition consumption

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Introduction

Hong Kong's new nutrition labelling scheme was introduced by the government in 2010. Even though health-consciousness has increased over the years, not many consumers have the habit of reading nutrition labels. The values on the labels are sometimes difficult to understand for general consumers. We have designed and implemented a diet tracking tool that keeps track of a person's daily consumptions based on nutrition labels as input.

The tool makes use of Optical Character Recognition (OCR) technology to analyze images of nutrition labels, taken by users on their smartphones (or digital cameras). Through a web user interface, the images are sent to a server, on which the OCR is run. The server also stores all user data to provide a convenient centralized storage. The Web UI is executable across all popular platforms, enabling users to use this tool anytime and anywhere.



Design

Client - Server interaction

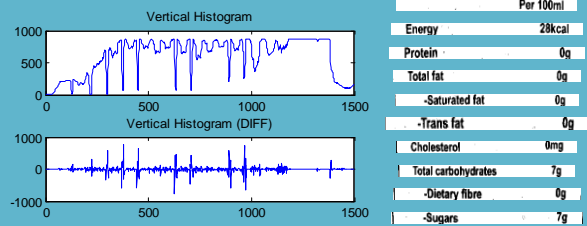
Client (User)	Server
1. Register Label	
Uploads photo of nutrition label	Performs OCR on the nutrition label Stores analyzed data into database
2. Record consumption	
Inputs <i>servings</i> of food consumed (user can skip Step 1 when the same food is consumed again)	Analyzes user's cumulative consumption based on consumption amount
3. Consumption history and Display alert level	
Requests consumption statistics over a specific period, e.g. 1 day or 1 week	Shows statistics of cumulative amount of nutrients consumed Display a 'safety level' for selected nutrients, e.g. 'Alert', 'Moderate' or 'Low' level of sodium intake

OCR

Preprocessing binarizing the image



Segmentation extracting lines



Pattern Recognition pattern matching by modified sliding-window technique

Step 1
extract character

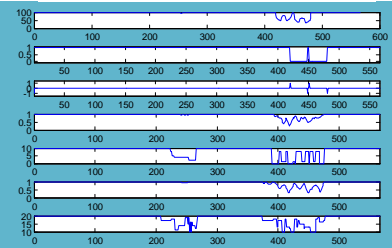
Step 2
compare character with template

Step 3
compare result among templates



Template: **3 4 m P**

$$SSD_{m,n} = \sum [S_{i,j} \oplus T_{i,j}]$$

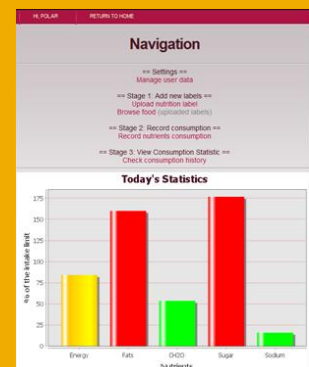


User Interface (UI)

We designed a user-friendly platform-independent Web UI with simple charts to help users understand complicated data clearly.

Navigation Page

Link to upload label, record consumption and view consumption history page.
A chart showing today's consumption to alert user.



Register a new food for the system

Upload barcode

BAR CODE UPLOAD

FILE: No file chosen

Upload label

LABEL UPLOAD FOR ITEM [123123]

FOOD NAME:

FILE: No file chosen

OR... Manually add a nutrition label

Food Browser

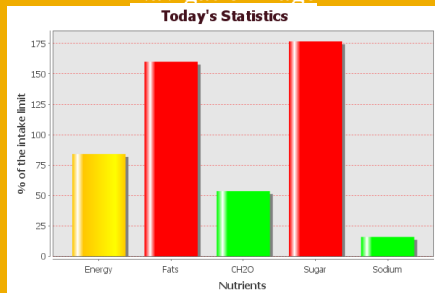
[Add new food]

LIST OF FOOD

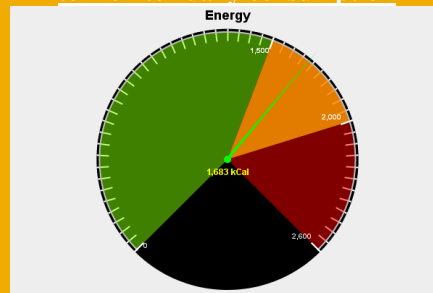
FOOD ID	FOOD NAME	DATE CREATED	View Detail	Consume
0901005132184	bjlj	2011-04-30	Click Me	Click Me
123	123	2011-04-30	Click Me	Click Me
295	295	2011-04-30	Click Me	Click Me
4890008711246	Self-Heal Spike Drink	2011-04-30	Click Me	Click Me
4892018094493	Ribena Blackcurrant Drink	2011-04-30	Click Me	Click Me
4892333101464	Fried Noodle - Chilli Sauce	2011-04-30	Click Me	Click Me

Data Visualization

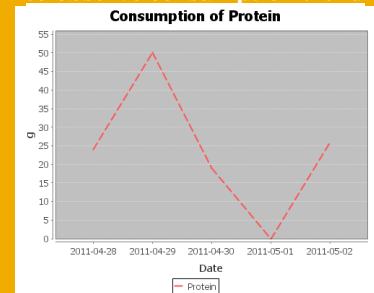
Daily Consumption Chart on Navigation Page



Dashboard for Patient to monitor daily consumption



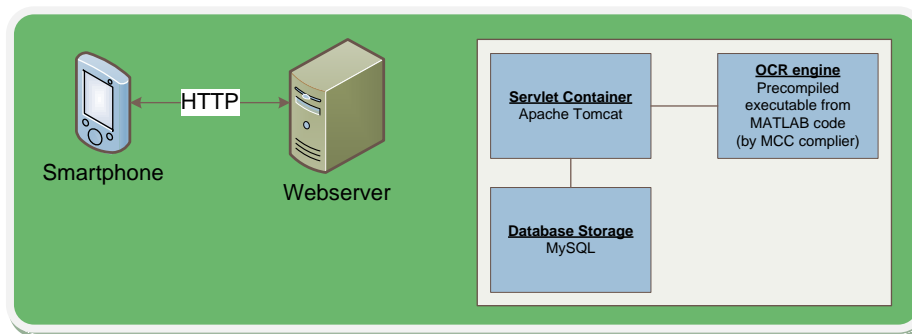
Line Graph for Medical Staff to observe consumption trend



Implementation

Server-side technology

We use Apache Tomcat as our servlet container, MySQL as database storage and MATLAB for OCR engine.



Evaluation

Speed for OCR

Average time used: 28.95s

Accuracy for OCR

Average: 68.5% (Number of images tested: 25)

Assumptions for Input Image

- ◆ Upright and centered
- ◆ Good lighting
- ◆ Sharp camera focus
- ◆ Label occupies (>70% of the image)
- ◆ Enough resolution (> 200K pixels)

Hardware Requirement for End User

- ◆ PC or Smartphone with web browser installed
- ◆ Camera with >2M resolution and auto focus