

Smart Fridge System: Progress Report

System Overview

Cyber-Flux Innovations is dedicated to creating the Smart Fridge System. The system is comprised of In-Fridge Hardware, a Backend Server and a website. The system provides users with many services, including the ability to view the contents of your fridge through the internet and sophisticated nutritional tracking mechanisms.

Work Completed

The development of the Smart Fridge System consisted of three stages: specification, component implementation and system integration. Specification was completed on October 13th and outlined the expected behavior of the prototype system. Component implementation, including development of the In-Fridge Hardware, Backend Server, software features and website was all conducted separately. High level interface specifications were included on the Functional and Design Specifications, but details of inter-component connection were left to the system integration stage of development.

Development of the In-Fridge Hardware required interfacing an RFID module with an Arduino microcontroller, temperature and humidity sensor and wireless (WiFi) module. A magnetically coupled door switch was interfaced with the Arduino to ensure efficient, door triggered data transmission. Control logic was implemented on the microcontroller to manage reading of RFID tags and transmitting this data to the Backend Server.

The Backend Server is capable of tracking items that enter and exit the fridge. Further, it produces HTML which is viewable through the web server. The Backend Server can update time-sensitive HTML on request from the web server (for example, a list of items in the fridge that are expiring soon). The Backend Server also provides data points for plotting, such as how many items were allowed to expire per month for the past year. The web server then plots these points using a JavaScript plotting library.

Work Remaining

Though individual components have been developed to near-maturity, system integration is still underway. In particular, the In-Fridge Hardware must balance sending temperature information with transmitting the contents of the fridge every time the door is closed. The exact coverage of the RFID reader within the fridge must still be verified. The complete process of transmitting contents and tracking them through the server must also be confirmed. The final placement of components within the fridge, including Arduino enclosure, temperature sensor and RFID module, must be completed (as well as the final wiring of these components together).

Significant efforts have been made to create a product that is both functional and aesthetically pleasing. Appropriate boxes have been purchased in order to conceal the hardware as much as possible. Furthermore, materials were purchased to fasten the RFID reader to the interior of the fridge in a way that

makes it hidden to the user. Finally, a company decal has been professionally printed for a unique company image. All the aesthetic elements have been purchased but still require final adjustments.

The Backend Server is mostly complete, though heavy testing is still required. Many events occur on particular triggers, for example some HTML files are generated when a user views a web page while others occur when an item is added to or removed from the fridge. Intricate sequences of events, including special cases where not all the necessary information is provided to the server, must still be tested for.

Various services must still be presented through the web site, including:

- Automatically generated grocery list
- Per-Item Nutritional Metrics
- Over-time nutritional tracking plots
- Manual Item Tagging

The web site also requires general polish, including finalizing the exact information that will be presented to the user. How the web site behaves when the product catalog (SimpleUPC) supplies varying amount of information must also be explored. Styling details, such as exact colouring and layout has also not yet been determined.

Missed Targets

The Smart Fridge System initially included a mobile (iPhone) application. The application was designed to be the primary visualization and interactive element of the smart fridge system. However, due to recent personnel issues with one of our group members, we were forced to provision for not having a mobile application. The system will now exclusively rely on a web-interface to provide all interaction with the system. Though the ease of scanning barcodes to manually tag items with an RFID tag is no longer possible, the website still provides all the initially targeted functionality. Further, the site is accessible on all internet-capable devices, including iPhones, iPads, Windows Phones, phones running Android, and traditional desktops.

Budget

Cyber-Flux Innovations is currently running slightly over budget. A failure to anticipate branding and presentation costs has negated cost-saving provisions to the extent that our allocated funds will no longer cover all expenses. However, the deficit is not significant – around one hundred dollars. Additional funds will be sought through the Wighton Development Fund.