CyberFridge
Assignment 2

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CyberFridge
Software Requirements Specifications
IEEE Template

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1. Introduction

Food waste is a major issue in North American countries. Countless resources are wasted when food is thrown out. The food industry requires resources to grow food, harvest it, process it, and transport it all over the country. When food is wasted, all these additional resources used to bring the food to the consumer are also wasted. These resources, if not wasted, can be allocated elsewhere to fix other issues. For example, oil can be saved if less food is transported. This will also help to reduce air pollution. The way that people interact with food must be changed to be sustainable for the years to come.

However the question about how food wastage can be lessened still remains. To answer this question, it is imperative to understand why people waste food. It is no secret that compared to earlier decades, people are having to work longer hours to support their families. In addition to this issue, it is also imperative that households have 2 breadwinners to support themselves. In previous years, it was common that households were able to support themselves on one income. In summary, people today are much busier than previous years, and this results in less time available for the planning of meals. A lack of meal planning inevitably leads to food wastage. It is often the case that people may buy too much or too little of an ingredient, they may also forget what is available in their fridge, or they may not be aware of the proper expiry dates of the ingredients before it is too late to use the item.

The answer to these issues is the CyberFridge. The CyberFridge is a fridge with an interactive system that will allow users to track the food in their fridge, find recipes corresponding to the ingredients available in their fridge, track how much of each ingredient is available, and track the expiry dates of food in the fridge. Through these features the CyberFridge will be able to lessen food wastage by ensuring that the user is aware of what ingredients they have, what ingredients are going to expire, and what the user can make with the available ingredients. These tools will hopefully allow the user to lessen waste by using what they already have.

In addition to solving the bigger issues of the nation, the CyberFridge can also aid the user in many facets of their personal lives. The CyberFridge will enable the user to find recipes that use what is already available before the ingredients expire. By reducing food wastage, the user will save money by not having to buy more food. In addition, it is proven that home cooked meals are healthier than food prepared elsewhere. The CyberFridge will allow the user to prepare more of their own meals and will enable the user to know exactly what they are eating. This will lessen the need for takeout meals and processed foods which are known to be less healthy than home cooked meals.

1.1 Purpose

The purpose of this document is to outline the requirements for the CyberFridge. By understanding the requirements outlined in this document, it is the goal that the reader will understand exactly what the CyberFridge will do. This will allow the reader to correctly implement the software required for the CyberFridge should they wish to do so. This software requirements document will be the basis for the software development process of the CyberFridge.

1.2 Scope

To lessen food wastage, a new system of food storage must be implemented so that the user is aware of the ingredients and their quantities available in their fridge, the expiry dates corresponding to the food items, and the recipes that can be made from the available ingredients. This will be achieved through a new revolutionary food storage system known as the CyberFridge. This system will be targeted towards households consisting of families, roommates, single people, and restaurants. The CyberFridge is not intended for commercial use.

1.2.1 Objective

To lessen food wastage among households.

1.2.2 Study Area

Major food wastage currently occurs in North American countries. Also fridges are currently the most common food storage mechanism in North America. Therefore the CyberFridge will be initially developed for North American countries.

1.3 Definitions

The following table will summarize terms commonly used in this document that pertain to the CyberFridge. They are defined here because they may not be identical to definitions of these terms in common use. The purpose of this table is to enable the user to better understand the requirements of the CyberFridge system.

Table 1: Definitions

Term	Definition
User	The term user will henceforth refer to the following people: • **Heads of Households:** Head of Households such as parents and couples (people who manage multi-person households) will likely be the largest portion of users. • **Students/Roommates:** People who wish to use the CyberFridge and require that fridge space must be shared. • **Chefs:** People who will use the CyberFridge in a professional setting where cooking will be required.
Inventory	The food available in the fridge that has not expired.
Database	The database will hold all recipes sorted by a criterion as specified by the user.

1.4 Acronyms and Abbreviations

Table 2: Acronyms and Abbreviations

Acronyms	Meaning
CARA	Clifford Automated Recipe Agent

1.5 References

1) Project Proposal: "CyberFridge" : http://www.cas.mcmaster.ca/~se3ra3/2015/as1-2015.pdf
2) IEEE SA: http://standards.ieee.org/findstds/standard/1074-1997.html
3) "Development of Web-GIS Tool for estimating the Rooftop Solar Power potential for Indian Solar Cities" Software Requirements Specifications (SRS) Document : http://www.cas.mcmaster.ca/~se3ra3/2015/RequirementsSpecificationInIEEE830.pdf

1.6 Overview

The software requirements document is hence forth organized into two sections. The first is an Overall Description and the second is the Specific Requirements. The Overall Description will describe the requirements needed by the system and the Specific Requirements section will describe in detail the requirements of the system.

2. General Description

The following section will describe the product and its requirements. This section will not state specific requirements. Instead it will provide the background for the requirements described in section 3, providing more insight as to why they are necessary.

2.1 Product Perspective

2.1.1 Detailed Methodology

The following is a description of the proposed study to obtain the necessary information needed to build an effective CyberFridge.

- Gather all individuals necessary for the construction of the hardware components and software components of the CyberFridge. The individuals needed are as follows:
    - **Hardware Architects:** The Hardware Architects will be designing the physical components of the system.
    - **Software Architects:** The software architects will design the interface for the system.
    - **Software Developers:** The Software Developers will be programming the interface for the system.
    - **HP :** HP will provide the company machines on which the software developers will program the system.
    - **Internet Providers:** The Internet Providers will provide the internet connection upon which the system will search for recipes.
    - **Manufacturers:** The manufacturers will be mass producing the CyberFridge.

- Gather individuals that match the description of intended users and gather information of their current food storage and eating habits. The individuals needed are as follows:
    - **Heads of Households:** Head of Households such as parents and couples (people who manage multi-person households) will likely be the largest portion of users.
    - **Students/Roommates**: People who wish to use the CyberFridge and require that fridge space must be shared.
    - **Chefs:** People who will use the CyberFridge in a professional setting where cooking will be required.

- Perform interviews with all individuals as outlined as above. Sample questions that may be asked are outlined below:

  Hardware Architects
    - How will the inside of the CyberFridge be organize? (compartments, drawers, shelves)
    - What sensors will the fridge have?
    - Where will the sensors be located?
    - How will food barcodes be scanned?
    - What physical components will allow for user interface?
    - What components will allow for the storage of data?
    - How much memory space will these components have?
    - Will the shelves have scales to track remaining food in the fridge?
    - How will the system receive user information/input? (buttons, touch screen?)
    - Will a physical keyboard be used?
    - Will a touch screen be used?
    - Will a screen be mounted to the CyberFridge?
    - How will the hardware pass information to the software program? (signals, currents)
    - How will the system output information? (screen? Sent to computer? Text message, audio output?)
    - How will the system track food that does not have barcode? (example: user input and weight?)

  Software Architects
    - How will the CyberFridge match a barcode to a food item? (internal database or external database?
    - Will the required databases be stored on the system or elsewhere? (and accessed via internet?)
    - What search algorithms will be used to search the databases?
    - What search algorithms will be used to search for recipes?
    - How can users expect to receive notifications about when food will expire? (on the CyberFridge? Through text? Through Email?)
    - How will the system interpret input from the hardware?
    - Will users be able to access the CyberFridge on their phones?
    - Will this require a mobile application?
    - How will the system track food that does not have barcode? (example: user input and weight?)

Software Developers

- What security measures should be taken to ensure privacy of the user?
- How will the user passwords be saved?
- What are feasible test cases for the CyberFridge?
- At what point in the testing process will the system be deemed sufficiently reliable?

HP

- How will the multiple copies of the system be stored?
- Where will the multiple copies of the system be stored?
- Will the code for the program be secure from access by outside parties?
- Will the machines require maintenance?

Internet Providers

- Which options are the fastest?
- How secure are the internet connections?
- Can outside parties access information being transmitted to the fridge? Vice versa?

Manufacturers

- How much will it cost to create one unit?
- How much time will it take to create one unit?
- Where will the units be created?
- How will the units be transported?
- How long will it take to transfer the unit from manufacturing warehouses to stores?
- Will units be manufactured using automation or human labor?
- How reliable are the physical components of the CyberFridge be? (will they require frequent repair/maintenance?)

Heads of Households

- How much food does your fridge hold?
- Do you often stick to one brand?
- Do you buy the same quantities of food every week?
- How many days a week are recipes used?
- How is your fridge organized?
- How often are groceries bought?
- How many people will have primary use of the fridge?
- How much access should each member in the household have?

Students/Roommates

- How much food does your fridge hold?
- How many days a week are recipes used?
- How is your fridge organized?
- How often are groceries bought?
- How many people will have primary use of the fridge?
- How is space in the fridge divided?

Chefs

- How much food does your fridge hold?
- In general are recipes used in the restaurant?
- Are the same brands used often?
- Is the same amount of food bought each time?
- How is the food organized in the fridge?
- How much food is used each day?

- Information gathered form the interviews should be organized.

- To create the CyberFridge the hardware must first be created. The CyberFridge must be created such that it can sense the quantities of food available in the fridge. This can be accomplished through the use of sensors that track weight. The CyberFridge must also accomplish all functions that a regular fridge accomplishes. This means that it must have sufficient space for food, have storage compartments, and have a cooling system. After this step has been completed, the database can then be constructed.

- The database is comprised of recipes. Along with the recipe instructions, the recipe ingredients and the quantity of ingredients they require must also be stored within the database. The database must also specify the cuisine that the recipe belongs to. This database will be accessed by the user. After this step has been completed, CARA can then be constructed.

- CARA is the system through which the user will be able to access the database. CARA will enable the user to search for recipes, sort the recipes by a criterion specified by the user, add recipes and modify recipes. To accomplish this, CARA should be designed such that it has an add method, a sort method, and a search method. In addition, CARA should be password protected so that the user is protected from cyber-attacks. The user should also be able to modify the inventory in the fridge, ie, the user should be able to add what ingredients have been bought and their corresponding expiry dates. CARA should also have checks in place so that the user does not user expired food. CARA should also compare the inventory to the database such that it provides the user with a list of possible recipes. CARA should also have internet accessibility so that new recipes can be searched for from the worldwide web and so that the user can access CARA on other computing devices.

- The CyberFridge must also have an interface where the user can access CARA directly on the fridge. This interface should be a screen that allows for text input.

2.1.1 System/Software Interfaces

In order to use the CyberFridge, the user must be able to interact with it. The following are the requirements needed for the interface to work:

Specification	Description
Web Browser	Google Chrome/Internet Explorer/Firefox
Internet Browsing Speed	Fast enough to load under 30 seconds
Database	Software structure to store recipes
CARA	Interface allowing user to perform actions
Password Encryption	Prevent hackers from obtaining user information
TCP/IP connection	Allowing access to internet

2.1.3 External Interfaces

The following table outlines the external components that the user will interact with and the external components that will communicate with the software.

Specification	Particulars
Sensors	Weight sensors to determine how much of an ingredient is left
Screen	LCD screen with touch control capability and text input capability

2.1.4 Hardware Interfaces

The following table outlines the minimum requirements of the hardware used for the CyberFridge.

Specification	Particulars
Operating System	Windows 7 / Apple under Safari / Windows 7 + Parallel 9
Storage	5 Gb to store recipes

2.2 Product Functions

S. No.	Particulars
1	**User Profile**
2	**User Login/Logout**
3	**Database of Recipes**
4	**Inventory Tracking**
5	**Recipe Suggestions**
6	**Internet Connectivity**
7	**Basic Fridge Functionality**

2.3 User Characteristics

- Education level for use of CARA – Low
    - The user must know text input methods and touch control methods, user is also expected to know how to search world wide web
- Cooking Experience – None
    - CARA should provide recipe instructions, therefore the user will need minimal cooking skills
- Familiarity of Fridge systems – Low
    - User is expected to know the basic ideologies of fridges (ie. Fridges preserve food)

2.4 General Constraints

The following is a list of constraints of the CyberFridge which can be attributed to the nature of food (I.e. There is a lot of variety of food)

- Sensors will not be able to tell exactly how much of an ingredient is available
- CARA will not have all types of foods and their corresponding expiry dates, some foods will be unknown to the system
- If a recipe requires an ingredient that is not usually stored in a fridge (for example flour) the system will have no way of knowing whether or not the user has that item
- It is virtually impossible to know the exact expiry date of produce item

2.5 Assumptions and Dependencies

- Searching for new recipes requires internet connectivity
- Remote access to the CARA system requires internet connectivity
- When new inventory is added, the user must enter items
- It is assumed that the user will only store produce items in the CyberFridge, dry items will not be stored in the CyberFridge
- The sensors will only be able to detect amount of an item , not what the item is

2.6 Apportioning of Requirements

Requirements that may be delayed as followed:

- Sensors will be able to detect amount of an item left in inventory

3. Specific Requirements

This sections contains all the software requirements needed such that designers are able to design a system to satisfy all requirements listed. Testers should be able to test all functionality and ensure that it traces back to these requirements.

3.1 Functional Requirements

S. No.	Features	Functionality	Descriptions
6	Internet Connectivity	To allow for searches of new recipes	Only available if user is logged in
7	Basic Fridge Functionality	Should be able to hold food	Food needs to be stored within the CyberFridge
7	Basic Fridge Functionality	Should be able to cool food	User should be able to define temperature at which food is cooled
4	Inventory Tracking	Should list all items in the fridge	Items should be kept track of for other functions
3	Database of Recipes	User should be able to define how recipes should be sorted	Can be sorted by cuisine for example, user can specify

4	Inventory Tracking	Should give information about an item that the user has specified	All items in fridge should be tracked for later user
4	Inventory Tracking	Should be able to add items to the inventory	To keep the inventory up to date
4	Inventory Tracking	Should be able to delete items from the inventory	To keep the inventory up to date
4	Inventory Tracking	Should track quantity of food used	To keep the inventory up to date
3	Database of Recipes	Database of recipes for user to reference	Aid the user in food preparation
3	Database of Recipes	User should be able to add new category of recipes	Allows user to modify database
3	Database of Recipes	User should be able to modify existing categories of recipes	Allows user to modify database
3	Database of Recipes	User should be able to modify recipes	Allows user to modify database
3	Database of Recipes	User should be able to add new recipes	Allows user to modify database
3	Database of Recipes	User should be able to delete recipes	Allows user to modify database
6	Internet Connectivity	Allows users to search for recipes on the internet	Aid user in food preparation
5	Recipe Suggestions	Suggest recipes to the user based on inventory and user preferences	Aid user in food preparation
5	Recipe Suggestions	Suggest ingredients to buy that can be used for recipes	Aid user in food preparation
1	User Profile	Track recipes frequently used by user	Aid user in food preparation
5	Recipe Suggestions	Suggest frequently used recipes	Aid user in food preparation
6	Internet Connectivity	User should be able to remotely access database through use of internet	Ease of user access
2	User Login/Logout	User should input password to gain access to system	Ensures security of user information
4	Inventory Tracking	The fridge should notify users when food is close to expiry	Ensures food safety of user
4	Inventory Tracking	The fridge should keep track of food expiry dates	Ensures food safety of user

3.2 Performance Requirements

- **Speed Requirements**
  - The system must load from the internet within 30 seconds.
  - Searches must implement optimized search algorithms such that a search is completed within 45 seconds of it being initiated.

    - CARA shall be able to make changes to the inventory within 5 seconds of a change made.
    - CARA shall be able to make changes to the recipe database within 5 seconds of a change made.

- **Safety Critical Requirements**
    - The CyberFridge should not overheat.
    - CARA shall be able to detect when food has expired.
    - The CyberFridge shall keep fool at a sufficiently cool temperature.

- **Precision Requirements**
    - CARA shall be able to approximate when food will expire within 6 hours of its actual expiry

- **Reliability and Availability Requirements**
    - The CyberFridge should be available for use 24 hours a day, 360 days a year, where the remaining 5 days will be used for maintenance.
    - The CARA system should be available for use 24 hours a day, 360 days a year, where the remaining 5 days will be used for system updates and maintenance.

- **Capacity Requirements**
    - The CyberFridge must hold enough food equivalent to the amount consumed in a week by a family of 5.
    - CARA shall be able to store a minimum of 13 recipes.

3.3 Design Constraints

- **Expected Physical Environment**
    - The CyberFridge shall be placed in a home dwelling or a restaurant.
    - The CyberFridge will not undergo any sever weather or climate conditions

- **Expected Technological Environment**
    - The CyberFridge shall use a text input device to receive information from the user.
    - The CyberFridge shall output information to the user by means of a screen.

- **Partner Applications**
    - The CyberFridge will require a device that can scan / take pictures of barcodes.
    - The system must have a TCP/IP connection to access the internet.
    - CARA shall be coded in Java.

3.4 Software Quality Attributes

- **Maintainability Requirements**
    - The fridge capabilities and CARA are expected to run independently such that while CARA is being updated, the food will still be refrigerated.

- **Portability Requirements**

- The system must be able to run on Google Chrome, Internet Explorer, and Firefox on a PC with a Windows 7 operating system.
- The system must be able to run on an Apple computer under Safari.
- The system must be able to run on Windows 7 operating system + Parallel 9.
- CARA should be able to run on any target platform without modification.

- **Security Requirements**
  - CARA shall require a password for a user to gain access.
  - CARA shall not make information about the CyberFridge available to unwanted third parties.

3.5 Other Requirements

- **Cultural Requirements**
  - Foods shall be classified into appropriate categories such that users are not offended by the classifications

- **Political Requirements**
  - The CyberFridge shall not break any government laws.
  - The CyberFridge shall meet FDA requirements.

- **Legal Requirements**
- The CyberFridge shall meet not affect any current copyright laws