1 Introduction

1.1 Background
While some estimates vary, there are approximately 1.3 million legally blind people in the United States. On a global scale, this number inflates to an estimated 37 million people. Around the world, each second another person goes blind, and every minute, another child becomes blind.

1.2 Problem
A limited amount of resources have been dedicated to assisting the blind while grocery shopping, an activity that many people who are not visually impaired take for granted. Grocery stores have many obstacles that could cause grief for a blind shopper. A few examples would be sale items, product displacement, and floor layouts. The common solution is to have a customer service representative assist the shopper through the store. However, blind shoppers need to schedule trips around the availability of these representatives. Also, this technique causes a lack of independence for the blind shopper.

1.3 Purpose and Goals
To create a system that will help assist blind shoppers in a grocery store and allow blind individuals to shop without having to rely on another person to assist them.

1.4 About the System
This product will help guide a blind shopper though a grocery store by giving them verbal directions to the products on his or her shopping list. Users will create shopping lists using a web application, so that they may build the lists easily and efficiently in the comfort of their own homes or wherever they are most used to computing. When a user arrives at the grocery store, the user will log in to a computerized shopping cart. The cart then proceeds to load the
user’s shopping list and then begin giving directions to the items. Upon arriving at a product, the user will be notified. At this point, the user will pick up the item and scan it with a barcode reader. This is done to ensure that the user has selected the correct item. All feedback provided to the user by the system will be done using Text to Speech software.

2 System-wide Requirements

2.1 User Credentials

2.1.1 Login ID

1. Each user, including the system administrators, will be assigned a unique login ID.

2. Login IDs will be based on the user’s actual name.

2.1.2 Password

1. Each user chooses his or her password for the system.

2. Passwords must be 5-8 characters in length.

3. Passwords must contain only alphanumeric characters (A-Z, a-z, 0-9).

4. The user must confirm the password after initial typing to accept it as the password.

5. Passwords will not be shown to the user at any point. While the user is entering the password, the typed characters will be echoed to the screen as asterisks.

3 List Creation Web Application Requirements

3.1 General User Interface

3.1.1 Accessibility

1. The application must be designed to work appropriately with screen readers and other common accessibility systems for the visually impaired.

3.2 Product Searches

To make the system more convenient for users, the list creation application will feature several different ways to search for products to add to shopping lists.
3.2.1 Specific Item Search
In this search, the user will enter a particular search term and the system will return a number of matches if they exist. This search is extremely similar to a general web search.

1. User inputs product keywords.
2. Application searches store database for up to 25 matches using “fuzzy” search logic employed by modern database systems.
3. If matches are found, user may select a match and proceed to add the product to the shopping list.
4. If no matches exist, inform user that the search returned no results.

3.2.2 Category Search
In this search, the user will navigate through a series of product categories and/or brands to select items.

1. Present top-level categories to user in ascending alphabetical order
2. User selects a top-level category.
3. Continue to present lower levels of categories until only a list of products remains.
4. User selects a product and proceeds to add it to the shopping list.

3.3 Shopping List Management
3.3.1 Adding Products to Shopping List

1. Users will optionally be able to enter the quantity desired for each item.
2. Users will have the option to add items as “Favorite Items.” Favorite Items will automatically be added to each new shopping list.

3.3.2 Creating a New Shopping List

1. Each user may store up to three shopping lists in the system at any one time. If a user attempts to create a fourth list, he or she will be instructed to first delete one list.
2. When the application sets up a new shopping list, it will automatically add the user’s “Favorite Items” to the list. The quantity of these items will initially be zero.
3.3.3 Editing an Existing Shopping List

1. Users will be able to add products to and delete products from shopping lists.
2. Users will be able to edit the quantities of items on shopping lists.

3.4 Non-Functional Requirements

4 Store Management Application Requirements

The success of this system relies not only on the ease of use for shoppers but also on the maintenance of the store layout. Thus, the goal of this component is to provide a simple application that allows store employees to easily model floor layout and product placement within the store.

4.1 User Interface

4.1.1 Store Layout

1. The application will support rectangular stores.
2. The application will display a graphical representation of the current store layout, and the representation will construct a scaled grid to represent store coordinates.
3. Store dimensions (length and width) will be entered in English units.
4. Shelving Units/Display Cases (hereafter referred to as “Planograms”)
   (a) Representation
      i. All planograms will be rectangular in shape.
      ii. The user will enter the number of shelves that a particular planogram contains.
      iii. The user will enter the number of product positions available on each shelf of a planogram. As such, the planogram is essentially a rectangular grid of product positions.
   (b) Placement
      i. The user will enter a position for each corner (front left, front right, rear left, rear right) of a planogram, either in store coordinates or English system measurements.
      ii. The system will not allow planograms to overlap.
      iii. The system will allow planograms to share a common edge; literally, it will allow the planograms to “touch.”
4.1.2 Product Placement
1. The system will display a graphical representation of a planogram and the positioning of products on the planogram.
2. Products can only be placed in positions on planograms.
3. Many products can be mapped to a single planogram position.
4. The user will be able to map products to planogram positions by the position's grid address.

4.2 Interaction With Store Database
4.2.1 Saving Changes
1. The system must use database transactions to allow the user to commit changes on demand.
2. The system will employ safeguards to prevent the user from inadvertently committing changes.

4.3 Non-Functional Requirements
4.3.1 Software Requirements
1. Microsoft Windows XP
2. Microsoft .NET Framework
3. Microsoft SQL Server 2005

5 Computerized Shopping Cart Requirements
5.1 User Input
5.1.1 Voice Commands
1. General Requirements for Voice Recognition
   (a) All voice commands for this system must be recognizable in noisy environments.
   (b) The voice recognition system must work reasonably well for both male and female users in various adult age brackets.
   (c) The system shall require little or no training to be able to recognize a user’s voice.
   (d) The system must be prepared to recognize user voice commands at all times.
2. “Where Am I?”
   (a) The system reads the user’s current location in the store, including
       the aisle number and what types of products are in the current aisle.

3. “Repeat Directions”
   (a) The system reads updated directions to the next product on the
       user’s shopping list.

4. “Next Item”
   (a) The system reads the name of the next item on the user’s shopping
       list and directions to that item.

5.1.2 Barcode Reader
1. The barcode reader must be able to communicate with the computer on
   board the cart.

2. When a product is scanned with the barcode, the system reads the name
   of the product scanned and whether or not the product is the one the user
   had intended to buy.
   (a) If the user has picked up the correct product, the system will read
       the quantity of the item that is needed. This process repeats until
       the user has picked up the needed quantity of the item, after which
       the system announces the next product on the list and begins giving
       directions.
   (b) If the user has picked up an incorrect product, the system will read
       the item selected, notify the user that the item was not the intended
       product, and suggest more precise directions to the intended product.

5.2 Store Navigation
5.2.1 RFID Tag Layout
1. RFID tags will be placed on the bases of shelving units, walls, and other
   obstacles in the store.

2. RFID tag placement must be possible without altering, destroying, or
   rearranging floor tiles, shelving units, or other store furnishings.

5.2.2 RFID Reader
1. The system must be able to support multiple RFID readers.

2. The RFID reader(s) will be mounted to the shopping cart in such a way
   that they will be within their effective distance range for reading tags
   when the user is walking along a wall or shelf equipped with tags.
3. The RFID reader must be able to communicate tag ID numbers to the computer.

5.3 Non-Functional Requirements

5.3.1 Computer and Software

1. Computer running Microsoft Windows XP Professional
2. Microsoft Speech API Version 5.1
3. Microsoft .NET Framework
4. Microsoft SQL Server 2005

5.3.2 External Hardware

1. Wireless Barcode Reader
2. Wireless RFID Reader
3. Wireless Headset with Microphone
4. Keyboard (Braille or modified QWERTY)