

1. Initial Project Document - Divide & Conquer 2 Automated Inventory Tracker (AIT)



**University of Central Florida
Department of Electrical and Computer Engineering**

Dr. Richie and Dr. Lei Wei
Senior Design 1

Group 24

Gaspar Dantas - Computer Engineering

Sonu Thummar - Computer Engineering

Justin Rehg - Computer Engineering

Lody Morillo - Electrical Engineering

2. **Project Narrative/Description** → The Automated Inventory Tracker (AIT) intends to automate a common task we have to deal with in our homes, which is tracking the products we have in our fridge, as well as when the product shall expire. This project will consist of a low cost design, consisting of a tracker that will be located outside the refrigerator at a convenient location for the users - attached to the PCB so there can be high accuracy on barcode detection. This product will be fused with a mobile application that we will develop to allow for easy compatibility with the user. We will allow the user to view all items within the fridge, to facilitate grocery shopping purchases, without the need of checking whether some items are needed. Our project will have a notification system to inform the user when an item is about to expire. This lightweight design will include a user friendly application that will scan entry and exit of products and update in real-time.

The purpose of smart inventory is to allow people to easily manage their inventories from their cell-phones with ease. A lot of food is wasted today because people forget to track their expiration date. This app will allow them to properly manage their items and also plan ahead. Also many people when visiting grocery shops forget what items they need or what items are finished from their inventory. With the help of smart inventory they can easily manage their grocery shopping list.

3. **List of requirements** → This system will be triggered every time an item is inserted or removed from the fridge and will keep adding up until the process is complete and the user can view all of the items through the mobile app. As displayed in table A, the inventory shall contain a scanner attached to the PCB, which will be connected to the

application through bluetooth. The product details will then be inserted into our SQL DB, as discussed in table B, via API calls, however the user may also insert/delete products manually through the application, as well as have the functionality for the user to adjust expiration dates and percentage of storage left.

Table A. Hardware requirements

1	The system should be able to scan the barcode/Qr Code
2	The system should be able to Capture all the information available from the barcode scanner like Name, Quantity, Expiration Date etc.
3	The system should automatically distinguish between name, expiration date , product specifications
4	Power supply to have our scanner function. 5 volt delivery
5	The system should distinguish between the add/remove functionality of the product(if a product is added or removed)
6	Bluetooth 5.0 adapter to connect and send data to the user's cell phone.
7	Button switch for turning ON/OFF the scanner system and display screen.
8	PandaBoard to be used as a platform for mobile software development.
9	Display to communicate information such as low battery to the user.
10	USB Hub 4-Port needed for extra USB connections.

Table B. Software Requirements

1	The software should be able to store items from the inventory in a SQL DB (up to 16TB worth of data)
2	The software should have an API to retrieve product details.
3	The software should be able to insert records directly from the scan and allow users to add inventory items.
4	The software should be able to sort all the data by names, expiration date
5	The software should be able to delete the data
6	The software should be able to link to the scanner through bluetooth
7	The software should be able to send notifications to the user regarding item expiration date
8	The software should allow the user to adjust amount remaining of the product (0-100%)
9	The software should allow the user to add/remove expiration dates through datetime pickers
10	The application should run in any operating system, intended mainly for phone usage

4. **Block Diagram** → Diagram A has a clear demonstration of the AIT workflow. We intend to use the PCB switch to have a scan in or scan out notation to indicate addition or deletion of a product into our SQL DB. This will trigger the software to execute the CRUD operation based on the users selection as displayed in the diagram A. In terms of group workload distribution we have listed in diagram B how we intend to accomplish this objective in a teamwork fashion. In this category, we have divided the project into 3 sub-elements to facilitate the research and assignments. For the mobile application, Gaspar and Sonu will be the developers in charge of connected the front-end with the SQL DB and handling all of the API calls when a product gets scanned. Lody and Justin will be handling the scanner and sensors and how they will be integrated into the PCB. Lastly we will come together as a group and accomplish the microcontroller integration - implementing the bluetooth support and switches to the board.

Diagram A. General

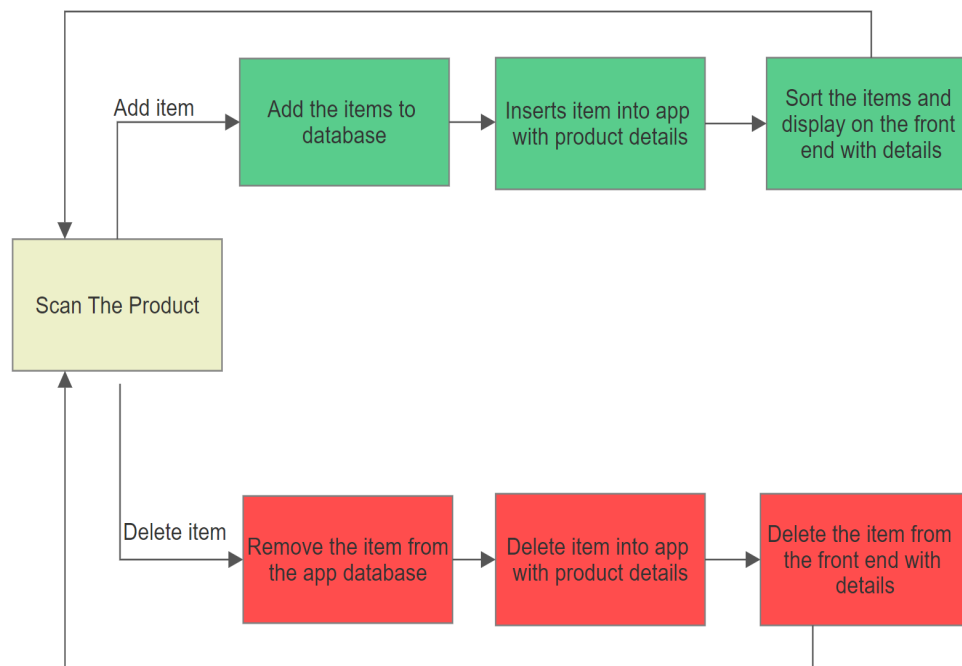
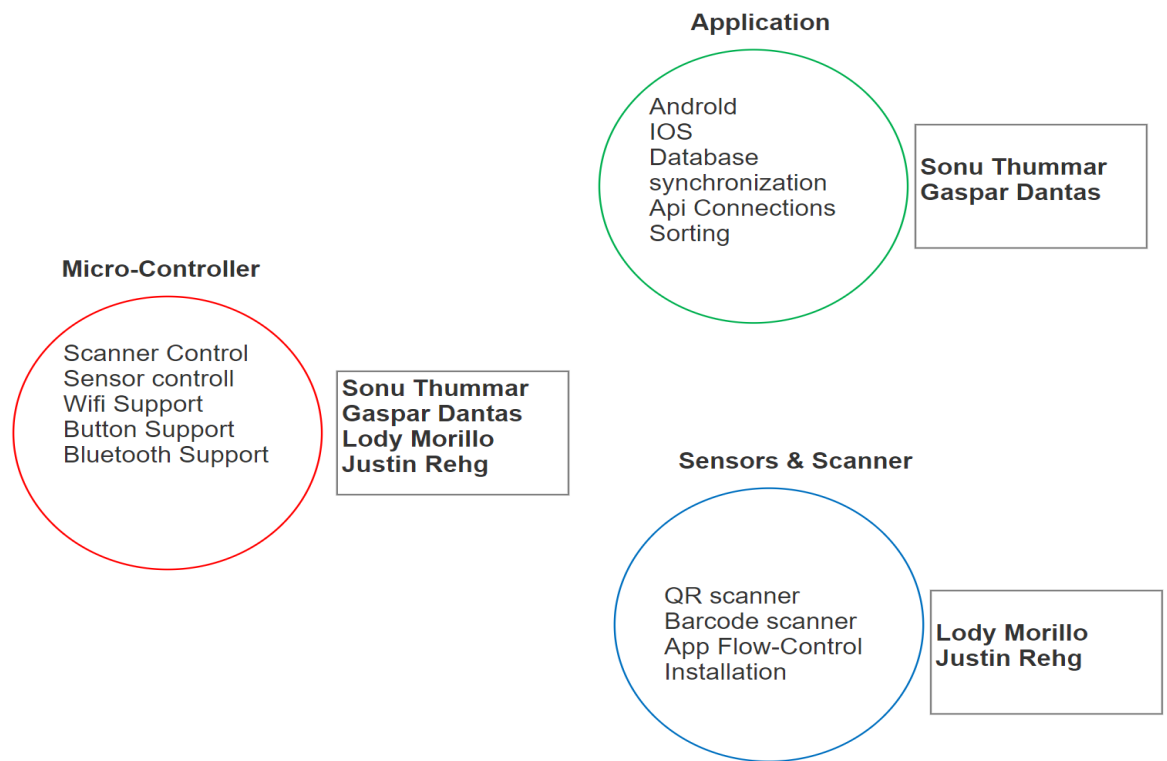


Diagram B. Group Breakdown



5. **Financial/Budget** → Our estimated budget for this project is just about \$470, as shown in table C, which includes having a potent scanner, PCB, bluetooth support, a display, PandaBoard and switches (we are also taking into account additional quantities in case of errors). Our project is mostly software based as we are developing a user friendly app to associate to the components mentioned.

Table C. Budget Reporting

Material	Link	Quantity	Cost
Mimo Touch 2 - 7" Portable Resistive Touch Display, USB (UM-740R)	https://bit.ly/2Z5no3Z	1	\$179.99
Barcode Scanner USB Laser	https://amzn.to/3rJKHwy	1	\$29.99
PandaBoard (UEVM4460G-02-02-00)	https://bit.ly/3aZht66	1	\$204.88
USB Hub 4-Port	https://amzn.to/2Z5D5bJ	1	\$12.99
Bluetooth Adapter	https://amzn.to/3pfndOi	1	\$8.97
PCB Custom	https://www.pcbway.com/	1	\$6.50
5V Battery Pack Power Supply USB	https://www.adafruit.com/product/1959	1	\$14.95
Button Switch Assortment Pack	https://www.adafruit.com/product/1010	1	\$5.95
Breadboard-friendly SPDT Slide Switch	https://www.adafruit.com/product/805	3	\$0.95(x3)= \$2.85
Refrigerator	Team member	1	\$0
TOTAL			\$467.07

6. **Project Milestones** → Our initial milestone is to have a complete guide and specifications related to the project so we can have a facilitated build for SD2 in the Summer. We will establish an initial UI with plans on how this app will function (all user features) and start acquiring the proper skillset for development in Native. As shown in Table D, for Senior Design 1 we plan to complete all of the appropriate documentation necessary prior to the build, having an initial version of the application released, with the UI established and getting all of the designs complete for both the hardware and software of the AIT project. For Senior Design 2, as displayed in table E, we intend to order all of the necessary parts as documented and complete the build based on the designs of the PCB and mobile application. Our intent is to finish by the 10th week so we can have time for testing and properly debugging the system implemented.

Table D. Senior Design 1 Milestones

No	Milestone(s)	Schedule
1	Research the project	6th week
2	Establish the UI	10th week
3	Integrate Documentation	12th week
4	Design the PCB	14th week
5	Design the physical model	15th Week
6	Design the App Screens	16th Week

Table E. Senior Design 2 Milestones

1	Order Parts	1st Week
2	Develop the App	5th Week
3	Build the model	7th Week
4	Integrate App with Model	9th Week
5	Testing & Debug	10th Week
6	Improvements/Fixings	11th Week
7	Showcase	12th Week

7. **Decision Matrix** → This project has been selected by our group, although we encountered some challenges that might cause us to redesign a few specifications, such as acknowledging not all barcodes will retrieve expiration date, so we can potentially make this adjustable by the user in case this information is not attained from the initial scan. Another challenge we have encountered is discovering an appropriate angle to facilitate the scan from our device from a static location in the refrigerator. We might have to modify and readjust by making this component an outer tool that the user can utilize instead, and this product will be a notification system specifying reminders of when something is about to expire within the app and from the device itself.

8. **House of Quality Diagram** → In this diagram C, we have blended customer expectations along with product requirements gathered from hardware and software specifications. We display the correlation across both and the goals we intend to accomplish.

Diagram C - House of Quality

Correlation matrix	
++	Strong positive
+	Positive
-	Negative
--	Strong negative
	Not correlated

Relationship matrix		
●	Strong	9
○	Medium	3
△	Weak	1
	No assignment	0

