Deployable Prototype Documentation
SmartCart

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Table of Contents

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Assignment 8

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Abstract—**American shopping markets have not had any major changes since the department store became a thing. We decided to change the shoppers experience by introducing a smart cart. This cart will keep track of all the items added into the cart. It also has collision avoidance, GPS tracking, and an insync phone app. This documentation explains the break down of project.**

Keywords—RFID; Brake System; GUI; Motor Control; SmartCart

I. Introduction

Shopping has always been a cornerstone of the American life. Whether it be shopping for a house, or the typical department store shopping Americans as a whole have a love hate relationship with the shopping experience provided. Brick and mortar stores have long gone unchecked for a shopping experience that hasn't had any major developments since the shopping cart was first introduced in 1937, in the Humpty Dumpty department stores. This experience actually worsened with customer service becoming less of a priority in an age where people can google any questions they have about any product.

The dot-com boom (1995-2001), allowed online retailers to give an alternative to customers from the typical brick and mortar stores. Although at first people never believed that an online retailer would ever replace a brick and mortar store we are slowly seeing the tide change. Stores started feeling the bite of the online retailers. The largest of them all, Amazon, quickly became the best place to shop, almost cannibalizing all markets. With success, they have been able to promote paid-services like Prime, which gives consumers the option of free same-day or two-day shipping on millions of items ranging from home goods to basic everyday needs. Now with their acquisition of Whole Foods, a grocery store chain, as of August 2017, they are working to further eliminate the need for consumers to visit their local food markets. Surprisingly enough, the German Research Center for Artificial Intelligence suggests that "traditional supermarkets will not disappear in the next decades because, for certain goods, consumers will prefer 'hands-on experience' with the product" they are going to purchase [13].

You can buy nearly everything for lower cost and get it delivered to your doorstep within hours. With their constant expansion of markets, they are giving flexibility to delivering groceries, produce, milk, and just about anything a human being can need and desire. This has ultimately led to millions of people across the country to stop going to brick and mortar stores.

Brick and mortars have many problems with the customer experience. These problems make shopping at brick and mortars a nuisance. These problems make shopping longer and harder. There are two main divisions of problems. We can look at the problems mainly affecting disabled people and problems that affect all people.

In order to revolutionize the shopping experience of consumers in brick and mortar stores, an invention of a new shopping cart that can reduce the inconveniences of shopping must be produced. This revolutionary new shopping cart will be include new safety features like a braking system and include an all in one inventory system where anything put in the cart will be tracked, totaled and allow for a faster checkout, eliminating the need to ever stand in line.

II. Societal Problem

A. *Inventory Tracking*

In order to help those who have children or those on a budget the cart will need to be able to track what has been put into it. The cart will need to know when something has been placed or removed from it at any time and be able to somehow display the current contents of the cart in an easy to read format. Then with that information it should be able to tally up and inform the user of the total price of its contents. If an item is mistakenly placed in without the user knowing a quick check of the system.

B. *Braking System*

In order to make it safer shopping experience for those who are accident prone, there needs to be a feature to allow for shopping cart braking. This feature must be able to allow a customer to avoid any hitting obstacles or persons in the way and be able to carry a reasonable amount of weight.

III. Design Idea Contract

Below are a list of each member, their focus, and their skill sets that pertain to this project. You will also find their resumes in the Appendix section of this document.

- Movement
  - 4 wheels, 2 servos, 2 wheels with controlled axis
  - 4 wheels, 4 motors, differentials
  - 4 wheels, 2 motors, differentials
  - 4 wheels, 1 motor, 1 wheel with controlled axis
- Detecting items
  - RFID
  - Barcode scanner
- Interaction/control
  - Touchscreen tablet on cart
  - Smartphone Mobile Application
- Position detection
  - IPS
  - GPS
  - Motion tracking + sensors

Normal shopping carts require someone to physically push them around. In order for our SmartCart to move autonomously, we need to have motors control the wheels. Not only do we need to be able to push the cart forward autonomously, we need to be able to control which direction it goes.

Our first design consideration was to have one motor control one of the rear wheels and have a motor control the angle of one of the front wheels. This approach would require the least amount of motors to move the cart around in a controlled manner; it would also be fairly easy to implement. Shopping carts usually have two fixed wheels in front (always facing forward) and two free wheels in the front (able to turn any direction). It would be easy to replace one of the rear wheels with a motorized wheel. Then we would need to attach a DC motor to one of the free wheels in the front to be able to control the angle of that wheel, which would control which angle the cart moves in.

The main downside of this approach is that it would lack precision. By having motors not push both sides equally, the cart will naturally drift to one of the sides regardless of the DC motors. We are worried that this urge to drift to one of the sides will exert too much resistance on the DC motors and will slowly damage it. This method also relies entirely on the motors for all directional controls; it would need to be very precise to be desirable.

Our current design consideration is to have four wheels with one motor on each wheel. The main disadvantage is that this would take more hardware to implement. However, we still think it is better for our application. Four motors would provide more power and therefore it would be more responsive to speed up and brake quickly. It needs this responsiveness in an environment where it might need to brake quickly to avoid collision. In addition, direction control is distributed between all four wheels instead of just one DC motor. This allows for more precise movement which is needed in its environment.

A. Detecting Items

In order to streamline the shopping experience, we want some way to manage and keep track of what users store in their carts. The first method we thought of was to have a barcode scanner within the cart. This way, users would scan items when they place them in their carts. Stores already have barcodes on all of their products, so this would be implementable immediately.

However, we think this would be a little tedious for users. It would be shifting the role of scanning items from the cashier to the shopper. Items would also need to be checked again in the end, in the case that the user did not scan some of their items.

We think a better way of detecting items is to implement RFID. All items would be a passive RFID tag and the cart would have an RFID reader that could detect items in a close radius. This would be much more convenient for users as they would only have to place items in their carts without the need to scan them. In addition, this would prevent the need for checkout lines in the end.

The main disadvantage of this is that stores would need to replace their barcodes with passive RFID tags. However, RFID tags are very cheap. They already cost fractions of a cent and will become even cheaper if they see widespread use and are bought in bulk.

B. Interaction and control

We want users to be able to communicate and control the shopping cart. We would like for them to be able to see an itemized list of their cart contents, the total price, as well as being able to set a spending limit.

One possible way to allow users to communicate with their SmartCart is to have a smartphone app. They would be able to see everything about their cart in their own handheld device. When they first enter the store, they would use the app to request a cart. The cart would then be tied to their device. When they are finished shopping, they would be able to pay through the app.

While we would like to have a smartphone app, we don’t want this to be the only way to use a SmartCart. Many people don’t want to shop while constantly using their phones. People should also be able to shop if their phone is low on battery or if they left it at home. Due to this, we want to attach a touchscreen tablet to the cart with an interactive GUI. This would allow all users to access the cart’s features such as being able to see their total price.

C. Position detection

In order for the shopping cart to be able to sense object/person in front of it, it has to be able to detect their position and brake immedietly. There are different ways to accomplish this and we have considered a few.

One way to implement this would be with an indoor positioning system (IPS). The store would have a wireless signal broadcasting from each corner of the store (at least 3 minimum). Each cart would then measure either the strength or delay to each of the wireless signals to determine its position.

With this approach, users would need to use the smartphone app to track their position in order for the cart to be able to track them. This approach would be the easiest to implement collision detection. Because all carts are constantly having their position tracked, you can have carts avoid running into each other. You can also have the carts stay away from restricted zones such as in between isles or outside of store premises.

Although it is useful to see the position of every cart, there are disadvantages to this approach that have caused us to look at different methods of position detection. As mentioned earlier, users are required to have the smart phone app in order to be able to use the cart. It wouldn't be able to detect their position without it. This approach also wouldn't work well with groups of people; people often shop in groups in which only one person in the group operates the shopping cart. IPS wouldn't detect anyone else in the group other than the person using the phone app. The carts wouldn't be aware of their positions and could potentially collide into them.

Finally, one of the biggest reasons we want to stay away from this approach is that we want our solution to be contained within the cart. This approach requires stores to install several Wi-Fi broadcasters throughout their store. While we plan to have the carts share some degree of communication with the store, we want them to be able to run independently as well.

Our previous design consideration was to use a set of sensors contained on the cart to be able to detect and track a shopper, and to use sensors in the cart to detect and avoid collisions. In our deployable prototype in Phase 2, we moved away from this method to using a set of servo motors with ping sensors to prevent collisions, a more stable approach to solving our task.

IV. Funding

After finalizing the items we would know that will be needed to implement our design into a real-life form, Appendix E is a list of items purchased with their cost.

V. Project Milestones

Given our project was designed with two major components throughout this process, Cart Braking and Inventory Tracking, we encounter to Major Milestones throughout Phase 2 of Spring 2018.

Major Event 1: Our first major event that was completed was implementing the necessary functions to control our cart's servo motors with the front based setup ping sensors.

Major Event 2: After this event, we were sure our Braking System functions were working, we simultaneously were able to have our Graphical User Interface and Mobile App functioning with our RFID reader on a touch-screen tablet. The design is easy to read for the user, simple to understand and use.

VI. Work Breakdown Structure (WBS)

Please refer to Appendix F for a display of our Work Breakdown Structure for Phase 2.

VII. Risk Assessment and Mitigation

To determine the various critical paths of our SmartCart, we had to determine what constituted as the driving component of our design. In doing so, we determined that our Brake System be the main guts of our final product in the overall operation of the cart. Our two lower critical paths would be our Graphical User Interface for checkout and our RFID system for item tracking. We determined the highest risks are sourced in human failure followed by software failure. The largest risk with regard to human failure is the failure to have the brake systemportion working. The largest risk in software failure is the failure of communication between our brake system and the motor controller.

a) High Critical Path No. 1: Braking System

As discussed in the past, our Braking System must be able to brake without hitting obstacles in the way. There also needs to be an option to disable the system.

The highest risk with the braking system is a human failure and send the following data in readable format to a motor controller. Once it was determined that this was the part of the project with the most risk it was allotted more time and human resources to this task.

The mitigation of this risk was determined to allocate all the human resources need to this specific problem. We also discovered that the better the hardware we are working with the less risk of human failure becoming a reality. We determined that working with a set of servo motors and pings we can more easily stop collisions and communicate with motor controllers. This also helped mitigate our next largest risk of the communication between our pings and the motor controller.

b) High Critical Path No. 2: Motor Control

As mentioned in prior reports, our current design consideration is to have four wheels with two connected to motors. The main disadvantage is that this would take more hardware to implement. However, we still think it is better for our application. Two servo motors would provide more power and therefore it would be more responsive to speed up and brake quickly. It needs this responsiveness in an environment where it might need to brake quickly to avoid collision. In addition, direction control is distributed between all four wheels instead of just one DC motor. This allows for more precise movement which is needed in its environment.

The motors play a significant role with the cart and has a high critical path. The brake system feature relies on the motors functioning properly and the motors rely on proper input from the Arduino to work correctly. The wheels will be attached to the motors and then the motors will be controlled by an Arduino which will receive input from the Euclid.

To mitigate the risk of the motors failing, we will place a H-bridge between the motors and Arduino. This will allow us to better control motor speed and braking. We are also taking precautions for the weight of the cart. Because everything is going to be resting on the wheels/motors, we want to ensure that it will be able to handle that weight. We will be initially testing the wheels and motors will a lighter load placed on them and then eventually with the full cart with a load placed on that to simulate items placed in a shopping cart.

c) Low Critical Path No.3: Graphical User Interface

The Graphical User Interface was determined to be a low critical path due to it not having direct control of the entire carts operation. This component is strictly going to be used to allow our users to have access to seeing what they have placed in their cart and to checkout wherever they are located in a store. A small risk that was; however, determined with the GUI system, is its possibility of not recognizing the items placed in the cart by the user because of interference of radio waves. To lower the risk of such an event to occur, we opted to purchase a medium-range RFID reader to only determine items within a certain distance. We feel that this will reduce the amount of interface from other potential nearby radio waves.

a) High Critical Path No. 2: RFID

As we discussed previously, the cart will need to know when something has been placed or removed from it at any time and be able to somehow display the current contents of the cart in an easy to read format. Then with that information it should be able to tally up and inform the user of the total price of its contents. If an item is mistakenly placed in without the user knowing a quick check of the system.

By itself the RFID reader has a low risk of failing was determined to be low on the critical path. Since we are not making the reader from scratch and we are buying a premade one there is little risk of hardware failure. If the hardware where to fail then it would moderately impact the cart, but the cart would still be able to operate. The biggest issues that could arise for the RFID would be the programming portion. The RFID reader by itself can just send out a signal and read any tags within its range, so it needs to be connected with the GUI interface system correctly to be able to properly manipulate the data. If the RFID is not setup properly then the GUI and Mobile App have a possibility of shutting down or receiving incorrect data to work with. This would disable the inventory tracking, but it would not stop the cart as a whole so the impact is not as large as the machine vision and motor portions. There is also an issue with being able to read things surrounded by a faraday cage such as items inside E.S.D. bags, however this does not pose an issue for most stores that use shopping carts.

VIII. Design Overview

Hardware: further detailed information in Appendix B.

- Motors
  - 4 wheels, 2 motors, differential setup
  - Able to move cart and items
  - Requires technician who is able to program drive
- High Frequency RFID
  - RFID antenna/reader
  - RFID tags
  - Able to read entire inside of cart
  - $50 - $200
  - Requires technician who understands how to program software for and use RFID
- Touchscreen tablet
  - Able to show internally developed GUI system
  - $50 - $150
  - Requires technician who can develop software apps that look professional and is easy to use
- GPS
  - Able to show cart location within a specified boundary and prevent shopping cart theft.
  - Will allow for brakes to get engaged if outside a set perimeter
- Shopping Cart
  - Able to fit all required hardware
  - $100 - $150
- Power Source
  - Able to power entire system and not weigh it down to the point it can't carry anything

Software: further detailed information in Appendix C.

1. *Inventory Tracking*
   1. Graphic User Interface
      1. Touch-based system that will allow user to track items placed in their cart, set a budget limit, provide total cost of goods,check-out directly on-the-spot, and track the data received from the RFID system.
      2. Software that will be used: WPF.
      3. Matteen and Jacob will be working on this part together. The estimated time of creating this piece of software will be about 30-40 hours.
      4. Completion will be determined by verifying if the software can detect data being retrieved by the RFID system (discussed next) in real-time.
   2. Mobile Application
      1. Mobile app system that will allow user to track items placed in their cart, set a budget limit, provide total

cost of goods,check-out directly on-the-spot, and track the data received from the RFID system.
2. Software that will be used: C# with integration from tablet GUI.
3. Matteen and Jacob will be working on this part together. The estimated time of creating this piece of software will be about 30-40 hours.
4. Completion will be determined by verifying if the software can detect data being retrieved by the RFID system (discussed next) in real-time.

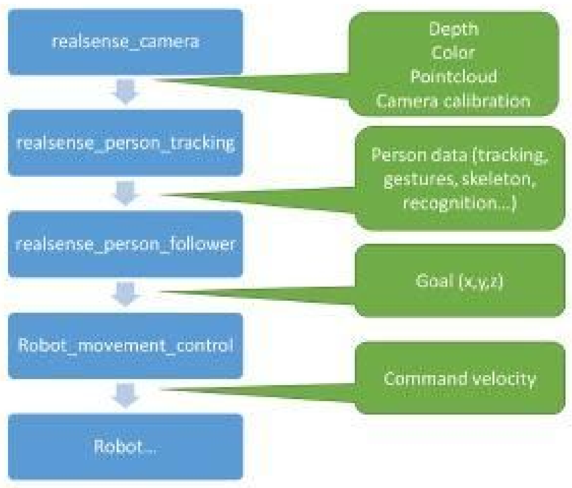
2. Remote Frequency Identification System (RFID System)
    i. Hardware based system that will determine and collect the necessary information needed to send to the touch-pad for the user to see.
    ii. The hardware used will be a high frequency RFID antenna and reader with the ability to reach around 2-3ft in reading radius.
    iii. The software will be developed using visual studios in the C# language to allow for full control over what the RFID reader does and how the data is controlled.
    iv. Jacob will be working on this part. The estimated time of implementing this piece is 30-40 hours.
    v. Completion will be determined by verifying if the RFID system is sending the correct data to the software implemented by Matteen and Ryan.

2. *Brake System*

a. Servo Motors and Ping Sensors
    i. Hardware and software system that will allow for a brakes to be engaged if pings detect object within 14 inches of front of cart..
    ii. Software that will be used: Arduino C++.
    iii. Adam will be working on this part. Other members of the team will help as needed per their expertise. The estimated time of implementing this piece is 30-40 hours.
    iv. Completion will be determined by verifying if the pings will be able to successfully determine an object based off of specific criteria we set and if the correct data is being sent to the motor system (discussed next).

b. Motor Controls
    i. Hardware system that will allow for a shopping cart to be run solely on the reliance of motors.
    ii. Hardware that will be used: a plastic shopping cart, and motors.
    iii. Software that will be used: the motors will be directly operated by the Brake System that will be implemented.
    iv. Jacob and Ryan will be working on this part together. The estimated time of implementing this part will be about 30-40 hours.

Completion will be determined when the motors are synchronized and operating based off of data collected by the Brake System.



IX. Deployable Prototype Status

Per our Design Idea Contract, our deployable prototype successfully shows each planned idea in a more polished manner. Of course, like any engineered product, there is always more room for improvements to be made in further iterations of a product. This experience has given us a strong footing to potential continue work on this product after we graduate school.

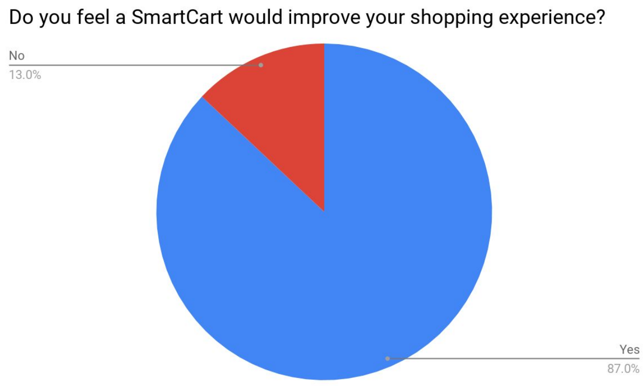
X. Deployable Prototype Marketability Forecast

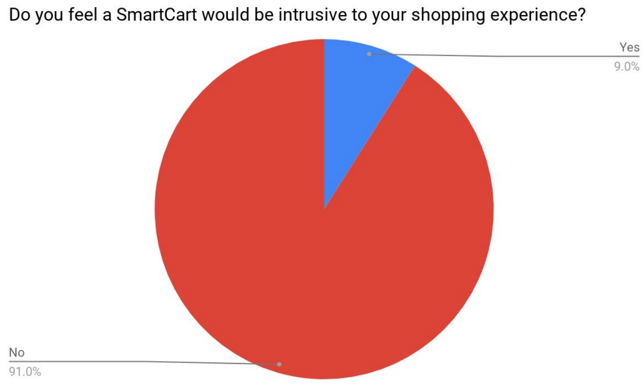
The overall functionality of our cart are functioning which is exactly what we were looking for in our Phase 2 of Spring 2018. To further achieve a marketable device, the design of our cart with a more sturdy and secure design will greatly improve customer satisfaction and experience.

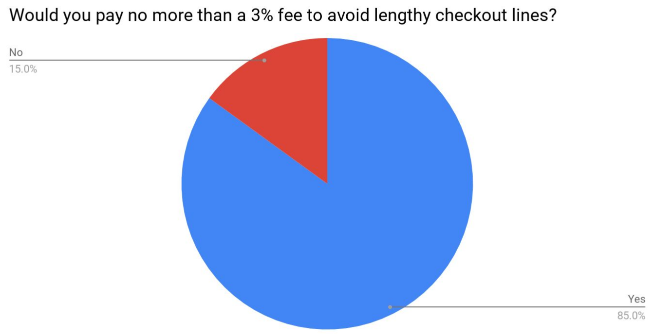
As we concluded this Phase 2 session design, we determined that our software could be more robust in terms of user interface. Currently, the cart's GUI is in a functioning state, but relies heavily on a refresh rate that we feel could be further improved to not dent the user experience.

Additionally, looking at our Project from a financial standpoint, our Market Review proved this could be a big hit with the average American shopper. The next three graphical figures show our research of what Customers and Business Owners think about our product.

A. From a Customer's standpoint



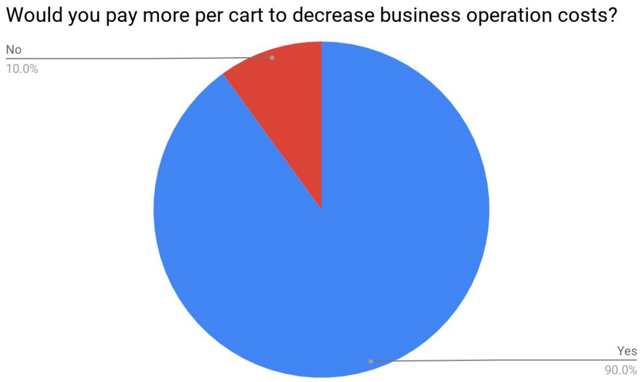




Data collected from a survey of 100 people.

As can be seen from the above graphs the majority of those surveyed were in support of the idea of the SmartCart. For those who disagreed we asked for more detail so that we could improve the product. If the negative feedback was summarized into a few words then it would be: "They have been shopping like this all their life and don't want to change now." We noticed that the demographic of people who preferred not use the upgraded cart were older. They explained that the learning curve to the newer technologies was to steep for them and they prefered things staying the way they were.

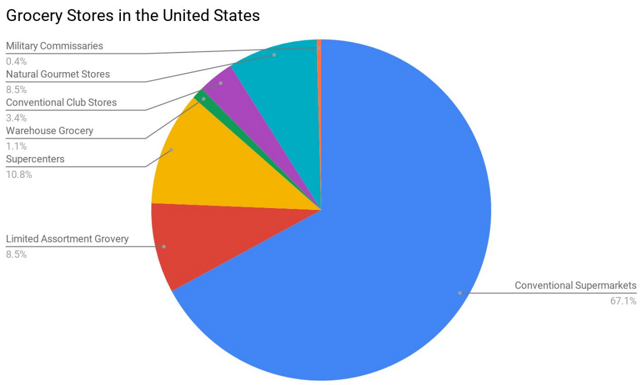
B. From a Business Owner's standpoint



Data collected from a survey of 10 Store Owners.

Market Size

Based off nearly 40,000 grocery stores in United State; giving us, the inventors of SmartCart, access to the most of this market share.



Data pulled from Neilsen TDLinx (2017) via FoodIndustry.com [14]

XI. Conclusion

A SmartCart that is able to meet the constraints of being able to prevent collisions as well as track the items put in the cart by said customer can be created in several ways. In order for us to meet the constraints set before however it was decided that we would use a differential drive cart with 2 servo motors, one motor per back wheel, an RFID system, a GPS, and an interactive touchscreen and mobile app with several features to allow for ease of access. The differential drive motors will make it easier for the cart to maneuver itself and avoid obstacles. The RFID system will help keep track of any item put into the cart with an RFID tag on it. The brake system will allow for the cart to be able to work congruently with the ping sensors and provide data for the motors to know when to engage and stop. The touchscreen and mobile app will allow for the user to see and interact with the inventory in the cart and keep track of prices.

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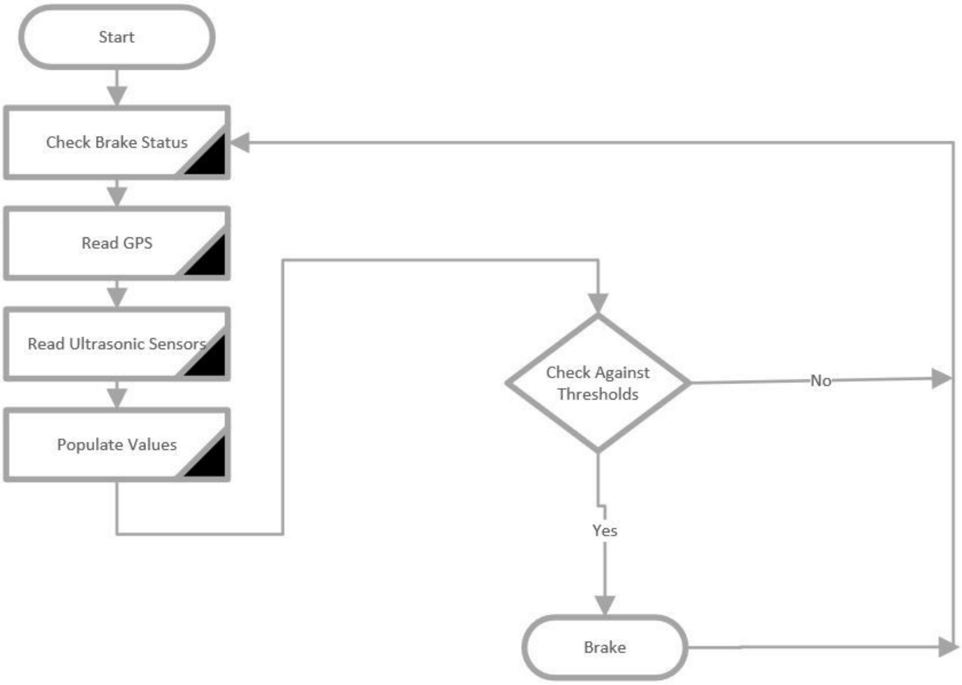
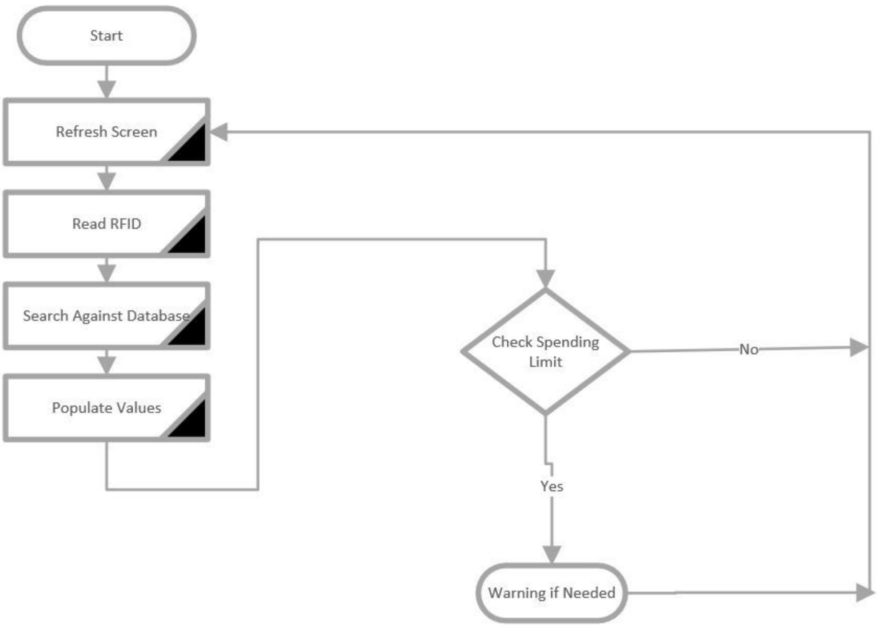
Appendix A
User Manual

To operate SmartCart and its next-generation features, please follow the below guidelines.

1. *Graphical User Interface*
    a. *An end-user will be presented with a simple screen that will allow them to see the items placed within the cart.*
    b. *A budget limiter is also included on the software to prevent overspending.*
    c. *Checking out is made simple by selecting the "check-out" button the lower-left hand corner of the screen. Upon successful payment, the user may leave the store with their purchased goods.*
2. *Brake System*
    a. *This system will automatically be functioning without any required user input. To assure the system is functioning, store operators may check the internal power module to verify power is ample for the motors and sensors.*

Appendix B
Braking and Software Flow Charts





Appendix E.
Project Partners and Cost Breakdown

ITEM	UNIT COST	QUANTITY	SHIPPING	TAX	PARTIAL TOTAL
NUVISION 8" TABLET	$ 72.99	1			$ 72.99
HIGH TORQUE 20KG SERVO MOTOR	$ 9.05	2			$ 18.10
MOUNTING BRACKET FOR MOTORS	$ 7.34	2			$ 14.68
RFID READER	$ 209.90	1			$ 209.90
USB TO SERIAL CONVERTER	$ 8.99	1		$ 0.74	$ 9.73
DISTANCE SENSOR-PING	$ 6.49	2			$ 11.49
2200MAH 11.1V LIPO BATTERY	$ 15.58	1		$ 1.29	$ 16.87
ADAFRUIT ULTIMATE GPS	$ 39.95	1			$39.95
			Total Cost =	$ 393.71	

<u>Funding Partners</u>

Project Sponsor: Intel

Project Funding 1: Ryan Peck
Project Funding 2: Matteen Helmand
Project Funding 3: Adam Al-Antably
Project Funding 4: Jacob Peterson

Appendix F.
Work Breakdown Structure

Detailed breakdown of Project Status and Timeline during Phase 2 of Spring 2018 Semester

Appendix G.
Resumes

Matteen Helmand

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Email: matteenhelmand@gmail.com
Sacramento, CA, 95758

EDUCATION
2014 to 2018 *California State University, Sacramento*
B.S. in Computer Engineering (Expected Graduation: Spring 2018)

- Core courses: Java programming, Assembly programming, System programing with C, Discrete Structures, Advanced Logic Design, Computer Interfacing, and Data Structures and Algorithms, etc.
- Projects: Using Java to simulate a grocery store to calculate time to complete transactions. Built a rolling dolly that holds a DLSR camera with facial recognition software using a Raspberry Pi and Python programming for automation.

PROFESSIONAL EXPERIENCE
3. April 2016 to Present ***SkyWest Real Estate***
Realtor (CalBRE: 02008421)

- Assist in different phases of high volume real estate transactions.
- Constantly prospect to drive in more sales and to establish a full pipeline.
- Work with clients to find the best possible terms of sale for all types of properties.
- Perform comparative market analysis on a regular basis for different types of properties
- Manage property management portfolios of about 150 investors across nearly 300 properties throughout the Northern California region.

2. July 2013 to April 2016 ***Apple***
Advisor

- Finding solutions to software/hardware related problems by providing unparalleled customer service and enrichment to the digital lifestyles primarily for iOS, Mac, and Apple Watch owners.
- Delight Apple product owners by listening to their needs, reaching agreement about their issue and driving it to a resolution.
- Assist in the training of new employees, when needed.
- Troubleshoot simple to complex issues, adapting to a variety of skill levels through a positive, analytical, and informative approach.
- Educate product owners about Apple's products, support options, online tools, and self-help or tutorial training resources.
- Communicate with team members, product owners, and other partners – always remembering that you represent the Apple brand.

1. October 2012 to July 2013 ***SkyWest Real Estate***
Administrator

- Manage and assist with projects in progress and guide them to completion.
- Maintain and prepare forms/packages needed for agents/clients.
- Monitor office owned equipment for compliance with security protocols.
- Responding to support tickets from in a timely, professional, and friendly manner.
- Building and maintaining client relationships and keeping a strong rapport.
- Testing out new and old website features, and rectifying any major or minor issues found.

EXPERTISE

- Fluent in English, Persian, Pashto, and Spanish.
- Programming: Java, Verilog, VHDL, C, Assembly, Python.
- Mac OS X: including iLife (iMovie and GarageBand) and iWork (Pages, Numbers, and Keynote), etc.
- Windows: including all Microsoft Office products, etc.

COMMUNITY VOLUNTEERING AND INTERESTS

- *Leonard Padilla Investigative Services*: Volunteer using social media, Internet and other tools to find individuals who have skipped bail and court appearances.
- *VIRTIS Sacramento*: Helping with newly arrived immigrants from war thorn countries.
- *Sacramento County District Attorney* office: Annual feed the homeless.
- *Sacramento Public Library*: Assist in local activities such as reading to toddlers or participating in activities involving junior high and high school students.

REFERENCES AVAILABLE UPON REQUEST

Jacob G. Petersen

3370 Marina Cove Circle

Elk Grove, Ca 95758

(916) 897-7813

jgpetersen249@gmail.com

OBJECTIVE:

To obtain an internship position with Mercedes-Benz Japan Co. involving the telematics system and broaden my knowledge of the car industry.

SUMMARY:

- Computer proficient for MS office
- Able to work independently, as a leader, or in team environment
- Self-motivated and determined hard worker
- Quick learner with things involving electronics and programs

EDUCATION:

- Franklin High School, Elk Grove CA 2007- 2011
- Maintained a 3.50 and higher all High School
- Taken computer tech, general education, advanced math, and 3 years of Japanese
- Electronics Engineer major
- Consumes River College 2011- 2012, 2014-2015
- Sacramento State University 2016-

EXPERIENCE:

Volunteer as full time missionary in Japan for my church June 2012- June 2014

- Worked with many various types of people
- Trained newer missionaries on how to do missionary work
- Was a district leader in charge of the activities of 8+ other missionaries

RYAN PECK
ryanpeck1@gmail.com

(707) 299-7278
7928 La Riviera Dr., Apt. 48.
Sacramento 95826 CA.

Objective: To develop industry experience in the field of Computer Engineering.

Education: Computer Engineering B.S. – California State University, Sacramento
Senior, Graduating Spring 2018

Overall GPA:	3.264
CSUS GPA:	3.713
Major GPA:	3.912

Knowledge and Skills:

Computer Languages
C, C++, Java, Python, Verilog, VHDL, HTML, CSS, JavaScript, Unix Shell, Git, x86 MASM Assembly, TCL

Hardware/Software
Experience using MultiSim, Altera Quartus II, Xilinx ISE Design Suite, LTspice, SolidWorks, VirtualBox, VisualStudio, Qt Creator, Code Composer Studio, MS Office Suite, Adobe Creative Suite. I have done electronics projects involving Arduino, TI MSP430, and AVR microcontrollers. I have taken classes on computer architecture (Intel x86) and logic design including how to program a FPGA with Verilog and VHDL.

Teamwork/Management
Went to a group-project oriented high school; voted Best Group Member among graduating class. Experienced in working on long team projects. Great at collaborating, project delegation and time management.

Personal Skills
Great at following instructions and working in a team or individually. Solid communication skills, both oral and written. Great at troubleshooting and problem solving. Very motivated when it comes to working with and developing technology.

Project Experience:

USB Game Controller
Built a USB-HID compatible game-pad designed to connect to a PC to use with rhythm-based games. It contains nine mechanical buttons in a case built from MDF board and powered with a TI MSP430 microcontroller. The button inputs are interrupt-based and use software debouncing for low power consumption and accuracy. It sends a USB-HID report to the computer that tells it which combination of buttons are pressed and then receives a USB-HID report to light up specific buttons.

Calendar GUI Program
Developed a program that displays a calendar along the background desktop of a computer. I wrote it in C++ and used Qt Creator to make the GUI. It uses built in libraries for managing date and time, and retrieving the correct time from the internet.

Extracurricular:

ACM member - Association of Computing Machinery. ACM is the largest collegiate computer science organization

Tau Beta Pi member - Engineering Honor Society. TBP is the oldest engineering honor society.

Work Experience:

Company: Microsemi Corp. **Jul 2016 - Present**

Position: NVMe Applications Engineering Co-op.

Responsibilities: The NVMe applications team provides direct support to other companies directly using our NVME products, primarily our flash controllers. I help the applications team by doing a variety of testing, writing scripts, and writing and modifying firmware.

Adam Antably

Personal Information

Address: 8028 Polo Crosse Ave.
Sacramento, CA 95829

Phone: (916)-604-0941
Email: aantably@gmail.com

Experience

Department of Water Resources: Earthquake Engineering
Engineering Student Assistant Oct 2016-present

- Assisted with development of databases (GIS), queries, and reports
- Assisted with repairs of seismic sensors and other electronics in field
- Assisted with design analysis and condition assessment
- Performed analysis of current and archived earthquake data

Red Sea Food Market Assistant Manager 2012 - 2015

- Managed store and maintained high customer service
- Facilitated relocation to much larger facility
- Increased sales and modernized POS system
- Trained and supervised 8 new employees
- Developed and diversified workforce

Education

California State University – Sacramento **2014– Present**
Electric and Electronic Engineering
Graduating May 2018

- Engineering Graphics and CADD
- Manufacturing Processes
- Computational Methods and Applications and Logic Design
- Machine Vision
- Electromechanical Conversions
- Applied Electromagnetics
- Circuit Analysis and Network Analysis
- Feedback Control Systems and Digital Control Systems
- Signals and Systems
- Electronics

Personal Skills

- Well organized and detail oriented
- Positive use of criticism and strong will to learn
- Excellent oral and written communication skills
- Strong analytical and time management skills
- Ability to attain goals without direct supervision
- Results based approach to problems
- Remains assertive, adaptable and confident in all dealings
- Dependable, trustworthy, and motivated in a business setting
- Determination to learn and ability to learn independently

Key Skills

Key Engineering Skills:

- Advanced Mathematical skills
- Proficient in C language
- Experience with Verilog
- SolidWorks 2015
- Adobe Dreamweaver CS6
- Microsoft Visual Studio 2015
- Competent with circuits
- Proficient with power tools
- Experienced in a machine shop
- Experience with multiple Simulation software
- Experience with ARM

Key Professional Skills

- Microsoft Word
- Microsoft PowerPoint
- Microsoft Publisher
- Microsoft Excel
- Adobe Photoshop
- Data Entry
- Printer/ Fax skills
- Data Analysis
- Numeric Data processing

Key Competencies

- Learning new technologies
- Desire to learn and achieve
- Creative and Imaginative
- Hardware Trouble shooting
- Software Trouble shooting

Extra-Curricular
Hyperloop Club:

- Sensor Sub-Lead
- Experience with ARM Cortex
- Experience with Raspberry Pi
- Experience with photoelectric, infrared, and laser distance sensors
- Experience with IMU's, temperature, and pressure sensors.
- Experience working with both subordinates and superiors at same time.