TECHAUTO

Post Mortem

Project Team:

Yawen (Evan) Chen
Jeffrey Wang
Cheng (James) Zeng
Samin Semsarilar
Ching Ho (Tom) Weng

Primary Contact:

Jeffrey Wang
jawang@sfu.ca

Submitted to:

Andrew Rawicz - ENSC 440W
Steve Whitmore - ENSC 305W
School of Engineering Science
Simon Fraser University

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TABLE OF CONTENTS

List of Figures

List of Tables

1   Introduction

At TechAuto, we aim to integrate automation into human daily activities. By introducing the Cart-Follow-X1, we will provide users with a hands free experience while transporting cargo. With the two operation modes, "Follow" and "Assist", the user can choose between having the cart automatically follow behind or take full manual control with motor power assistance. The Cart-Follow-X1 consists of two main systems, the control system, and the mechanical system. The control system tracks user position and controls motor operation while the mechanical system applies the motor power to the carts rear wheels for cart movement.

2   System Overview

The Cart-Follow-X1 has two operating modes, "Follow" and "Assist" mode. In "Follow" mode, the user will be carrying a remote which contains an ultrasonic transmitter. The transmitter will start transmitting ultrasonic pulses once the "Follow" mode has activated. On the cart, two receivers are placed on two sides of the front of the cart to receive the ultrasonic pulses. User location relative to the cart can then be calculated through the pulse's travelling time to each of the receiver. With information on the user's location, the onboard microcontroller can then send out appropriate instructions to the DC motor drive to control the speed of each motor which will in turn, control the speed and steering of the cart. A collision detection system is also integrated to "Follow" mode to ensure safety in operation. A proximity sensor is placed in the lower front of the cart which will cause an emergency stop on the motors if it detects anything beyond the cart's proximity limit. Figure 1 shows the main concept of "Follow" mode operation.
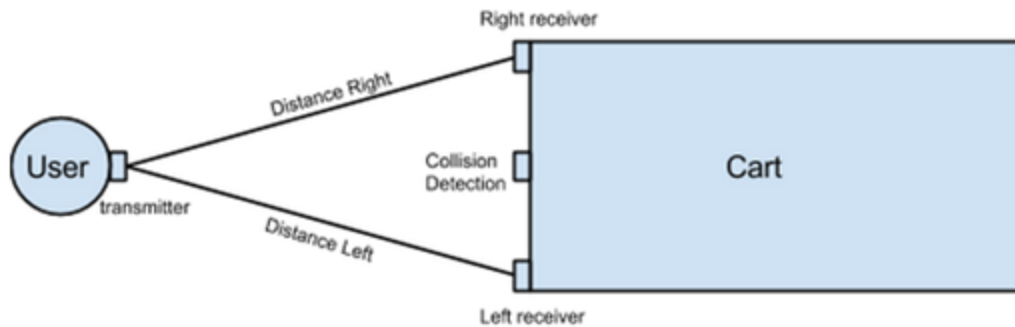
FIGURE 1: Follow Mode Operating Concept

In "Assist" Mode, the user will have full manual control over the cart with electric motor assistance. The electric motors can be controlled through a push button located on the handle of the cart for easy access. Releasing the push button applies full break on both motors which comes in handy if the user requires to stop the cart on ramps. Figure 2 shows the high level block diagram of the Cart-Follow-X1 system.
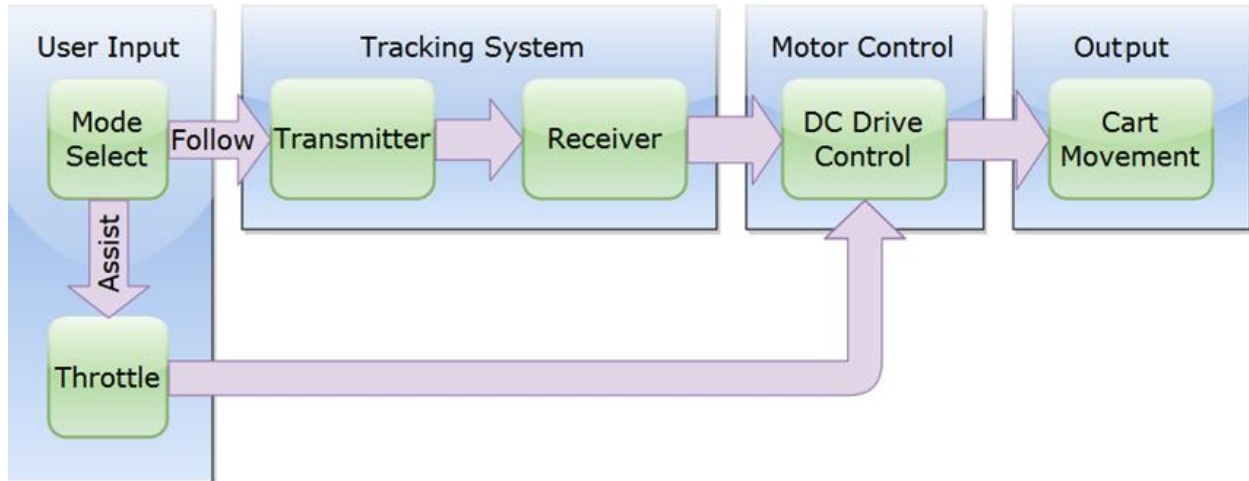

FIGURE 2: High Level Block Diagram of Cart-Follow-X1

3   Components & Costs

Due to design changes and unforeseen expenses, this project exceeded our expected cost of $915.00 as listed in the proposal document. The source of funding for the Cart-Follow-X1 project is through ESSEF and its sponsors, which they have provided $750.00 for this project. This funding will help cover the majority of the costs, while the remaining $230.07 will be split evenly among each team member.

TABLE 1: Estimated vs Actual Cost

Item	Estimated Cost	Actual Cost	Notes
150W DC Motors (x2)	$140.00	$184.12	Did not expect an import tax of $43.04
12A 24V DC Motor Drive (x1)	$60.00	$116.59	
2A 6V DC Motor, 2A 24V DC Motor (x2)	N/A	$32.20	Used for proof of concept testing
Raspberry Pi B+(x3), SD Cards (x3), Ultrasonic Sensors (x5)	$300.00	$242.46	Opted for ultrasonic sensors instead of more expensive Bluetooth iBeacon
12V 5.0Ah Rechargeable Battery (x2)	$60.00	$54.34	
Wires, Wire terminals, Fuses	$35.00	$40.76	More wires used than expected
Switches, LEDs, Capacitors, Perfboards	N/A	$41.29	Included under Misc. from proposal document
Cart Frame & Mechanical Components: Pulleys, V-Belt, Screws, Wood, Steel Straps, Velcro, Glue	$320.00	$195.52	Went with an off-the-shelf cart frame that came with wheels, so buying separate wheels was not needed
Taxes HST (12%)	N/A	$72.79	Did not include taxes in proposal document
Total	$915	$980.07	Over budget by $65.07

4   Schedule

As shown in Figure 3, all of the documentation were completed on time and there were some deviations with the proposed schedule for the project implementation. Throughout this semester, we learned that there will always be changes and modifications to our project, so our design discussion took longer than we had planned. We also realized that ordering parts is not a one-time thing. As the project progressed, we realized that we needed to buy missing components as we continued onto integration. To compensate for these delays, we performed our tests ahead of schedule to make sure there were no major failures to our components. In the end, we were still able to complete our project on time. Figure 3 shows the proposed schedule versus the actual schedule of the entirety of the Cart-Follow-X1 project.
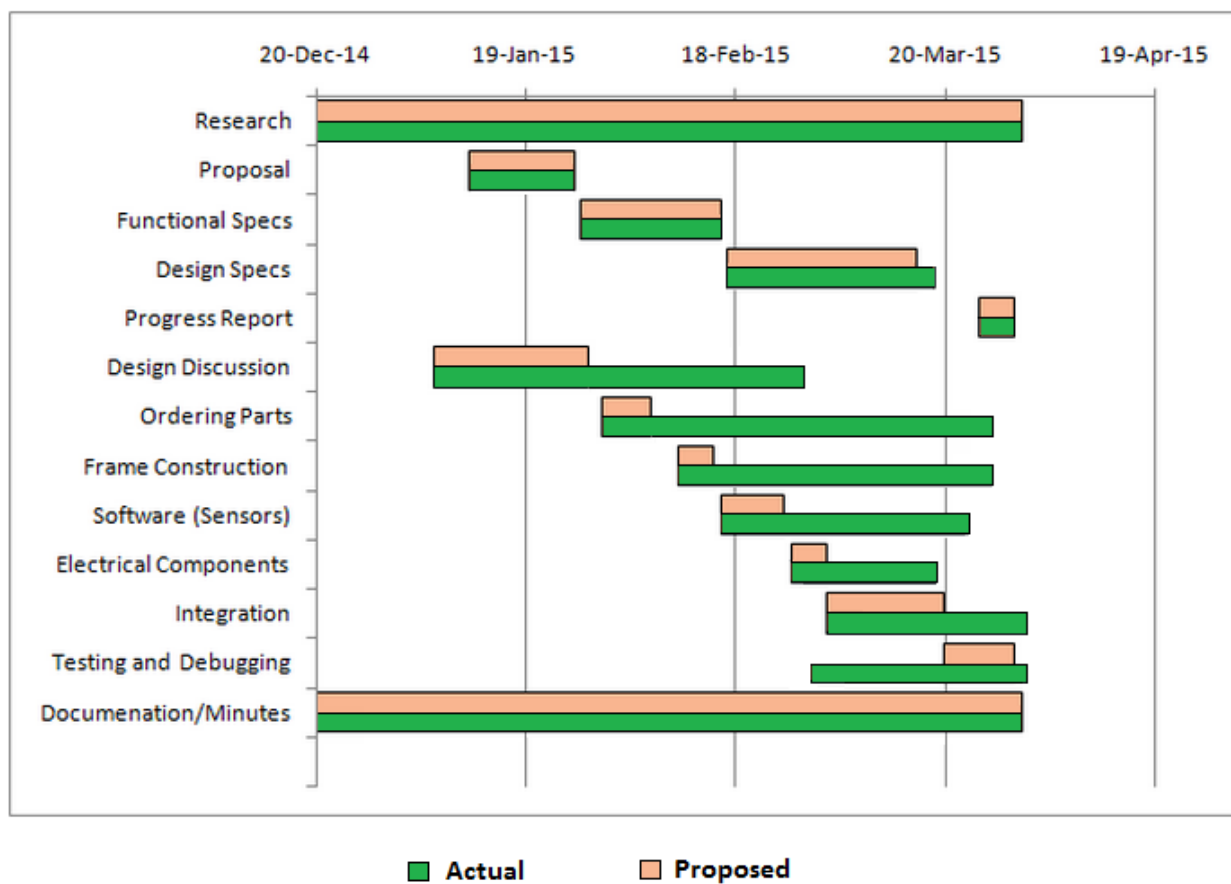

FIGURE 3: Proposed vs Actual Schedule

5   Challenges

The main challenges we faced with this project involved the control system of the Cart-Follow-X1.

Synchronization Between Remote and Cart

During the implementation of the cart's tracking system, we were unable to obtain correct distance readings from our receivers. After intensive research and investigation, we concluded that the problem came from the lack of synchronization on the trigger signals sent to both the transmitter and receiver. In order to obtain the correct pulse traveling time between transmitter and receivers, they need to be triggered at the same time. To resolve this issue, a wired connection was made between transmitter (remote) and the onboard receiver to synchronize the trigger signal. Other wireless synchronization options (e.g. infrared, RF transceivers) were also considered but was ruled out due to lower reliability and higher costs compared to a wired connection.

Reading Spikes of Tracking System

Due to the hardware limitations of the ultrasonic sensors, data spikes in the distance measurements severely impacted the accuracy of the cart's tracking system. When a reading spike happens, the cart would respond with unexpected sudden movements. To resolve this issue, we first decreased the cart's sensitivity for reading spikes by giving a wider decision boundary when deciding when to turn in our algorithm. Although this decreases the cart's responsiveness to small user movements, it prevents cart from responding to those small reading spikes. Secondly, we improved the efficiency of the algorithm to allow a faster sampling rate for the sensors. This minimizes the data spike's effect on the cart's movement because new readings quickly replaces the false reading with the increased sampling rate.

6   Group Dynamics

TechAuto consists of five senior engineering students who has worked very well together throughout the semester. We had two to three meetings every week throughout the semester, and our main method of communication was through Skype and mobile application.

In the design phase of the project, the team was separated into two groups. One group was responsible for designing the control system while the other group was responsible for the mechanical system. The groups were organized according to the strengths of each member, and since the control system required the longest time to complete, we had three members work on the control system, and two members on the mechanical.

Every member in the team has contributed towards the development of the project. The team worked very well together and meetings were held on a regular basis. There were no conflicts within the team because all possible issues were resolved during the frequent meetings.

7   Workload Distribution & Individual Learning

Table 2 shows the workload distribution of the Cart-Follow-X1 project from each individual member.

TABLE 2: Workload Distribution

Task	Evan	Jeffrey	James	Samin	Tom
Software - Tracking System	xxx	xx		xxx	
Software - Collision Detection System	xxx	xx		xxx	
Software - PWM Control	xxx	xx		xxx	
Software - Assist Mode	xxx	xx		xxx	
Software - Mode Switching & LEDs	xxx	xx		xxx	
Mechanical - Transmission System			xxx		xxx
Mechanical - Mounting	xx		xxx		xxx
Mechanical - Wire Management	x		xxx		xxx
Integration & Soldering	xxx	xx	xx	xx	xx
System Testing	xx	xx	xx	xxx	xx
Documentation	xx	xxx	xx	xx	xx
Minutes/Administrative		xxx			xx

Yawen (Evan) Chen - CEO

As the CEO, I managed the project throughout the development cycle. I assigned tasks to each team members and monitored our progress of development. I am also the lead designer in our control group and is responsible for the designing of the overall control system. Throughout the development of this project, our team has faced numerous challenges. By working as a team, we were able to resolve those problems and succeed in completing our prototype on time.

While designing the control system, I have learned a lot about the Raspberry Pi B+ development board and Python programming language. This would be a great help for possible future projects using similar hardwares. I have also learned the proper way to do engineering documentation while writing all the required specifications. The rubric provided for each document showed me what to expect in a professional engineering document. This is very beneficial to me because writing proper engineering specifications is a required skill for becoming a true engineer.

Although all these technical skills are valuable, the most important skills that I have gained are the soft skills. Throughout these three months of development, my time management skills has greatly improved. I have learned that in order to keep the project on schedule, aiming to finish each task few days earlier is always required. Those few days will act as a buffer zone when facing unexpected problems. We have been stuck on unexpected problems several times during our control system development, and those few extra days allowed us to resolve the issue and keep the project on schedule. I have also learned that communication between team members is vital in project development. Our team has been split into two groups, so it is important to keep all team members up to date about the all development progress and design changes to ensure that our control system and mechanical system would work well together after integration.

Overall, this course has been an amazing experience. The skills I learned from this course will be the foundation for the development of my career. All of us has worked very hard to complete this project. I love each and every member in our team and it would be an honour to work with this team again.

Jeffrey Wang - COO

At the start of the semester, we as a group had struggled to decide on the type of project we would like to work on. Many project ideas were done before, and we wanted to make something original. The project cannot be too simple, yet we had to be realistic and not too ambitious as we only had less than four months to complete it. In the end, I'm glad we were able to come up with the Cart-Follow-X1 idea, as I was able to learn new skills as well as apply some of the skills I've learned in the past four years.

In this project I contributed to the software development of the control system. Before the start of this course, I had never used a Raspberry Pi, or coded in Python, but after using them for over 10 weeks, I now know the strong computing power that the Pi has and why it is so popular. This project also introduced me to dual DC motor drivers and their immense capabilities to control our motors however we like. Working on the control system with Evan and Samin, I was able to learn the software aspect of controlling our ultrasonic sensors and creating an optimal algorithm for our overall control system.

This project has also taught me the importance of scheduling and planning. Working on a project of this scale for an extended period of time required lots of planning to make sure we didn't fall behind. Planning also meant researching, I learned that if we had done more research from the start, we would have saved a lot more time and money. Documentation was a huge component of this project, and I was responsible for a lot of the write-up and the final editing of all the documents that were submitted. I learned the importance of good documentation practice as it is one of the main sources of communication to the user. Another thing this project has taught me is the importance of teamwork. We were faced with many problems throughout the semester, but when everyone worked together, we were able to solve most of the problems we faced.

Overall, ENSC 440W/305W is one of the best courses I have taken in my undergraduate career. I learned a lot of new technical and interpersonal skills that will be very beneficial for me in the future. From testing individual components to integrating the whole system and seeing it work was one of the proudest moments for me this semester. Working with Evan, Samin, James and Tom this semester was a great experience, and I would like to thank each one of them for their hard work in making this project a success.

Cheng (James) Zeng - CTO

As a fourth year student majoring in electronics engineering, and taking three courses beside ENSC 440/305, I believe this course was the most challenging one comparing with other courses. Through this project I have gained some incredible experiences not only technically, but also personally and emotionally.

Our group was formed before the start of this semester. However, we had no idea what we were going to do in the beginning. After we had a better idea of the specialties and skills of each team member via the first Skype meeting, we proceeded to look for project ideas and conducted research regarding the ideas we came up with. I was surprised by the passion shown from the other teammates, thus I knew I would be able to learn a lot from them throughout the term.

In this project, I was responsible for designing and mounting the mechanical system. In the beginning, I had no idea how the cart would be motorized, what materials we needed to buy, and where can we find those materials. Although I came up with the idea of the transmission system by implementing some thin gears between the wheels and cart frame, the space of this was way too narrow so I had to withdraw the idea. We went to Canadian Tire and The Home Depot to browse every aisle to get inspired and to come up with some ideas to find a solution. Fortunately, we found a perfect solution for our project, pulleys and belts worked wonderfully for our transmission system. I also learned that In order to enhance my knowledge in our mechanical design theoretically, I would need to do a lot of trial and error through hands on work.

Since I was responsible for the mechanical design of our project, I was required to do the SolidWorks and AutoCAD diagrams for our documents. From this work, I have improved my 2D and 3D drawing using both SolidWorks and AutoCAD extensively. I have had previous knowledge of SolidWorks from ENSC 489 but I have not used it since then. I felt all the SolidWorks knowledge come back to me after a few times of using it, and in the meanwhile, I learnt some new functions that I have never used before. Other than SolidWorks, I also had my first attempt on AutoCAD for the 2D technical drawings. This project has helped me gain a lot of technical drawing and prototyping skills.

I learned that team work is an important thing when working on a project. It was a pleasure working with my amazing teammates because I really learned a lot from them. I was not only impressed with their passion for the project, but also their positive attitudes and their sense of humors. I also learned a great deal of interpersonal skills when it came to both time management and the overall handling of workload I had to deal with over the past four months.

Samin Semsarilar - CIO

As a fourth year Computer Engineering student, I really had no idea what to expect when taking ENSC 305W/440W. The only knowledge I had of this course is that it pushes you to the limit and that you have to design something. Initially I was not planning to take this course but my friend and our COO Jeffrey Wang convinced me that now is a good time to take ENSC 305W/440W. I must say that I can classify this decision as one of the best decisions I have made in my university career. I think that this project has taught me more about the world outside of university more than any other experience in the past 4 years.

My personal responsibilities with regards to the Cart-Follow-X1 included taking the lead on the software involved in our project and being a member of the Control System team. It was a tough task because this meant that the most important functionality and selling point of our product rested on our shoulders. While developing the Control System, I picked up a different variety of skills such as using a Raspberry Pi development board and Python programming. Furthermore, I acquired documentation skills as well as learned about teamwork.

Throughout the project, my group (Control System) was not always meeting with the Mechanical System group. However, it was imperative that we communicated very well and collaborated often to ensure that the quality of our product met our expectations. Our constant communication made integration much painless than expectation. The moment we combined the Control and Mechanical Systems, the cart's operation was at a much better state than we had anticipated. At the end of the day, this course didn't really make me apply the knowledge that I accumulated in my 4 years at university to finish the project. The course made me think like an engineer in industry.

I was lucky to have such a great team to go through this experience with. We had little to no conflicts, and everyone got along with each other very well. The group dynamic was always positive and although we felt the pressure to build a presentable product, we did not panic. I want to personally thank each and every one of my team members for such a job well done. I am extremely proud about the product we have created because I know the amount of work that each and every one of us has put into it.

Ching Ho (Tom) Weng - CFO

Before I took ENSC440, I was expecting to apply the knowledge I've learned in the past four years into our project, but I was wrong, ENSC440 is about continued learning. We were expected to make mistakes but we were able to grow from these mistakes. This way of learning is the hard way but usually the best way. On the side, I had four excellent teammates with variant of skills that allowed us to carry through the semester. I've learned so much from my teammates that I would've never learned from any other courses.

As the CFO of TechAuto, my job was to achieve our Cart-Follow-X1 project without over spending and try to stay true to our budget as close as possible. Besides that, I would also need to make sure all the electronic components we ordered would arrive on time so we would be able to start working right away. Additionally, I was responsible for getting quotes from all the components and make the final decisions. At the beginning of the semester we were expecting to need a budget between $900 to $1000 and at the end we were successful in following this budget.

Other than the financial tasks in the team, I am also in charge of the mechanical system of the cart. Even though I'm not a mechatronic student, nor familiar with mechanics, I was able to solve our mechanical problems. Throughout the semester I've gained a lot of mechanical knowledge. I've learned different types of motors and how are they being controlled in our system. I also gained some experience with electronic circuits, ultrasonic sensors, and Raspberry Pi's. As our project required distance tracking, I've also learned the main solution for our distance tracking. Besides technical knowledge, I have learned skills in time management because things won't always go as planned. Even though we were ahead of schedule most of the time, we still ended up with barely enough time to finish.

TechAuto team worked well as one. We couldn't come this far if we lost any one of our teammates. We complemented each other well and we had great communication throughout. Even though we had some challenges during the semester, it didn't stop or change our ambition. I want to thank all my excellent teammates. Even though not everything worked as smoothly as planned, we were still able to make it the end. This project has been an awesome experience.

8   Conclusion & Future Work

The five members of TechAuto was successful in carrying out our mission to design the Cart-Follow-X1 to bring convenience in cargo transportation. This course provided all of us a valuable learning experience, both technically and interpersonally. For our design, we were able to overcome the limitations of the ultrasonic sensor reading spikes and synchronization issues to create a working prototype.

For future improvements on the control system, we hope to replace the synchronization wire with a wireless solution for better appearances. We also like to use better sensors to improve tracking performance. For the mechanical system, we would like to enclose our transmission system as well as improve its mounting and wiring to give the cart a more appealing look. We also have plans on a more powerful variant, the Cart-Follow-X2. It will contain all the improvements mentioned above, and a more powerful motor for heavier loads to better compete with our competitors.

Appendix

Jan 9, 2015
(10:30 AM – 11:30 AM)
SFU Lab 1

Present: Evan Chen, Jeffrey Wang, Samin Semarilar, Tom Weng, James Zeng

Absent: None

Purpose of Meeting: To discuss project idea

Minutes:

A.   Electric powered suitcase/bag/wagon

Discussion: The wagon would have speed control on the handle for going uphill, and a break control for going downhill. It can also function hands-free. Need to consider how many wheels (2 or 4); type of batteries; heat dissipation; motor; and control mechanism. Need to consult with Andrew & Steve to see if this is a suitable project for the capstone engineering course.

B.   Radio Navigation Car Finder

Discussion: Design a device to locate a parked car in a crowded parking lot. Ideally this device would be small and portable. The method of locating cars we would be using a radio navigation system. Need to consult with Andrew & Steve to see if this is a suitable project for the capstone engineering course.

C.   Next Meeting Date

January 11, 2015 at 12:30PM in Lab 1.

D.   Other Business

None.

Jan 11, 2015
(12:30 PM – 3:30 PM)
SFU Lab 1

Present: Evan Chen, Jeffrey Wang, Samin Semarilar, Tom Weng, James Zeng

Absent: None

Purpose of Meeting: To discuss project layout and design; start proposal

Minutes:

A.   Design and Component Research

Discussion: We will design a 4-wheel wagon project. We plan to use a DC motor, and have it front wheel steering. Could possibly have the wagon handle multi-terrain (large wheels with suspensions). The shape of the wagon is undecided at the moment.   We also discussed prototype materials (hard leather or plastic for case or bag; light metal for frame).

B.   Proposal Discussion

Discussion: Discussed several topics required in the grading rubric. Discussed the background and introduction to our product, the market, and the risks and benefits. Several company names and product names were discussed but yet to be finalized. We will continue to think of suitable names this week. Google docs have been set up for editing of the proposal.

C.   Next Meeting Date

January 15, 2015 at 9:30 AM in Lab 4.

D.   Other Business

None.

Jan 15, 2015
(10:30 AM – 2:30 PM)
SFU Lab 4

Present: Evan Chen, Jeffrey Wang, Samin Semarilar, Tom Weng, James Zeng

Absent: None

Purpose of Meeting: Research Costs and components, proposal document, funding forms

Minutes:

A.   Costs and Components

Discussion: Researched components required, including 2 motors, 1 magnet reduction dc motor, 4 wheels, 1 electric scooter speed control, 3 scooter batteries, fuse and caps. More component research still required.

B.   Proposal Document

Discussion: Completed the write up for Risks and Benefits. Also researched the current market and competitions for a automated cargo carrying system.

C.   Funding Forms

Discussion: Filled out forms for the ESSEF funding

D.   Next Meeting Date

January 21, 2015 at 10:30 AM in Lab 4.

E.   Other Business

Product name finalized as "Cart-Follow-X1", and Company name shall be "TechAuto Inc".

Jan 21, 2015
(11:30 AM – 1:30 PM)
SFU Lab 4, ASB 8836, W.A.C. Bennett Library

Present: Evan Chen, Jeffrey Wang, Tom Weng, James Zeng, Samin Semsarilar

Absent: None

Purpose of Meeting: Discuss sensor problems with Lukas, and market research

Minutes:

A.   Lukas Suggestions

Discussion: Explained what type of sensor technology we plan to use for our project, and Lukas gave some suggestions, including Flora GPS FW 556, RFID, Optical and Ultrasonic sensors. He also provided us with a list of electronics store to visit for our component needs including, Sparkfun, Seeed, Digikey, Lee's Electronics.

B.   Talked to Head Access Services of SFU library to research market

Discussion: Talked to Scott Mackenzie of the Burnaby SFU library to see market potential of our product. Received good feedback, as they would purchase our cart to replace their book carts (which he said costs them about $900/cart). Our cart is similar in price, but it also has electronic components and has the "Follow" feature.

C.   Next Meeting Date

January 29, 2015 at 10:30 AM in Lab 4.

D.   Other Business

None.

Jan 29, 2015
(10:30 AM – 1:30 PM)
SFU Lab 4, RP Electronics, Home Depot

Present: Evan Chen, Jeffrey Wang, Tom Weng, James Zeng, Samin Semsarilar

Absent: None

Purpose of Meeting: Purchasing of components

Minutes:

A.   Cart Frame

Discussion: James will go to Home Depot himself to purchase the cart frame. This ended up costing about $85. Cart will be kept at James' place. Receipts given to Tom.

B.   Electronics

Discussion: Evan, Jeffrey, Tom, and Samin will go to RP Electronics to purchase most of the electronic components (Battery, DC Drive, Toy motor for testing, sensors, Raspberry Pi, electric wires, fuses). This ended up costing about $160. RP did not have the motors we were looking for, so that will be purchased in the near future. All electronics will be kept in Jeffrey's locker. Receipts given to Tom.

C.   Next Meeting Date

TBD.

D.   Other Business

None.

Feb 3, 2015
(2:30 PM – 3:30 PM)
SFU Lab 4

Present: Evan Chen, Jeffrey Wang, Tom Weng, James Zeng, Samin Semsarilar

Absent: None

Purpose of Meeting: Discuss Tasks to be done for the next week

Minutes:

A.   Things left to buy

Discussion: We still need to buy 2 motors (12V, 2A, 100W, and greater than 2000RPM); Connectors (female wire); another Raspberry Pi (B+); Brakes (may not need this, because we can possibly use our motors somehow to control braking).

B.   Things to do before and during reading break

Discussion: Test ultrasonic sensors (test each individual sensors for distance measurement); connect receiver/transmitter of the boards and then measure distance between them; measure and confirm accuracy; start Functional spec. document.

C.   Next Meeting Date

TBD.

D.   Other Business

None.

Feb 9, 2015
(10:30 PM – 11:30 PM)
SFU Lab 4

Present: Evan Chen, Jeffrey Wang, Tom Weng, James Zeng, Samin Semsarilar

Absent: None

Purpose of Meeting: Discuss Functional Specification write up

Minutes:

A.   Document organization

Discussion: Decided to split the document into sections like so: Intro, System Overview, Mechanical System, Control System, Sustainability, and Conclusion

B.   Things to write in each section

Discussion: Each section should have the following requirements where applicable:

- Physical Requirements
- Electrical Requirements
- Standards

C.   Google Docs

Google docs have been set up for editing.

D.   Other Business

None.

Feb 18, 2015
(10:30 PM – 11:30 PM)
SFU Lab 4

Present: Evan Chen, Jeffrey Wang, Tom Weng, James Zeng, Samin Semsarilar

Absent: None

Purpose of Meeting: Progress Updates & Current Issues

Minutes:

A.   Current DC drive may not work with our system

Discussion: Our current DC drive which cost us about $30 is not powerful enough to power bigger motors. We did some research and found one that would be compatible for about $250. Budget will go up significantly.

B.   Distance measurements for Ultrasonic sensors

Discussion: Samin set up the ultrasonic sensor test code for the Raspberry Pi and the distance measurement is working perfectly.

C.   Scott Mackenzie from W.A.C. Bennett library followed up with Evan

Discussion: Scott contacted Evan to see if we're still selling our product to the library. We let him know that we won't be done until the end of the semester, and that we're currently working on our prototype. He continues to have interest in our product.

D.   Other Business

None.

Feb 26, 2015
(1:30 PM – 3:30 PM)
SFU Lab 4

Present: Evan Chen, Jeffrey Wang, Tom Weng, James Zeng, Samin Semsarilar

Absent: None

Purpose of Meeting: Set up meeting with Jamal and distributions of tasks

Minutes:

A.   Meeting with Jamal tomorrow

Discussion: Meeting with Jamal tomorrow at 1:30PM in Lab 1 to discuss synchronization issues.

B.   Control System

Discussion: Evan, Samin, and Jeffrey will be responsible for designing the Control system of the Cart-Follow-X1. This includes "Follow" mode, "Assist" mode, and any other designs associated with the control system.

C.   Mechanical System

Discussion: Tom and James will be responsible for designing the Mechanical system of the Cart-Follow-X1. This includes the design of the transmission system and all mounting and integration of the control system onto the cart.

TBD.

D.   Next Meeting Date

TBD.

Mar 7, 2015
(2:30 AM – 3:30 PM)
SFU Lab 4

Present: Evan Chen, Jeffrey Wang, Tom Weng, James Zeng, Samin Semsarilar

Absent: None.

Purpose of Meeting: Purchasing of components at RP and Implementing Switches

Minutes:

A.   Items to be Purchased

Discussion: We still need to buy 2 motors (12V, 2A, 100W, and greater than 2000RPM); Connectors (female wire); another Raspberry Pi (B+); Brakes (may not need this, because we can possibly use our motors somehow to control braking).

B.   Implementing Switches to Motor and Battery

Discussion: Test ultrasonic sensors (test each individual sensors for distance measurement); connect receiver/transmitter of the boards and then measure distance between them; measure and confirm accuracy; start Functional spec. document.

C.   Next Meeting Date

TBD.

D.   Other Business

None.

Mar 12, 2015
(2:30 AM – 3:30 PM)
SFU Lab 4

Present: Evan Chen, Jeffrey Wang, Tom Weng, James Zeng, Samin Semsarilar

Absent: None.

Purpose of Meeting: Discuss Progress and Current Issues

Minutes:

A.   Mechanical System Progress

Discussion: James and Tom completed the transmission system and it works really well. It works really well for our project. Their next tasks are mounting the control system and wire management.

B.   Control System Progress

Discussion: Started to test our control system algorithm with the real motors. However, when we attach the real motors to our DC drive and Pi, the sensors give bad readings. This did not happen when we used the toy motors. We will probably schedule another meeting with Jamal to ask for advice.

C.   Next Meeting Date

TBD.

D.   Other Business

None.

Mar 14, 2015
(2:30 AM – 3:30 PM)
SFU Lab 4

Present: Evan Chen, Jeffrey Wang, Tom Weng, James Zeng, Samin Semsarilar

Absent: None.

Purpose of Meeting: Discuss Progress and Current Issues

Minutes:

A.   Control System Progress

Discussion: A solution we can up with for the bad readings of the sensors is to use a separate Pi for the DC drive, so that it is not connected with the same Pi that is controlling the sensors. Not sure if this will fix it.

B.   Purchasing components

Discussion: Evan will go to RP Electronics alone to buy a third Raspberry Pi B+. He will also buy another SD card for this.

C.   Next Meeting Date

TBD.

D.   Other Business

Our initial budget has been exceeded according to Tom.

Mar 15, 2015
(2:30 AM – 3:30 PM)
SFU Lab 4

Present: Evan Chen, Jeffrey Wang, Tom Weng, James Zeng, Samin Semsarilar

Absent: None.

Purpose of Meeting: Discuss Progress and Current Issues

Minutes:

A.   Control System Progress

Discussion: Using a separate Pi did solve the problem. But we discovered that if we physically held onto the motor, the sensors would give bad readings. However if we let go of the motor, the sensor readings would go back to normal. So using another Pi was not necessary. Not sure why this is happening, but this will not be an issue since the motor is mounted on the cart.

B.   Raspberry Pi pins

Discussion: We noticed that using the same Pi for the DC drive as well as the sensors resulted in several pins breaking. So buying the third Raspberry Pi was still necessary.

C.   Next Meeting Date

TBD.

D.   Other Business

None.

Mar 17, 2015
(2:30 AM – 3:30 PM)
SFU Lab 4

Present: Evan Chen, Jeffrey Wang, Tom Weng, James Zeng, Samin Semsarilar

Absent: None.

Purpose of Meeting: Discuss Design Specification document

Minutes:

A.   Mechanical System Section

Discussion: Tom and James will be responsible for doing the write-up for the mechanical system section of the document. Evan and James will do most of the AutoCAD and SolidWorks for the cart design since they have the most experience with these software.

B.   Control System Section

Discussion: Evan, Samin, and Jeffrey will be responsible for doing the write-up for the control system section of the document. Samin will do all the circuit/block diagrams of the system. Jeffrey will start the write-up for the Introduction and Abstract sections.

C.   Test Plan

Tom will be responsible for writing a test plan for the document.

D.   Next Meeting

TBD.

E.   Other Business

None.

Mar 23, 2015
(2:30 AM – 3:30 PM)
SFU Lab 4

Present: Evan Chen, Jeffrey Wang, Tom Weng, James Zeng, Samin Semsarilar

Absent: None.

Purpose of Meeting: Discuss Progress and Current Issues

Minutes:

A.   Control System Progress

Discussion: "Assist" mode is working perfectly, the speed is quite fast. This can be easily modified by changing the duty cycle.

B.   Switch Progress

Discussion: Evan, Samin, and Jeffrey implemented a switching algorithm for the mode switch. Mode will be switched with a push button.

C.   LED Progress

Discussion: LEDs have been implemented as a user interface for the user to distinguish between "Follow" or "Assist" mode. Green LED represents "Follow" mode, while Blue LED represents "Assist" mode.

D.   Next Meeting Date

TBD.

E.   Other Business

None.

Mar 26, 2015
(10:30 AM – 11:30 PM)
SFU Lab 4

Present: Evan Chen, Jeffrey Wang, Tom Weng, James Zeng, Samin Semsarilar

Absent: None.

Purpose of Meeting: Progress & Testing Prototype

Minutes:

A.   Current Progress

Discussion: First time putting the cart on the ground to do real testing with the implementation of both Control and Mechanical system.

B.   "Assist" mode functionality

Discussion: "Assist" mode is working perfectly. Pressing the throttle button will give motor power to the cart, and upon releasing the button, the motor will stop.

C.   "Follow" mode functionality

Discussion: "Follow" mode still needs work. We will need to adjust the speed by changing the duty cycle. Also may need to change to better capacitors for our filter to smooth out our filtered signal.

D.   Next Meeting Date

TBD.

E.   Other Business

None.

Apr 3, 2015
(10:30 AM – 11:30 PM)
SFU Lab 4

Present: Evan Chen, Jeffrey Wang, Tom Weng, James Zeng, Samin Semsarilar

Absent: None.

Purpose of Meeting: Discuss Progress and Current Issues

Minutes:

A.   Current Progress

Discussion: Transferred all our circuits on breadboards to perfboards. Did all our soldering today and tested the circuit to make sure our control system is operating the way we intended it to.

B.   Post Mortem Write-up

Discussion: Jeffrey will start working on the Post Mortem write-up. Everyone else is instructed to start writing their own individual learning.

C.   Current Issues

Discussion: Evan not feeling well, and hopefully he can make it to our next meeting on Tuesday.

D.   Next Meeting Date

TBD.

E.   Other Business

None.

Apr 7, 2015
(10:30 AM – 8:30 PM)
SFU Lab 4

Present: Evan Chen, Jeffrey Wang, Tom Weng, James Zeng, Samin Semsarilar

Absent: None.

Purpose of Meeting: Discuss Current Issues and Conduct Final Tests

Minutes:

A.   Mechanical System & Integration Progress

Discussion: Tom and James completed the final enclosures on the cart

B.   Control System Debugging

Discussion: Fixed the "Assist" and "Follow" mode motor speeds.

C.   Testing

Discussion: Tested the cart with load of about 20 kg. Cart seems to slow down so the speed of the motors will need to be adjusted.

D.   Other Business

- Remote needs enclosure
- One more receiver needs to be mounted
- Revised test plan submitted
- Both 12V batteries need to be recharged in the morning so that more testing can be done in the afternoon tomorrow
- Need video footage for outdoor tests, as well as realistic transmitter placement on the user

Apr 8, 2015
(10:30 AM – 9:30 PM)
SFU Lab 1

Present: Evan Chen, Jeffrey Wang, Tom Weng, James Zeng, Samin Semsarilar

Absent: None.

Purpose of Meeting: Demo and Presentation Discussion

Minutes:

A.   PowerPoint

Discussion: All team members will be present to work on the PowerPoint presentation.

B.   Tests

Discussion: We will conduct final tests on the cart and make sure nothing is wrong before the demo tomorrow.

C.   Presentation Rehearsal

Discussion: All group members will be present to practice our ENSC 440W presentation.

D.   Next Meeting Date

8:30AM - April 9, 2015.