

TECHAUTO

Project Team:

Yawen (Evan) Chen - CEO
Jeffrey Wang - COO
Cheng (James) Zeng - CTO
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Ching Ho (Tom) Weng - CFO

ENSC 305W/440W
Simon Fraser University
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OVERVIEW

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- Acknowledgements

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BACKGROUND & MOTIVATION

MOTIVATION

- People carry some sort of luggage or cargo in everyday activities
- Most common way of handling cargo right now is through manual labour (like pushing a cart, or carrying a heavy bag)
- We want to address the problem of having to manually carry your belongings wherever you go
- We also want to minimize the amount of force exerted to improve quality of life

BACKGROUND & MOTIVATION

Market

- Construction or Factory workers
- Elderly
- Injured or Disabled
- Schools and Labs
- Libraries
 - Scott Mackenzie, Head Access Services of W.A.C. Bennett Library at S.F.U.

COMPETITION

Current Solutions:



- Moto-Cart Jr. by Lift Products is a motorized platform truck
- Heavy (395 lbs.)
- Expensive (Over \$3000 CAD)

COMPETITION

Current Solutions:



- Global Industrial Folding Platform Truck
- Cheap (\$50 CAD)
- No electrical motor assistance

PROJECT OVERVIEW

COMPANY

TechAuto

- Start-up company that consists of five senior engineering students
- Company Goal: Integrating automation into every day activities

Yawen (Evan) Chen - CEO

- Control System Design
- Project Manager

Jeffrey Wang - COO

- Control System Design
- Chief-Editor of Documents

Samin Semsarilar - CIO

- Control System Design
- Software

Cheng (James) Zeng - CTO

- Mechanical System Design
- Enclosure and Wiring

Ching Ho (Tom) Weng - CFO

- Mechanical System Design
- Finance Management

OUR PRODUCT

- The first of Cart-Follow-X series, Cart-Follow-X1



CART-FOLLOW-X1

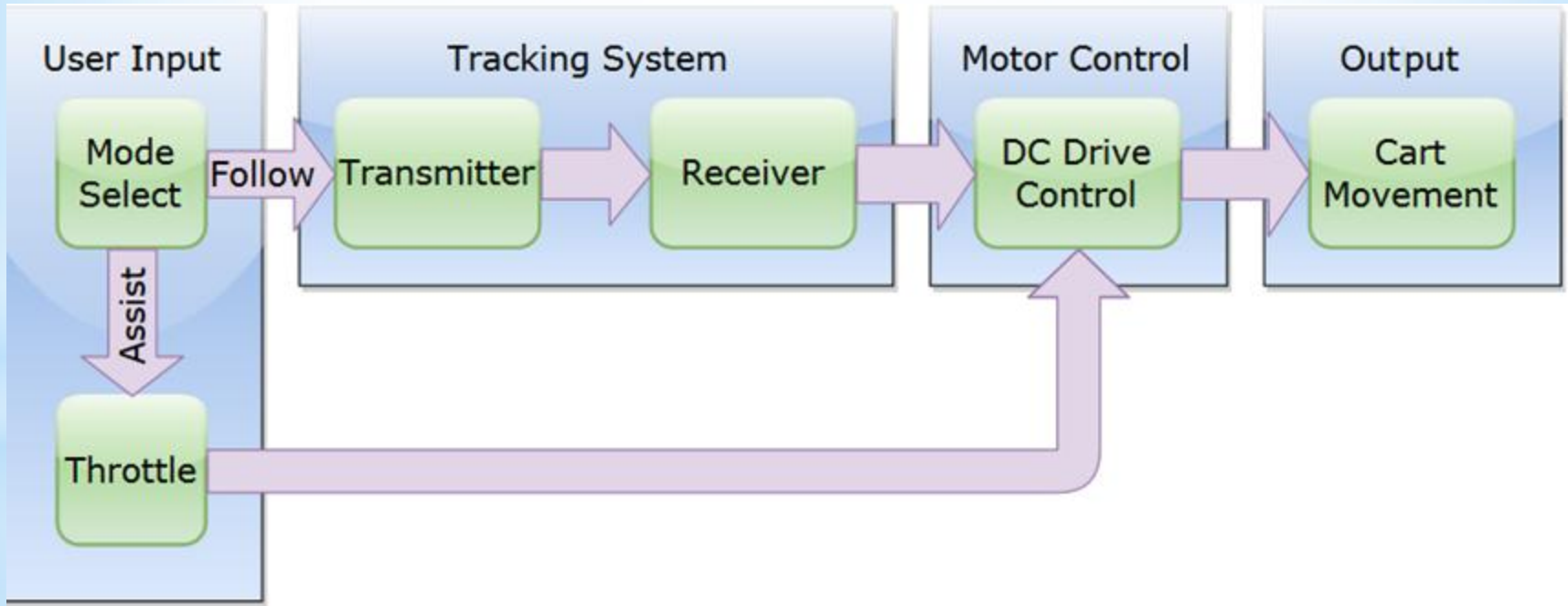
- **Assist mode**
 - Full manual control
 - Motor power assistance
 - Stress-free

CART-FOLLOW-X1

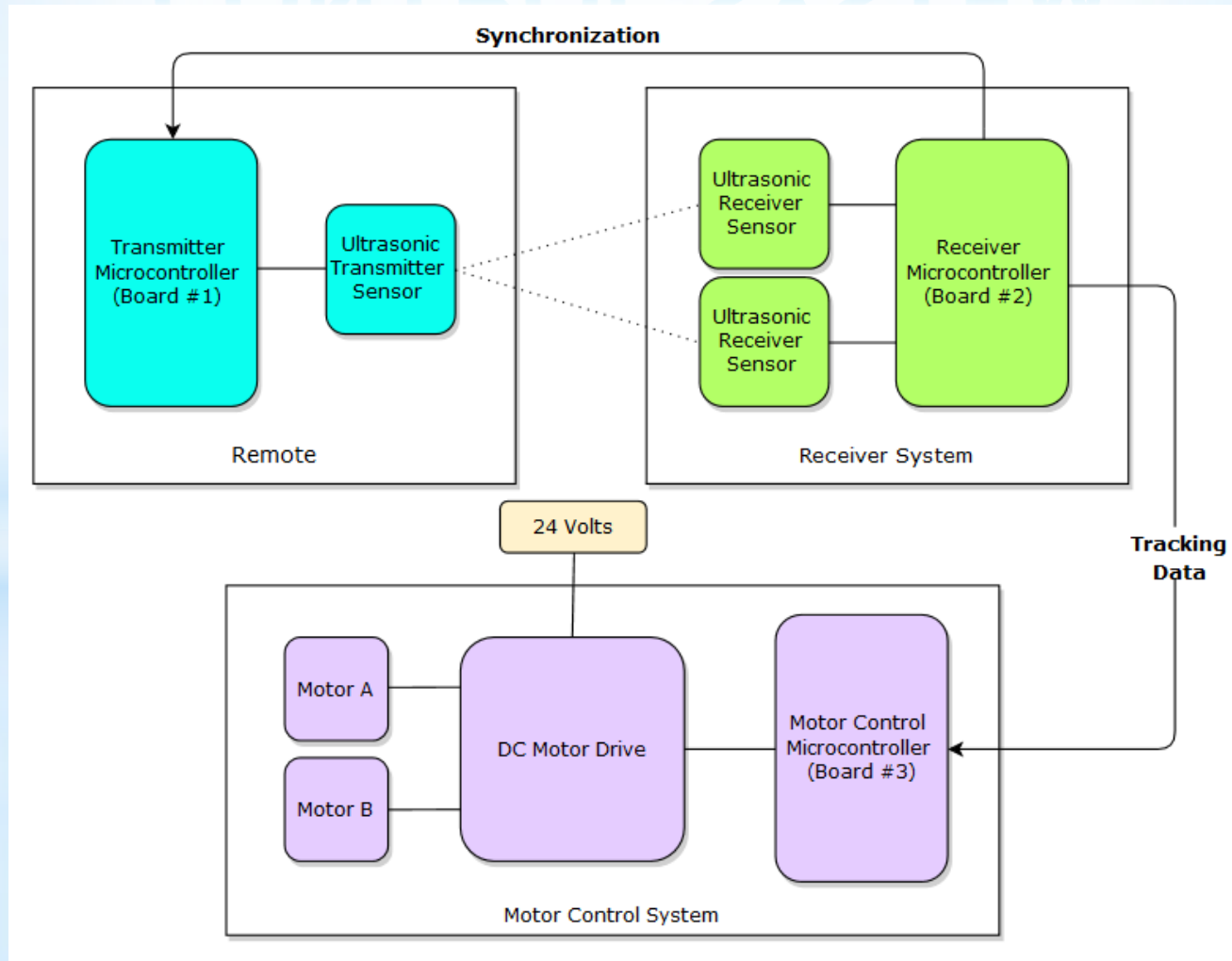
- **Follow mode**
 - Tracks user position
 - Automatic follow
 - Hands-free

SYSTEM OVERVIEW

SYSTEM OVERVIEW

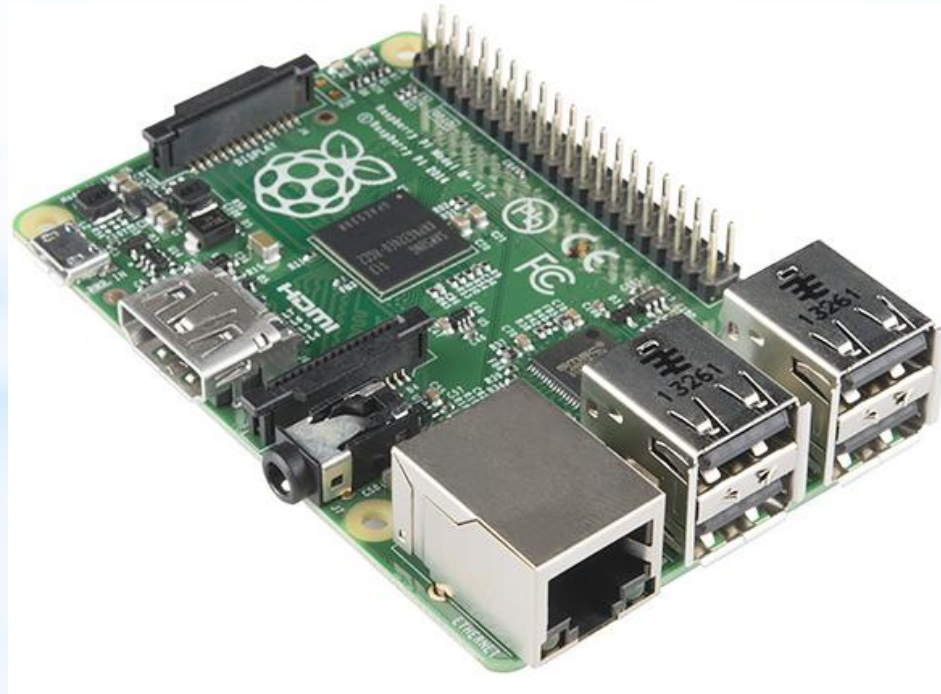


CONTROL SYSTEM



COMPONENTS

Raspberry Pi B+ Development Board



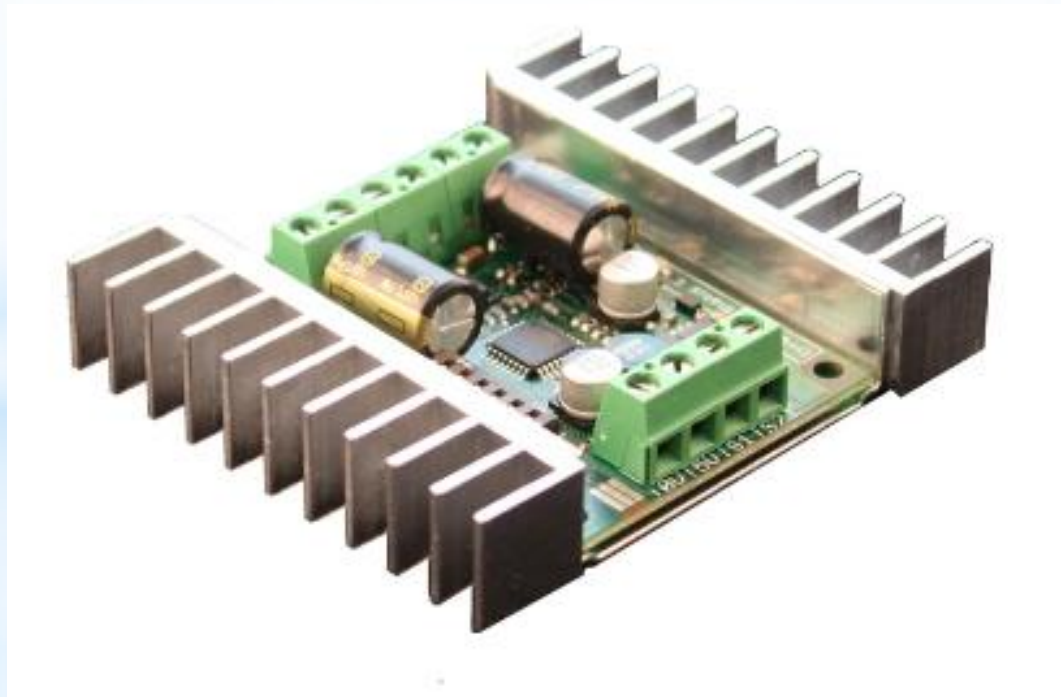
COMPONENTS

HC-SR04 Ultrasonic Sensors

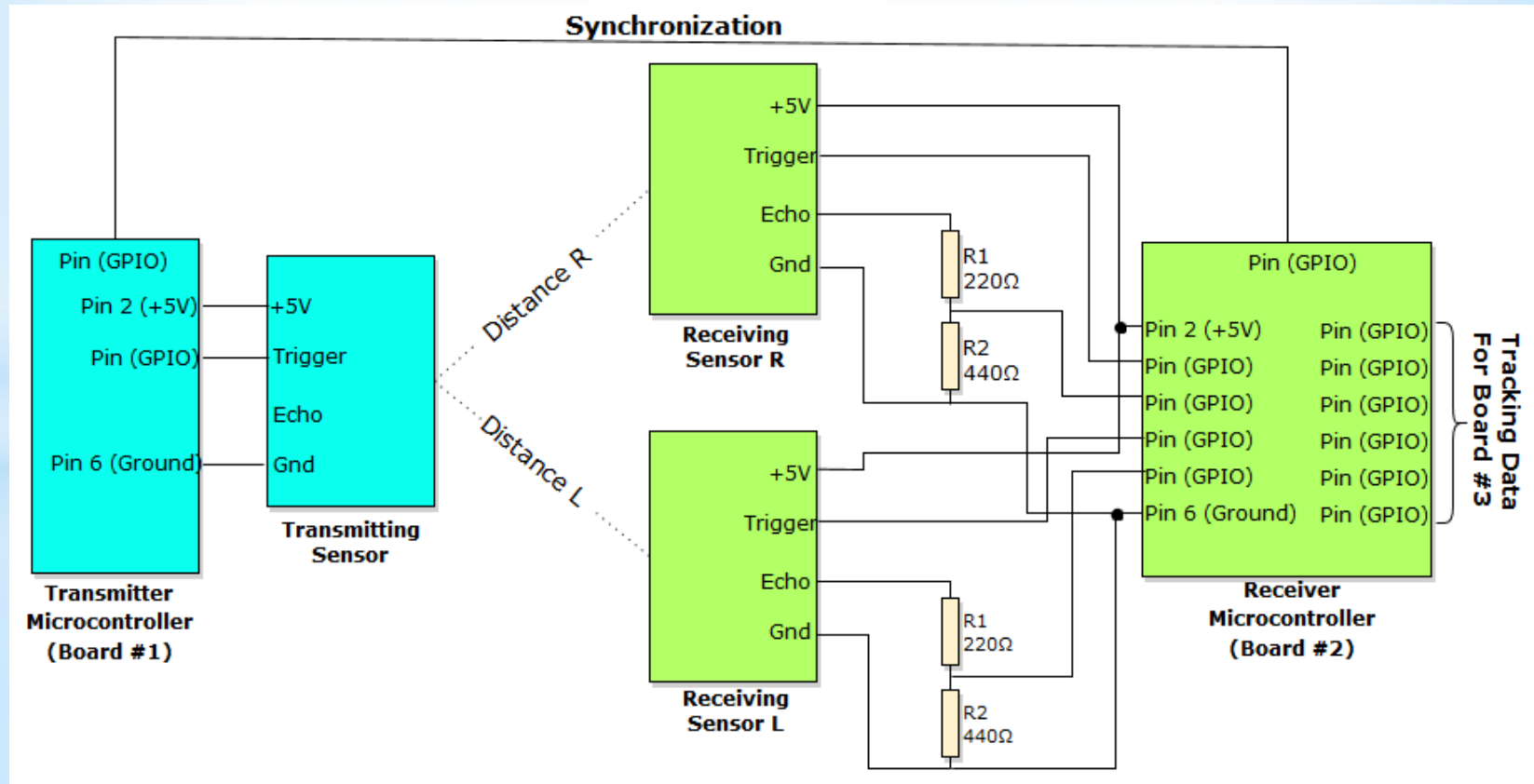


COMPONENTS

Sabertooth Dual 12A 6-24V Regenerative Motor Driver

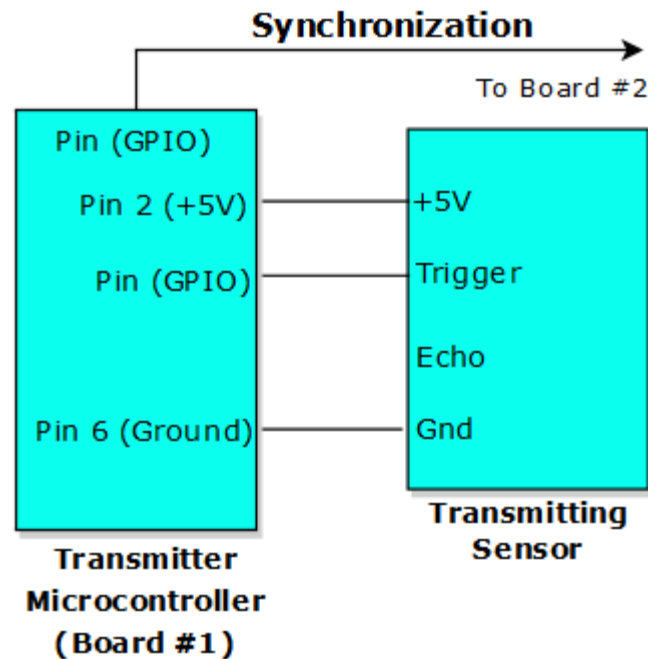


TRACKING SYSTEM



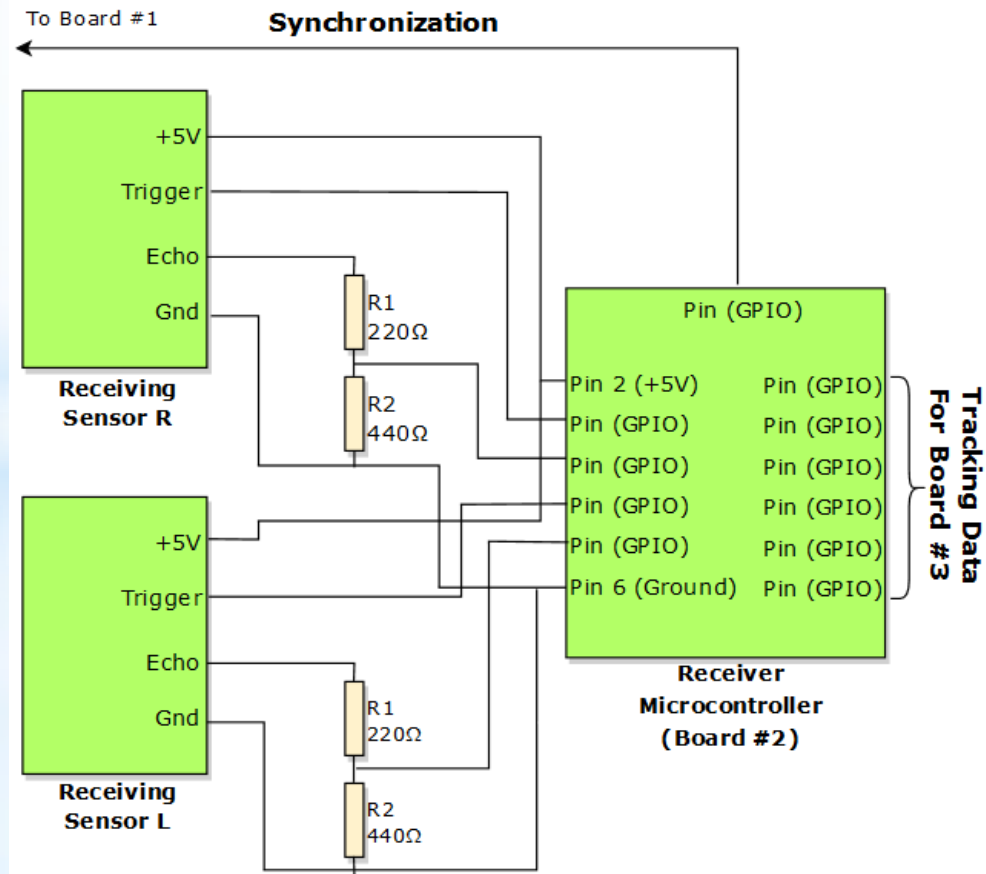
TRACKING SYSTEM

- Remote (Transmitter)

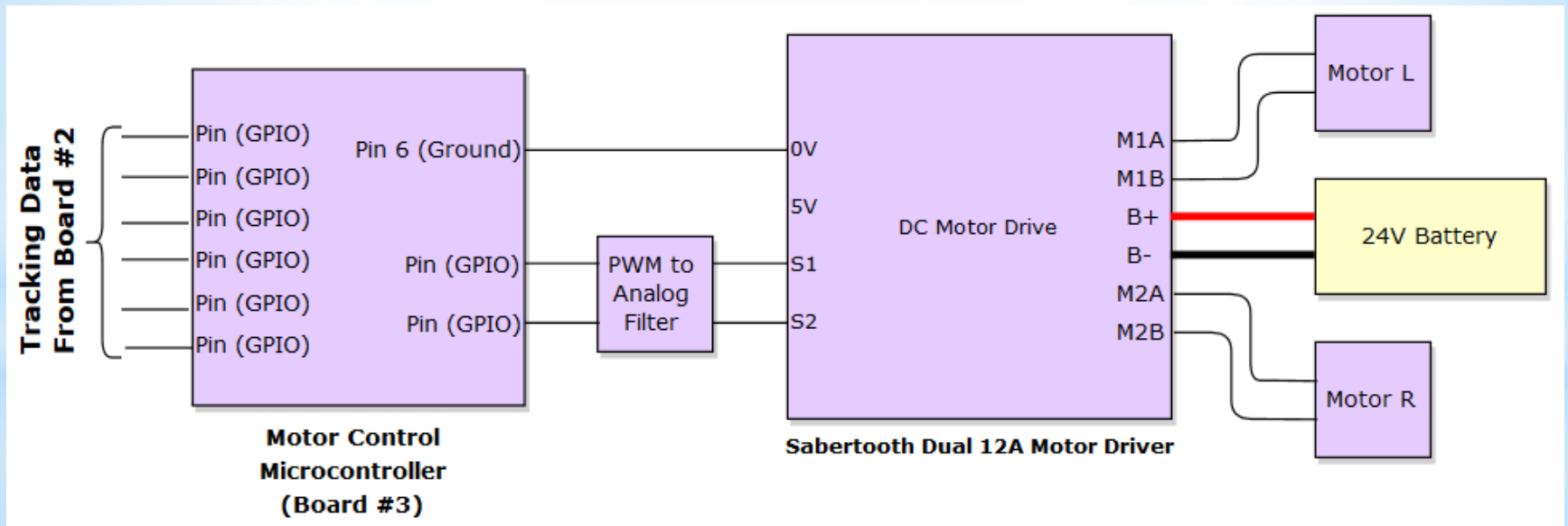


TRACKING SYSTEM

- Receivers (Onboard)



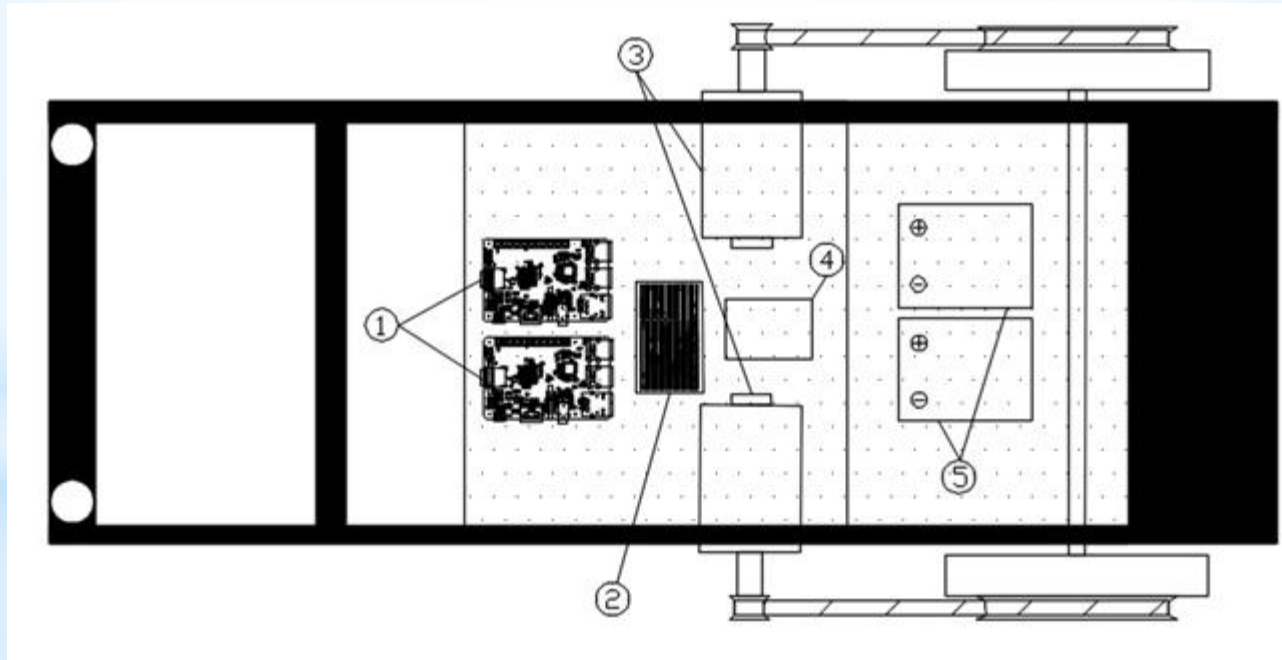
MOTOR CONTROL



COLLISION DETECTION

- Positioned in front of the cart
- Minimum distance of 0.45 meters
- Improves operation safety

MECHANICAL SYSTEM



COMPONENTS

- 12V 5Ah Lead-Acid Batteries



COMPONENTS

- 150W 24V DC Motors



COMPONENTS

- Cart Frame is based off the Steel-Tough™ 400 3 in 1 Engineered Nylon Hand Truck

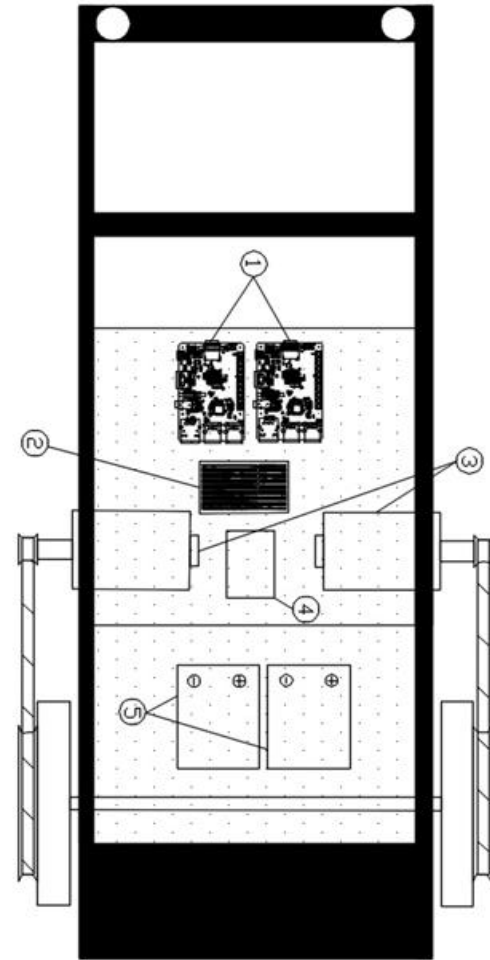
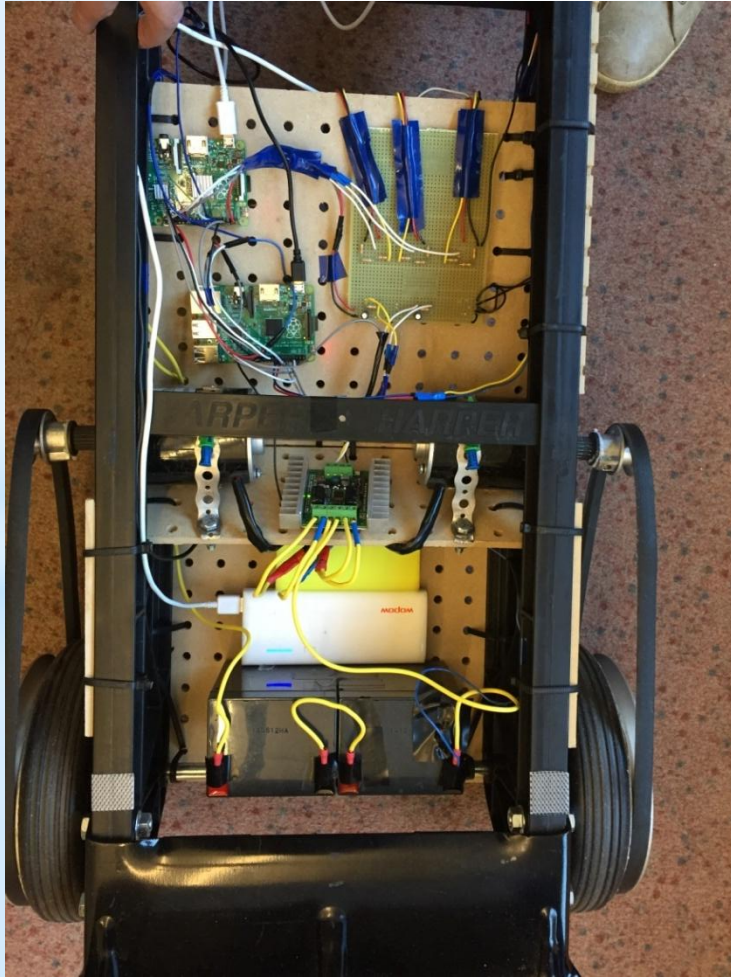


TRANSMISSION SYSTEM

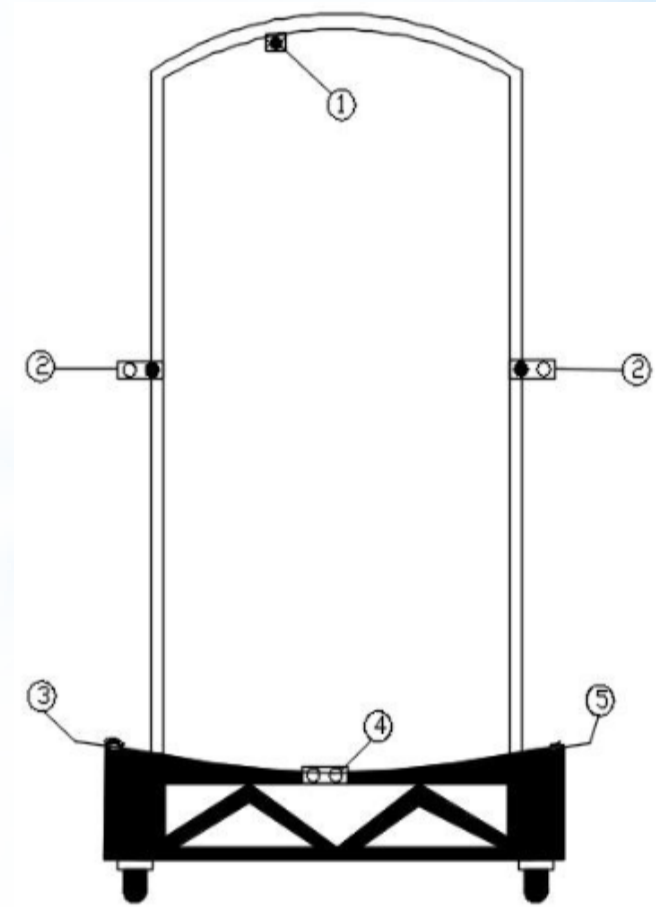
- V-Belt Pulley System



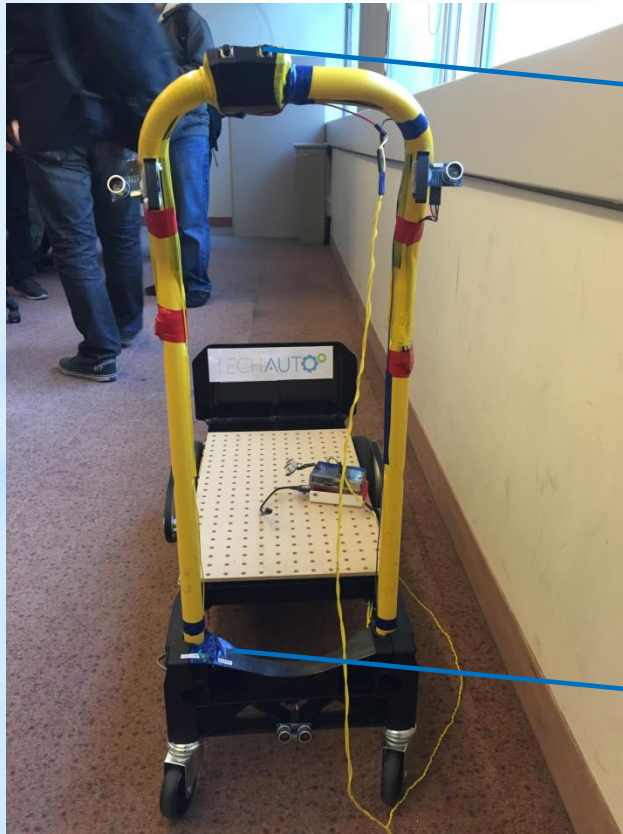
MOUNTING & WIRING



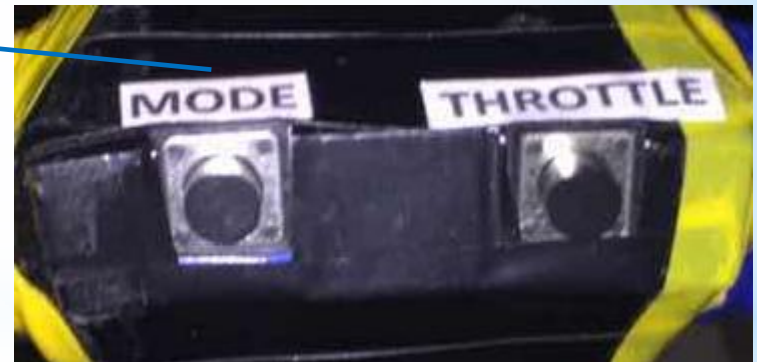
MOUNTING & WIRING



USER INTERFACE



Buttons



LEDs



FINANCE & SCHEDULE

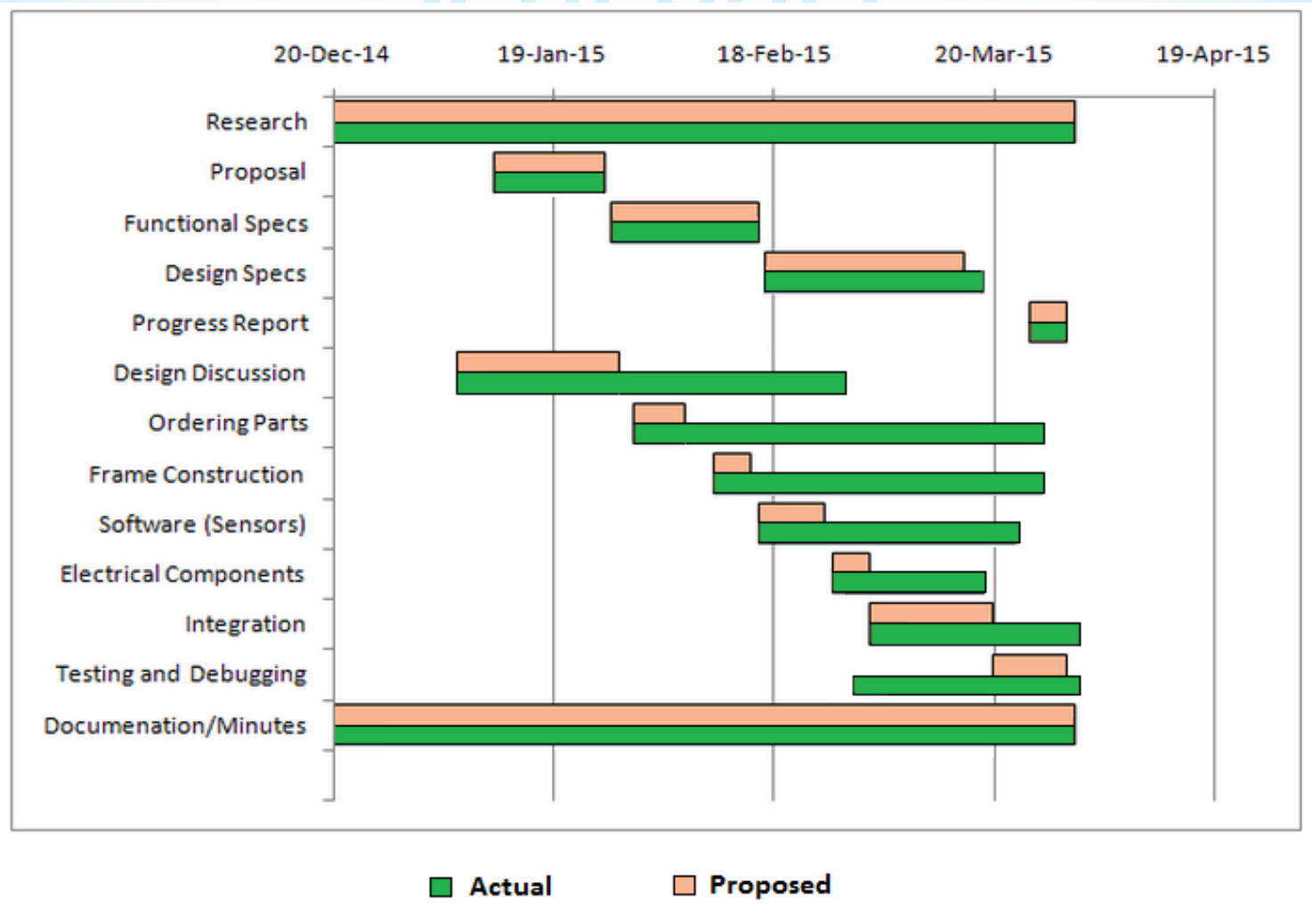
FINANCING

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

BUSINESS CASE

- Selling price: \$1899
- Profit: $\$1899 - \$980 = \$919$
- Expected time for reproducing the prototype: 16 hrs
- Main market: Construction or Factory workers, Elderly, Injured or Disabled, Schools and Labs

SCHEDULE



CONCLUSION

CONCLUSION

- The project was completed within three months
- All team members worked well together
- Successfully designed an automated cargo carrying cart that has the function to follow its user

LEARNING EXPERIENCE

- Raspberry Pi technology & Python
- Mechanical Design
- Proper Documentation Writing
- Teamwork
- Time Management

FUTURE PLANS

- Wireless synchronization
- Better sensors
- Better microcontrollers
- Better mechanical design
- Second Model (Cart-Follow-X2)

ACKNOWLEDGEMENTS

- Dr. Andrew Rawicz
- Steve Whitmore
- Jamal, Mona and the rest of the ENSC 440W/305W TAs
- Scott Mackenzie
- ESSEF Sponsors

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QUESTIONS

