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• DEVELOPING STORY • DEVELOPING ST

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**BABY STROLLER ROLLS
ONTO TRAIN TRACKS**

DEVELOPING
STORY







Baby Guerrero
Technologies

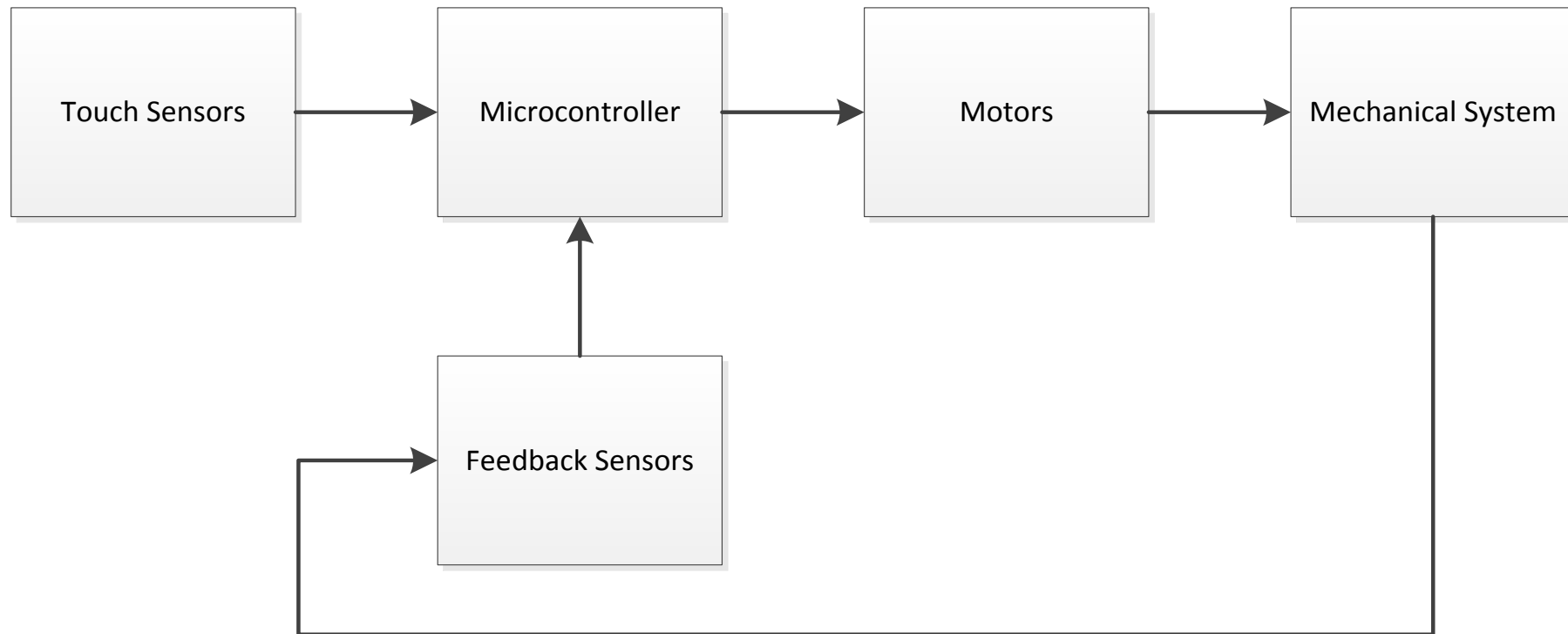
Responsibilities of Team Baby Guerrero

Software (Team Arduino Argonaut)	Mechanical (Team Big Rig)	Electronics (Team MegaOhm)
Modeled the Solidworks design	Designed rigid foundation	Circuit Design
Programmed the Arduino	Mounted mechanical components	Tactile Sensor Design
	Built acrylic housing	

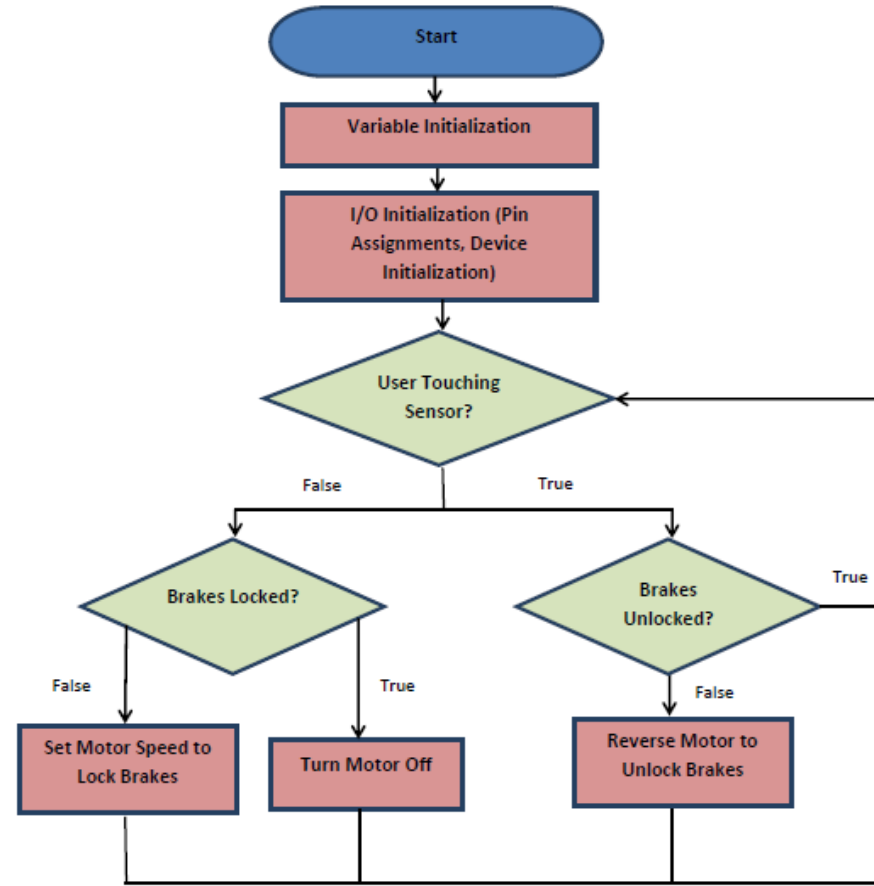
Outline

- High Level System Overview
- System Design
- Business Case
- Project Specifics
- What We Learned
- Future Plans For Project

High Level System Overview

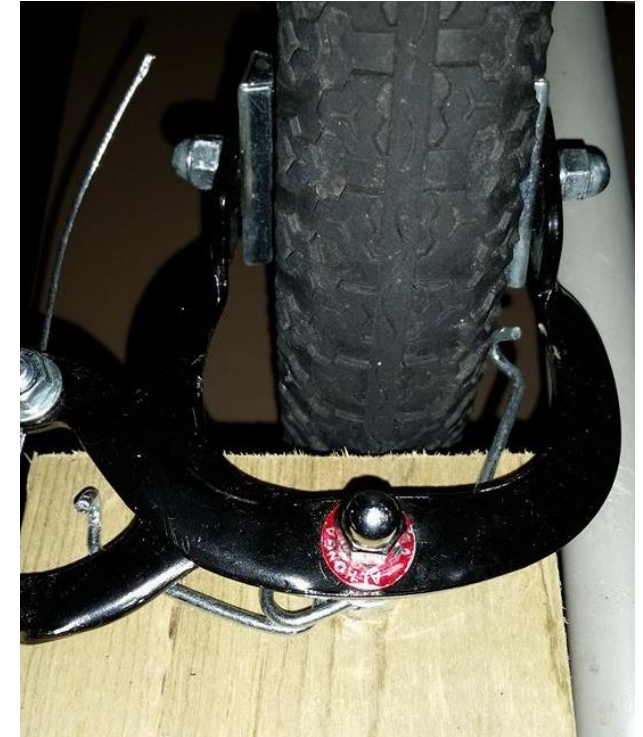
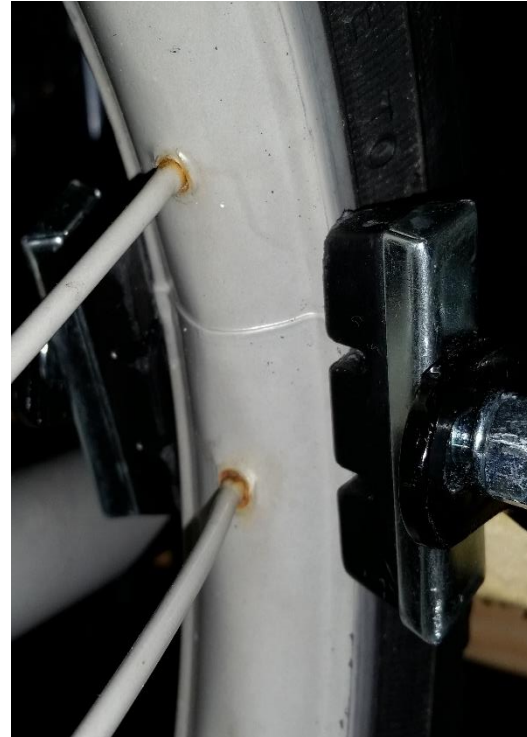


Software Algorithm



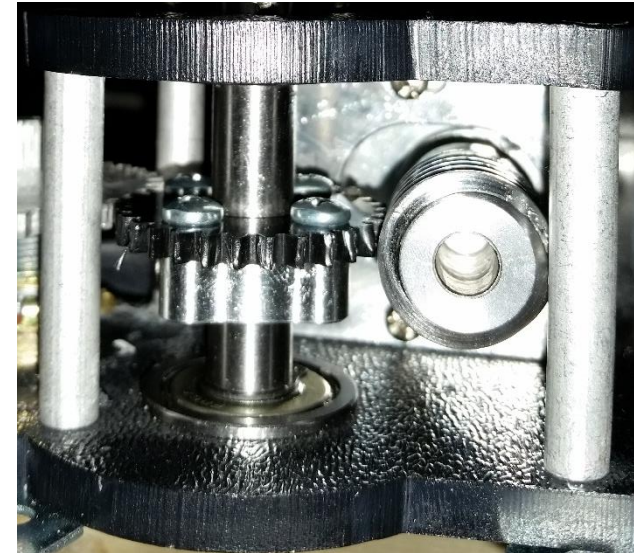
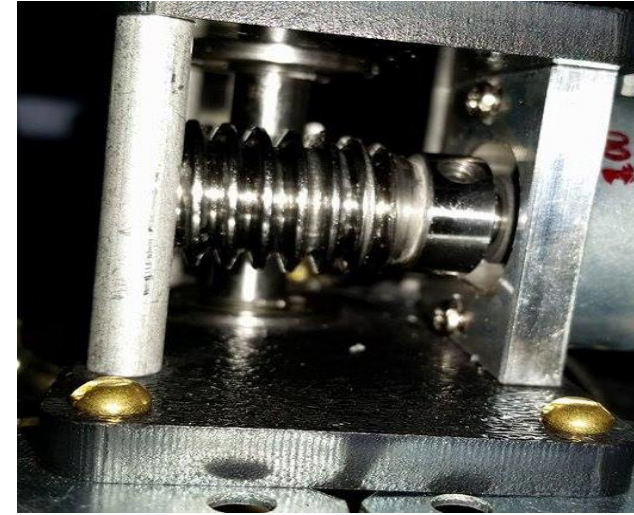
System Design

- Stroller Choice and Brake
 - Peg Perego Cullo
 - Component mounting friendly
 - Works with brakes



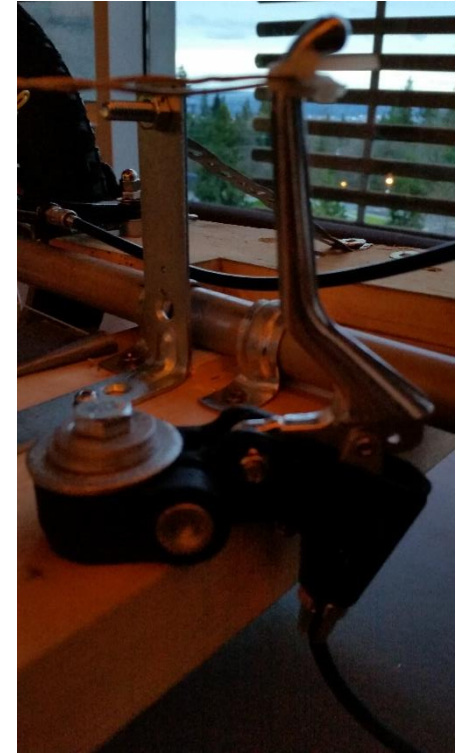
System Design Continued

- Motor and Gearbox (worm drive) Choice
 - Worm drive is non-backdrivable
 - Provides 30:1 gear ratio
 - Motor delivers high torque, is reasonably fast, and affordable
- Alternative:
 - Linear actuator: too expensive and takes time to deliver



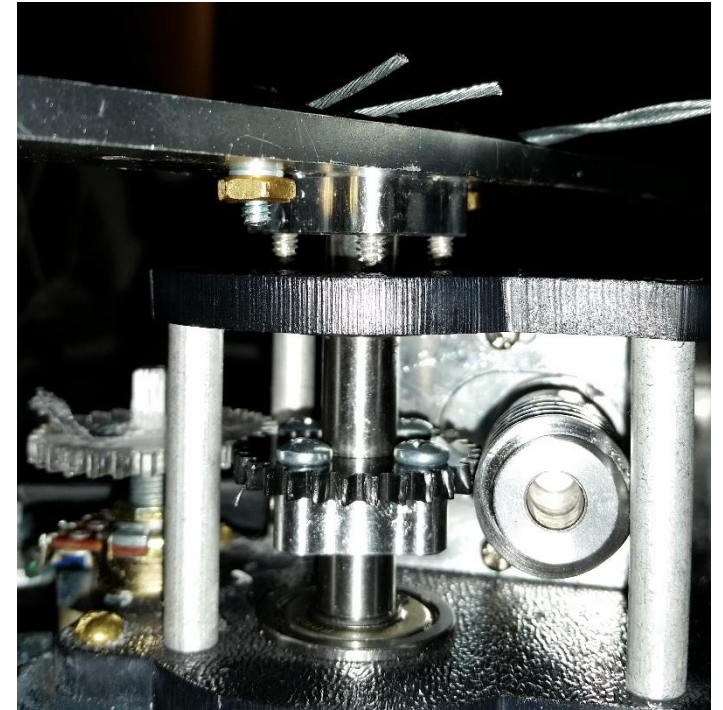
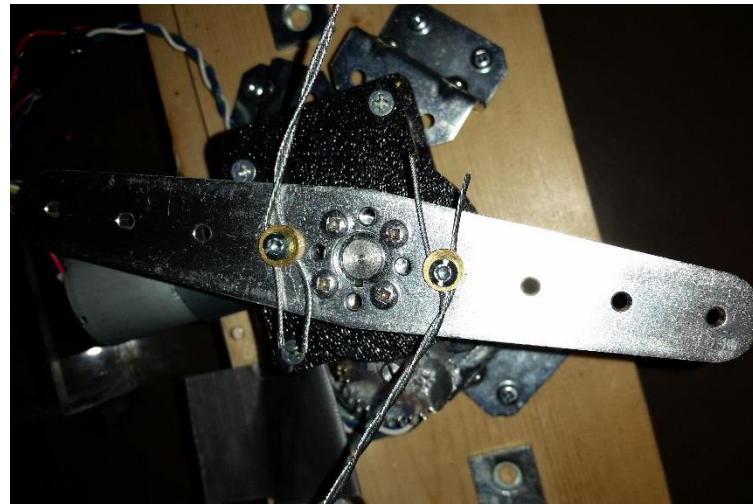
System Design Continued

- Plastic Gear
 - “High Torque Applications”
 - Metal Gear
 - Addition of Levers



System Design Continued

- Clamping Hub and Arm
 - No access or training to use machine shop
 - Difficult to find what we need locally
 - Extra pay for shipping



System Design Continued

- Touch sensing: A simple metallic spring contact switch.
 - Why we chose it?
 - Simple and reliable
 - Works with gloves
 - Not as prone to humidity damage
 - Lasts forever



System Design Continued

- Alternatives:
 - Capacitive Sensor:
 - Too slow
 - Needs a separate controller
 - Grounding issues
 - IR sensor:
 - Prone to noise and humidity damage
 - FSR:
 - Damaged by humidity and it wears out
 - Ultrasonic Sensor:
 - Bulky, complex and expensive

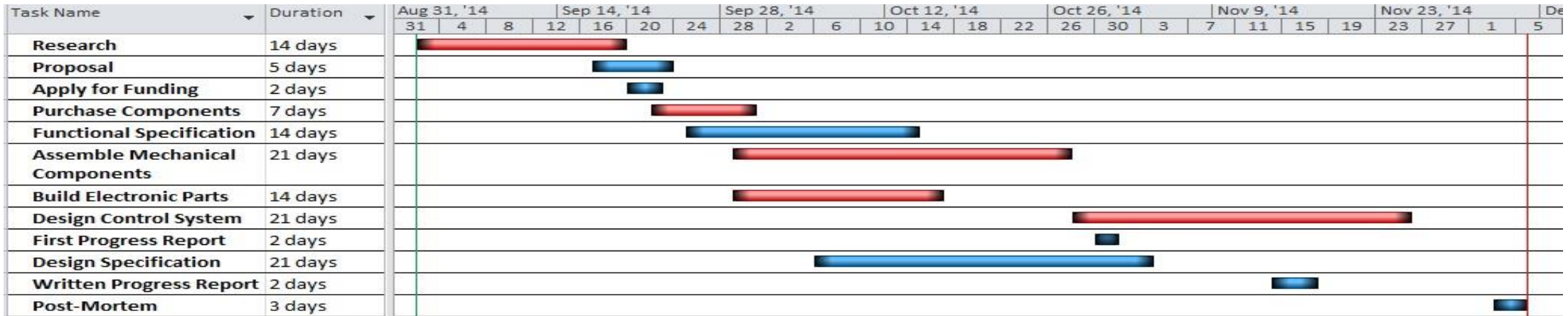
System Design Continued

- Potentiometer
 - Gives absolute angle
 - Less prone to error
 - Less complex
- Alternative:
 - Encoder: problem with sampling frequency, real time constraints, and it gives relative angle

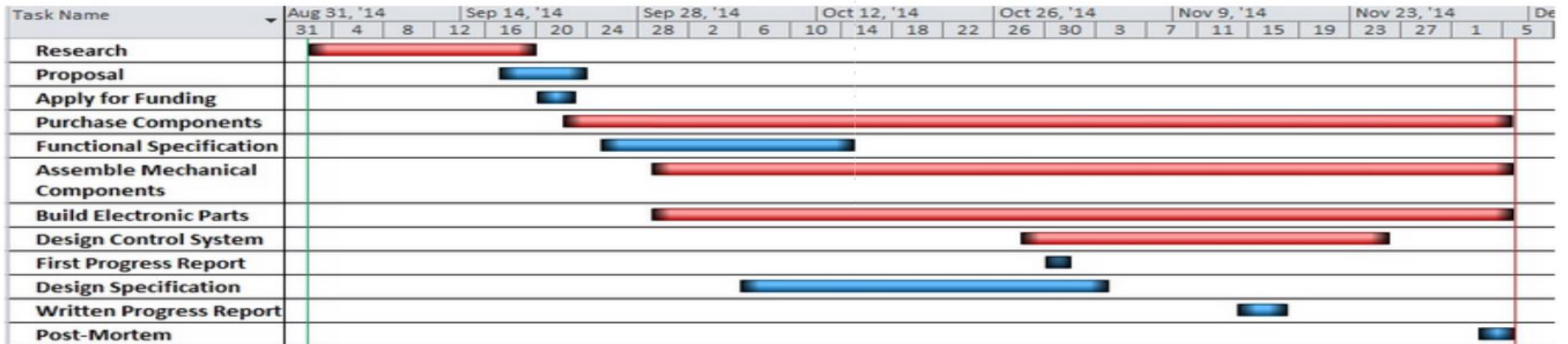


Project Specifics

Intended Schedule



Actual Schedule



Project Specifics

Budget at Time of Proposal

Mechanical Parts	qty	price
Motor	3	\$150.00
Stroller	1	\$250.00
Brake	2	\$120.00
Actuator Components	11	\$22.00
Encoder	1	\$20.00
Mechanical Total		\$562.00
Electronic Parts	qty	price
Batteries	2	\$35.00
IC components	33	\$48.00
Arduino	3	\$120.00
LCD	1	\$15.00
Battery Chargers	2	\$40.00
Perfboard	1	\$8.00
Solder	1	\$6.00
Electronic Total		\$272.00
Total		\$834.00

Final Budget

Mechanical Parts	qty	price
Motor	2	\$100.00
Stroller	1	\$60.00
Brake Components	2	\$25.00
Actuator Components	11	\$175.00
Building Materials	1	\$200.00
Mechanical Total		\$560.00
Electronic Parts	qty	price
Batteries	2	Donated
IC components	33	\$80.00
Microcontrollers	4	\$140.00
LCD	1	N/A
Battery Chargers	1	\$25.00
Electronic Components	1	\$8.00
Encoder	1	N/A
Electronic Total		\$253.00
Total		\$813.00

What we learned?

- Technical Skills
 - Mechanical Design
 - Electronics
 - Prototyping
 - Documentation
- Soft Skills
 - Group Chemistry
 - Networking

Future of our Stroller

- Future improvement
 - Add battery management
 - Improve the speed braking
 - Install mechanical override
 - Reduce Noise
 - Optimize space and weight

Business Case

- US baby care market size in 2012 = **\$47.7 billion**
(<http://www.statista.com/topics/1259/baby-care-market/>)
- Over **50,000 stroller-related injuries** in the US in 2012
(<http://www.cpsc.gov/en/Media/Documents/Research--Statistics/Injury-Statistics/Toys/Nursery-Products/Injuries-and-Deaths-Associated-with-Nursery-Products-Among-Children-Younger-than-Age-Five1/>)

Business Case: Competition

- No direct competition
- UGO concept (<http://www.gizmag.com/ugo-brings-strollers-to-safe-stop/11826/>)
- Navigator (<http://philandteds.com/us/Products/Push/navigator#.VlgXfDGjNcY>)



Business Case: Costs and Profits

Item	Price (CAD)
Bicycle brakes	\$12
Brake cables	\$10
Worm gearbox	\$70
Motor	\$45
Electronics	\$60
Battery	\$60
Brake levers	\$12
Clamping hub and arm	\$30
Total	\$299

- Cost of braking system prototype (excluding stroller) is approximately **\$300/stroller**
- Considering room for optimization and elimination of middle man, it is reasonable to say that this cost can go down to about **\$50/stroller**
- To make a reasonable profit, we would need to sell this system for **\$150/stroller**
- **Profit = \$100/stroller**

Business Case: Raising Funds

- Kickstarter, Indiegogo
- Dragon's Den, Shark Tank
- Investors
- Approach stroller manufacturer with idea

Conclusion





Questions?