RoTrio Final Presentation

RoTrike Power Assist Add-On

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Problem/Need

- There exists a large gap between manual and full powered wheel chairs.

Problem/Need Continued

- Current manual propulsion chairs create repetitive stress injuries
- People that use wheelchairs have a harder time getting cardiovascular exercise

Our Project

Disability Groups Targeted

- Any wheelchair user who would like an alternative to the two primary wheelchair markets (MS patients, elderly individuals, paraplegics, etc).

Current Solutions

User Interviews

Key Takeaways:

- ✓ Need to bridge gap between full power and manual chairs
- ✓ Need to be able to cover long distances (at least 10 miles)
- ✓ Looks are important
- ✓ Stigma attached to riding different types of wheelchairs
- ✓ “Hassle factor is the biggest factor for us.”

Design Constraints

- Easily integrated on RoTrike
- Minimal modification of components
- Easily assembled by user
- Weight
- Safety

Design Process

- Adding Power
- Weighing pros/cons of reasonable solutions
- Initial Decision
- Sourcing
- Re-evaluation, Iteration

Force and Power Analysis

IMAGE REMOVED FOR CONFIDENTIALITY

Pull Force Measurement

Push Force Measurement

Normal Force on Wheel

Product Matrix

Product	Website	Separate Kit Option	Notes	16" Wheel option	Cost	Build Quality	Front Wheel Option	Cruise
Wilderness Energy	http://www.wildernessenergy.com/ProductDetails.	no		No	?		Yes	
EzeeBike	http://www.ezeebike.com/index.htm	no	Seems to be popular with many online retailers, various retailers give different options	No	$800 + batteries	Told it is poor quality by velo ebikes, stores online seem to like it though	yes	
EcoBikes	http://www.ecobike-usa.com/index.asp	no	national wholesale dealers are in the area, and are interested in project	No	?	Good	yes	
Bionx	http://www.bionx.ca/en/	yes		Maybe		Good reputation	Yes, but waste of money	
Golden Motor	http://goldenmotor.com/	yes		Yes	$600	poor	yes	Yes
elebike YF02A	http://www.elebike.com.tw/rim.htm	yes	datasheet for quick release wheel : http://www.elebike.com.tw/pdf/Super_series.pdf	Yes		?	yes	
Ultramotor		No	We are calling to check on customization. Mike's Bikes should have the A2B	Probably	?	Looks nice	Maybe	
Amped Bikes	http://www.ampedbikes.com/complete.html	Yes	Geared motor has no resistance in freewheel, is 9lbs, and $500, direct drive has resistance, is 14lbs, $346 Direct drive more durable	no	$545	looks decent	yes	no?
Roadrunner system	http://www.electricrider.com/crystalyte/x-k3625r-16.htm	yes	Far more power than needed, of questionable quality, don't bother.	yes	$630	looks decent	yes	yes
E-bikeKits	http://www.e-bikekit.com/index.php	yes		no	$1000 for lithium, $600 for lead acid	Looks nice	yes	

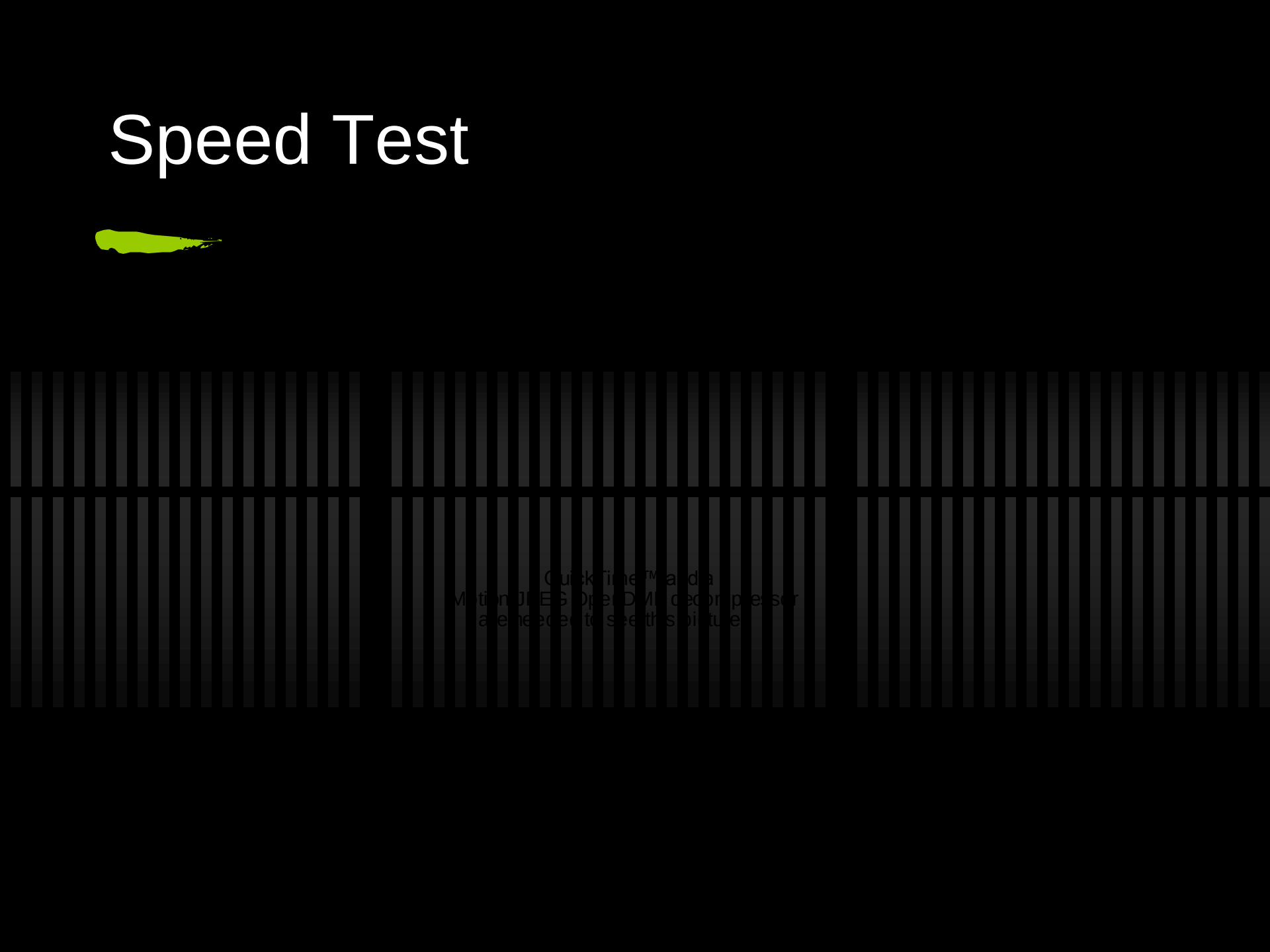
Prototyping

- ✓ Acquired an electric bike conversion kit with an in-hub motor as a first prototype.
- ✓ Performed various tests to understand the limitations of the vehicle.

Our Solution

- Front hub motor controlled via throttle, with cruise control option
- Need new connectors and wing nuts for front wheel
- Estimated Cost : between $500-$1200 depending on battery
- Easily installed by user

Speed Test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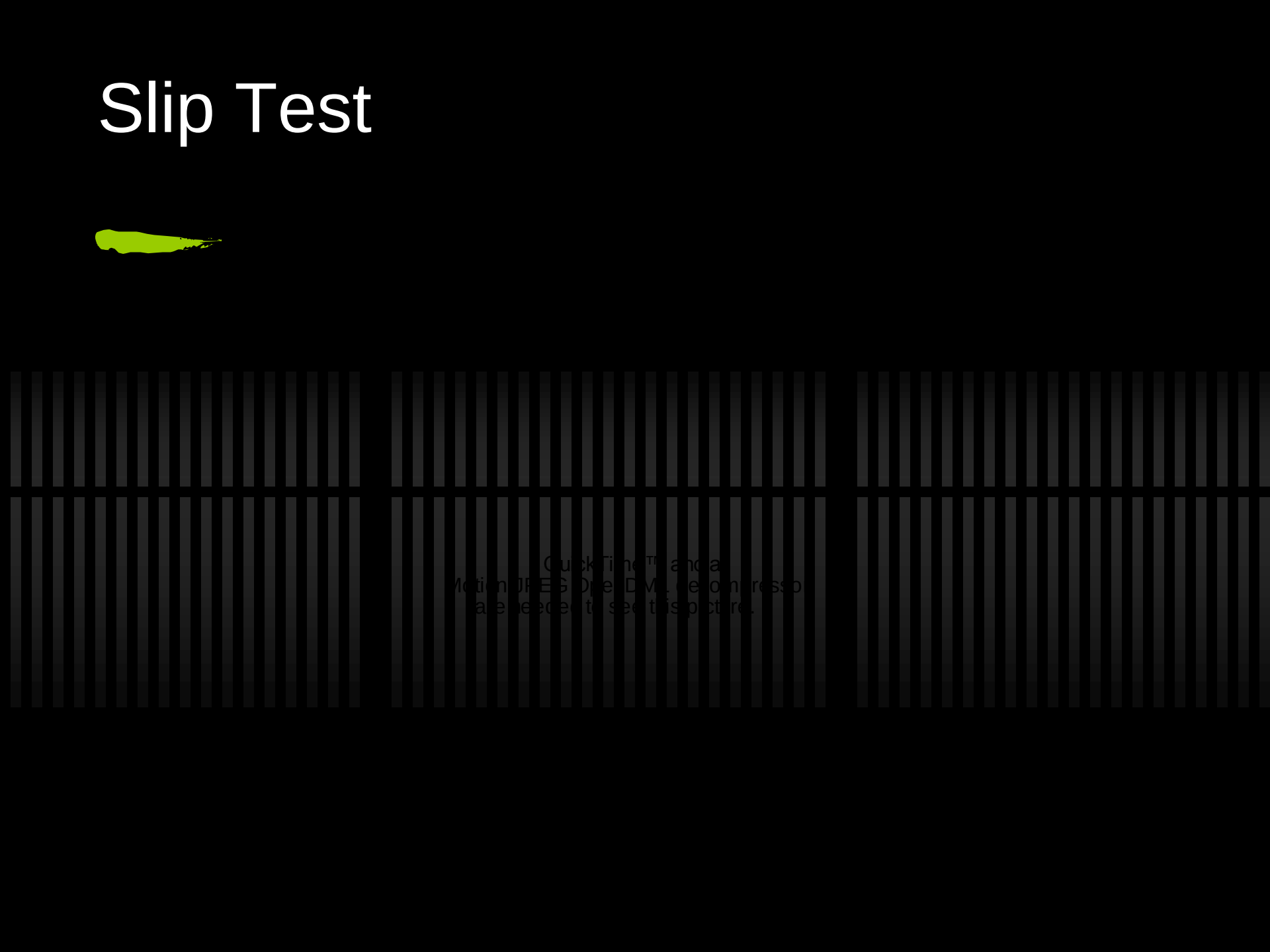
Motion JPEG OpenDML decompressor
are needed to see this picture.

Slip Test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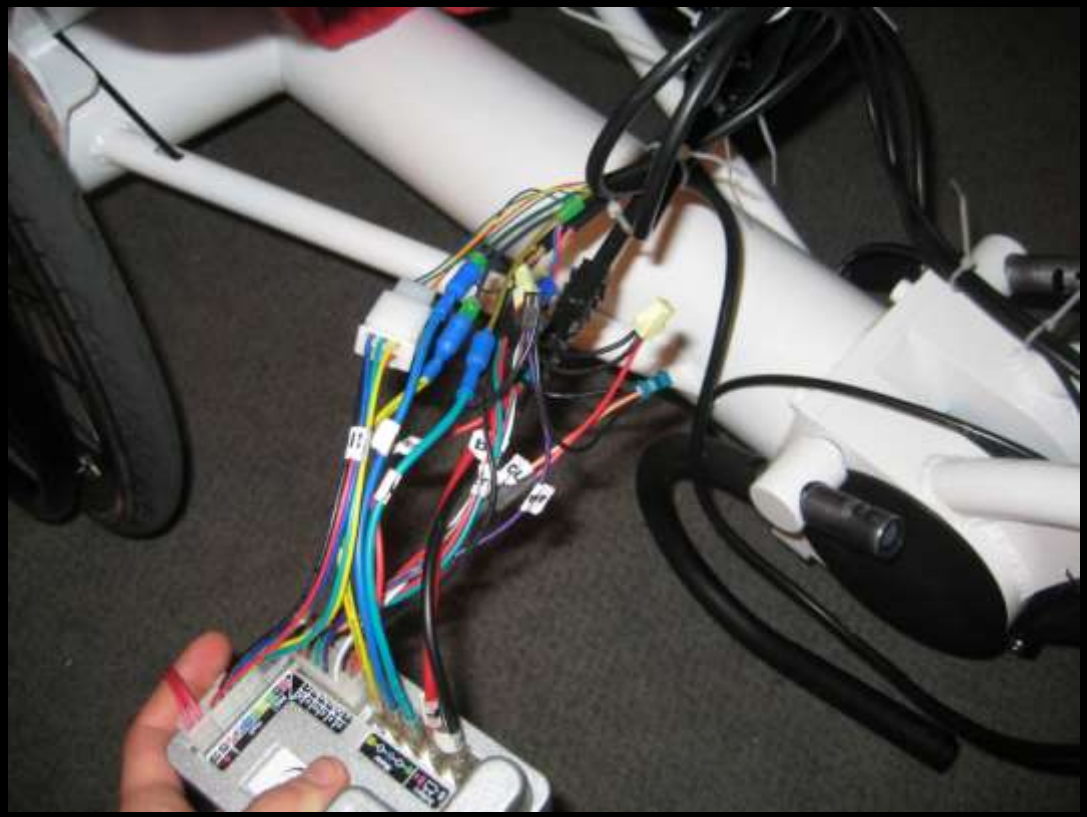
Packaging



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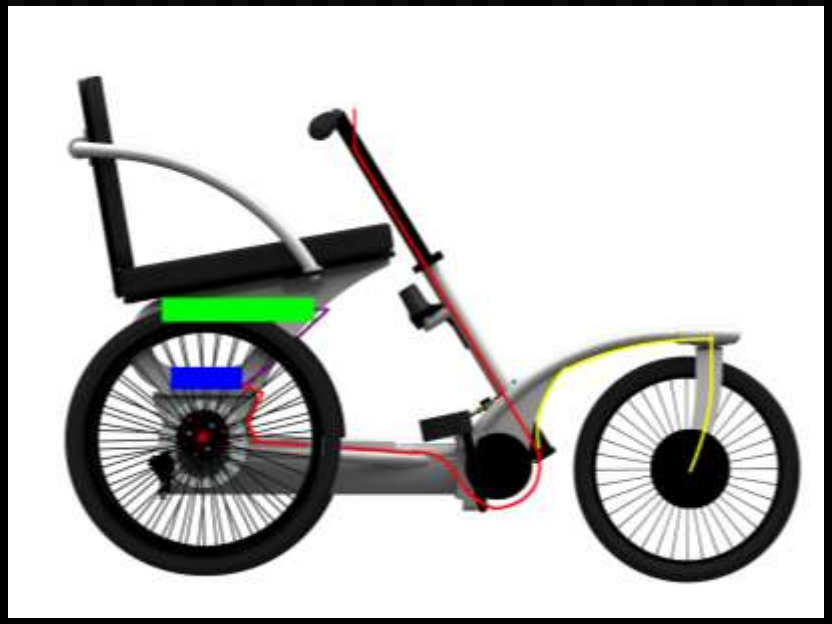

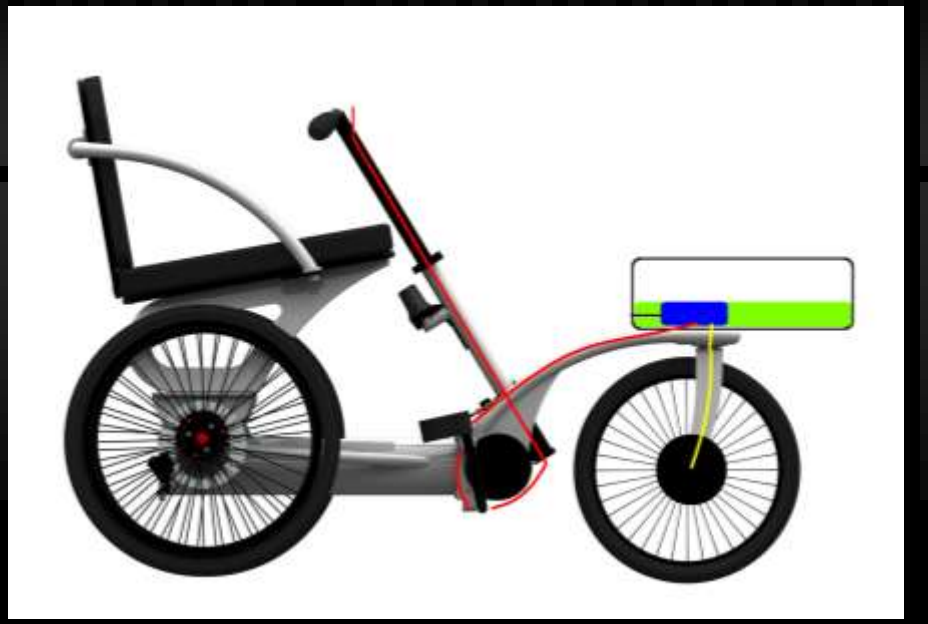

Handing the project off…

- ✓ User perspective on problem articulated
- ✓ Created detailed product matrix
- ✓ Quantitative analysis of force and power required
- ✓ Proof of concept prototype