Multidisciplinary Senior Design
Project Readiness Package

Project Title:	Modified Ride-On Car for Toddlers
Project Number: (assigned by MSD)	P18025
Primary Customer: (provide name, phone number, and email)	Leah Talbot, PT, PCS (Leah.Talbot@waynearc.org) Roosevelt Children's Center 848 Peirson Ave. Newark, NY 14513 (585) 451-6176
Sponsor(s): (provide name, phone number, email, and amount of support)	MSD/Roosevelt Children's Center
Preferred Start Term:	Spring 2018 or Fall 2018
Faculty Champion: (provide name and email)	
Other Support:	Potential to collaborate with other local providers – Leah will provide contact info as appropriate
Project Guide: (assigned by MSD)	

Prepared By Date

Received By Date

Project Information

Overview:

The customer for this project is a physical therapist who works with children with a variety of different disabilities. She has need for a mobility device that will allow children with limited mobility to open up their cognitive, social, and motor development. The ability to move independently helps a child interact with their peers, explore the world around them, and begin to learn the motor skills they'll need to get around as an older child. The particular child she has in mind for this project is not rolling over at 12 months, and is not likely to begin crawling in the future. She expects the child to be transitioned to a powered wheelchair in the future, and this mobility device would allow the child to begin getting used to having control over where he is going. The customer may be able to identify other local PT's who are interested in this type of accommodation, so while the immediate need is for a custom device for one child, she expects that this device will be able to be used with other children. The typical age range for use of a device like this is 18-36 months.

The customer has been inspired by the University of Delaware's Go Baby Go! program (https://sites.udel.edu/gobabygo/) to create a customized ride-on car for her client to use. Go Baby Go! (GBG) began in 2007 as a collaboration between two University of Delaware faculty members: a mechanical engineer and a physical therapist. Their work has led to the establishment of about 40 Go Baby Go! programs nationwide, with a mission of helping people to explore their world via independent mobility. One of the ways in which they do this is providing modified ride-on cars for kids. GBG provides a wide variety of information and lessons learned for people interested in modifying their own cars who are not necessarily affiliated with a GBG program: https://sites.udel.edu/gobabygo/files/2017/07/GoBabyGo_Manual-1m8z16m.pdf
Since each car must be customized to the user, this manual is only a starting point for anyone creating a GBG-inspired car. (Image from http://sites.udel.edu/gobabygo/)

The goal for this team will be to modify a children's ride-on vehicle to provide the physical support required for the client, as well as to modify the controls interface to make it accessible to the child. Typical Go Baby Go! cars have added postural support and cushioning. Depending on the child's gross- and fine-motor abilities, the forward/backward controls for the car may need to be modified. The first child who will use the car expresses symptoms of Cerebral Palsy, which can include wrist and thumb contractures that make typical pushbutton and steering controls difficult to use. The car should also have remote control capability for a caregiver. This serves two purposes. First, it is a safety feature so that a parent or caregiver can override potentially dangerous motion; second, it allows a parent or caregiver to provide complementary control for the child. For example, if the child is able to control forward/backward but not steer, the caregiver may control steering while the child learns.

* **Preliminary Customer Requirements (CR):**

Category	Requirement	Importance	Comment
1. Safe	1.1 Safe for child	9	
	1.2 Safe for adult	9	
	1.3 Allows adult to override child command when needed	3	
	1.4 Remote control doesn't interfere with other devices	9	
2. Adjustable	2.1 Adjustable amount of control for child (e.g., forward/backward, steering)	3	
	2.2 Adjustable amount of support for child	3	
	2.3 Adjustable top speed	1	
	2.4 Easy to store	3	
3. Easy to use	3.1 Easy for child to move forward/backward	9	
	3.2 Easy for child to steer, when enabled	3	
	3.3 Easy for adult to move forward/backward	9	
	3.4 Easy for adult to steer	9	
	3.5 Easy to secure child into car	9	
	3.6 Easy to remove child from car	9	
4. Reliable	4.1 Can withstand minor bumps	3	
	4.2 Will survive repeated routine use	3	
	4.3 Can be used for a long time on a single charge	1	
	4.4 Can be recharged many times	3	
5. Cost effective	5.1 Lost cost to make	3	
	5.2 Low cost to maintain	3	
	5.3 Low cost to repair	3	

* **Preliminary Engineering Requirements (ER)**: not a comprehensive list

ER	CR's	Metric	Target	Minimallly acceptable	Comment
1		Safety standards	Conform to ASTM, ISO		As appropriate for pediatric model
2		<$500	<$1000		

3		Remote controls available	Forward/backward, steering, speed limit, e-stop	e-stop	
4		Time child will stay in car	>20 min	>5 min	
5		Speed pre-sets	1 mph, 2 mph, 3 mph	COTS presets	COTS Power Wheels include 1 & 2 mph models, and 2.5 & 5 mph models
6		Usage time on one battery charge	60 minutes	20 minutes	
7		Total added weight with modifications	10 lb	2 lb	
8		Remote control range	30 ft	10 ft	What happens when remote is out of range?
9		Remote control field	360º		

* **Constraints:**
Team will use a Go Baby Go! inspired design, rather than designing and building a clean-sheet mobility device.
Cost: $1000 for prototyping + final device
Safety: Team will be guided by ASTM and ISO standards for ride on toys and powered mobility devices (adapted as appropriate with guidance from customer)

* **Project Deliverables:**
Minimum requirements:
- All design documents (e.g., concepts, analysis, detailed drawings/schematics, BOM, test results)
- working prototype
- technical paper, submitted to either 2017 RESNA or SB^3C conference
- poster
- All teams finishing during the spring term are expected to participate in ImagineRIT

† **Budget Information:**

Power Wheels or similar car ($300)
Remote controller ($50)
Mechanical elements for remote steering control ($50)

Postural supports ($50)
Custom child controls: forward/backward and steering ($50)

* Intellectual Property:

There are no IP restrictions imposed on the team.

Project Resources

† **Required Resources (besides student staffing):**
Describe the resources necessary for successful project completion. When the resource is secured, the responsible person should initial and date to acknowledge that they have agreed to provide this support. We assume that all teams with ME/ISE students will have access to the ME Machine Shop and all teams with EE students will have access to the EE Senior Design Lab, so it is not necessary to list these. Limit this list to specialized expertise, space, equipment, and materials.

Faculty list individuals and their area of expertise (people who can provide specialized knowledge unique to your project, e.g., faculty you will need to consult for more than a basic technical question during office hours)	**Initial/ date**
Environment (e.g., a specific lab with specialized equipment/facilities, space for very large or oily/greasy projects, space for projects that generate airborne debris or hazardous gases, specific electrical requirements such as 3-phase power)	**Initial/ date**
Equipment (specific computing, test, measurement, or construction equipment that the team will need to borrow, e.g., CMM, SEM,)	**Initial/ date**
Materials (materials that will be consumed during the course of the project, e.g., test samples from customer, specialized raw material for construction, chemicals that must be purchased and stored)	**Initial/ date**
Other	**Initial/ date**

† **Anticipated Staffing By Discipline:**

Dept.	**# Req.**	**Expected Activities**
BME	1	Provide appropriate postural support and custom interface for child.
CE		
EE	2	Modify on-board controls, create remote control capability, manage power
ISE	1	Ensure safety of child and parent
ME	1-2	Work with BME to provide appropriate postural support and custom interface for child, design remote steering control mechanism.
Other		