UNIVERSITY

GoBabyGo-D

Background Report

Hussen Alajmy
Saleh Almasari
Shahah Eshkanani
Yousef Alenezi
Yousef Alraqem

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Project Sponsor: Dr. Sarah Oman
Faculty Advisor: Dr. Sarah Oman
Sponsor Mentor: Dr. Sarah Oman
Instructor: Dr. Sarah Oman

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TABLE OF CONTENTS

[Use your word processor to delete the following Table of Contents and insert a new TOC. Include front matter (except for the cover page), body of the report, and all appendices. The Table should include four levels of headings, e.g., down to 2.2.1.3, as illustrated below.]

1 BACKGROUND

1.1 Introduction

Go Baby Go is a project that aims at helping children that are disabled and cannot move like normal children. This is by making them toy cars that they can ride on by themselves without the assistance of any person. This is not a commercial exploit and the cars that are made through this program are given out to needy children. Our team is just one of the many teams across the world that is doing this kind of work.

We intend to make a unique design of a baby toy car. The team will come up with its own prototype, find the funds that are to be used to make the design and then go ahead and do the work. We hope that after the completion of the project, we have helped one more baby to be able to ride on itself. This project is also a chance for us to give back to the society what it truly deserves and by giving them an avenue to give through this project.

This project began with research on the development of young children and how it affects their lives in the future. This was done by the pioneer of the project named Professor Cole Galloway from Delaware University. According to him, if a child has a vibrant childhood, they tend to have a more normal adulthood. He said that children ought to play and have all the fun in the world and even if they are disabled and if they do, they will be no different from any other children when they grow up.

Some of the benefits that the child will get is having a better intellectual capacity. When children are playing and moving about and discovering things, it builds their intellectual capabilities. The second benefit is that it leads them to being able to relate well with other people. When children are playing, they are able to make friends something that they will be able to do in the future if they are able to have fun with the cars in their young age. Finally, it will be a form of rehabilitation to the child. It will help to strengthen their weak bones and even perhaps it may allow them to walk again. One of the main goals is to make them feel that they are able to achieve what any ordinary child could, as well as equipping them with the ability to interact with other kids.

This project is an engineering challenge that we are taking upon ourselves. It happens to be a good challenge in that it will not only build our engineering brainstorming skills, but it will be a useful contribution to society.

1.2 Project Description

Children with limited mobility often do not receive the much needed exposure to socialization to appropriately cognitively develop. Existing research shows that equipping young children with self-control of their own environment can have meaningful impacts on the long term outcomes given such impairments as cerebral palsy or muscular dystrophy. The Go Baby Go (GBG) project that started at the University of Delaware has developed a set of DIY cars for families with children with mobility restrictions. These cars have been designed on commercially available ride on toy car platforms (like Power Wheels) and have been deployed worldwide by the GBG team. These cars have shown to be a cost-effective means of enabling young children to move and interact with their peers.

The goal of this project will be to design and build a new version of the GBG retrofits – specifically to design a universal control for children with extremely limited mobility of their arms and/or legs.

1.3 Original System

This project involved the design of a completely new "Pressure Pad Go Baby Go". There was no original system when this project began.

1.3.1 Original System Structure

The original system is something unique that is something completely different from all ideas designed for GBG. It's going to be a toy car with a lot of modifications. The GBG team would like to establish a toy ride that satisfies the needs of the disabled child with the newest technologies such as a hand pressure system that makes the child wander around by themselves without the help of a parent and a new technology that would use renewable energy sources as a part of the car to make it environmentally friendly. This is just one of the modifications that the team will develop throughout the project. The objective of this project is to build a cheap-cost car with the latest technologies to help serve the child better.

2 REQUIREMENTS

The GBG team met with the client Dr. Oman to get briefed on the current customer requirements based on the project description that was provided to the team. These customer requirements must be met by the final product.

2.1 Customer Requirements (CRs)

The GBG team has five main customer requirements (CR) which will be weighted using a scale of 1 to 5 (5 = top), depending on the importance of each CR.

In the table provided below (Table 1), there is a list of customer requirements – each requirement has a brief description to clarify customer requirements clearly.

Table 1 Customer Requirements

Customer requirements	**Description**
Power system	**The system should include an acceleration controller, cruise controller, and safety breaks**
Physical	**The system should have comfortable seats, trunk mobility, and legs supporting**
Operating system	**The system must be easy to operate, so the child can use it easily**
Financial	**The system must be low cost**
Safety	**The system should ensure the safety of the child, by having seatbelt harness and bars.**

2.2 House of Quality (HoQ)

The current house of quality is a diagram which helps in determining how the customer needs are being valued and weighted with regards to the product.

Table 2 HOQ

Customer Requirement	Weight	Engineering Requirement	
1. Power system			
a. Control acceleration	5		
b. cruise controller	3		
c. Breaks	5		
2. Physical			
a. comfortable seats	5		
b. trunk mobility	4		
c. legs support	3		
3. Operating system			
a. easy to operate	5		
3. Financial	5		
4. Safety			
a. seatbelt harness	5		
b. bars	3		

3 EXISTING DESIGNS

There are many existing designs for GBG created out of similar ideas of a wheel chair, toys and mobility games. Three different ideas caught the group's attention: the scoot, the current GBG retrofit (electric car) and the scooter. These products have some disadvantages that need to be fixed or improved. The team will start to think briefly in order to create a new idea for mobility that could meet the clients need. The existing design element of this project is important for the team and will be helpful for the future of this project.

3.1 Design Research

On October 2015, the GBG organization was created. This organization is taking care of children with special needs to make them feel like normal children by building mobility equipment. Kids with special needs are part of the community so the GBG program will allow them achieve their dream and play as and have fun. The organization has faced some difficulties with designing GBG devices because every single child has a particular need and it is hard to meet all these intricate needs simultaneously. As a consequence, the group has faced some difficulties too. Our research, briefly, has shown that most of the existing designs available on the market are similar and are expensive. Most of the research was done online and most of the team members have developed their own ideas based on some of the lessons they learnt during the ME286 class at Northern Arizona University.

3.2 System Level

The GBG project requires a main system of mobility to transport a child from point A to point B. The current systems mainly depend on using a retrofit with tires to transport the child. The main system level will be dependent on the customer requirements and on how it relates to the requirements. Accordingly, there are many different systems that were used for each retrofit. For example, wheelchairs rely on human energy in order to move a patient from point A to point B. The 3 main system designs which will be discussed in the subsequent pages are the following:

1) Scoot
2) Current Go Baby Go retrofit (electric Car)
3) Scooter

3.2.1 Existing Design #1: Scoot

The scoot is a current main system that is used for both normal and disabled children to transport them from a point to another. This system could be used in three different ways – the first method is that it can be used by crawling. Crawling will help the child in exploring and strengthening the upper body muscles such as the abdominal area [2]. The second way to use this system is by scooting. Scooting allows the child to move while sitting up straight and using their legs. This will help the child move more freely to explore outer surroundings. The final way to use this device is by riding it. The device allows the parent to add a tire on each side which will make the device act like a wheelchair. This system will depend completely on human energy since there are no electrical components involved and the child will have to move physically by himself or herself to maneuver it.

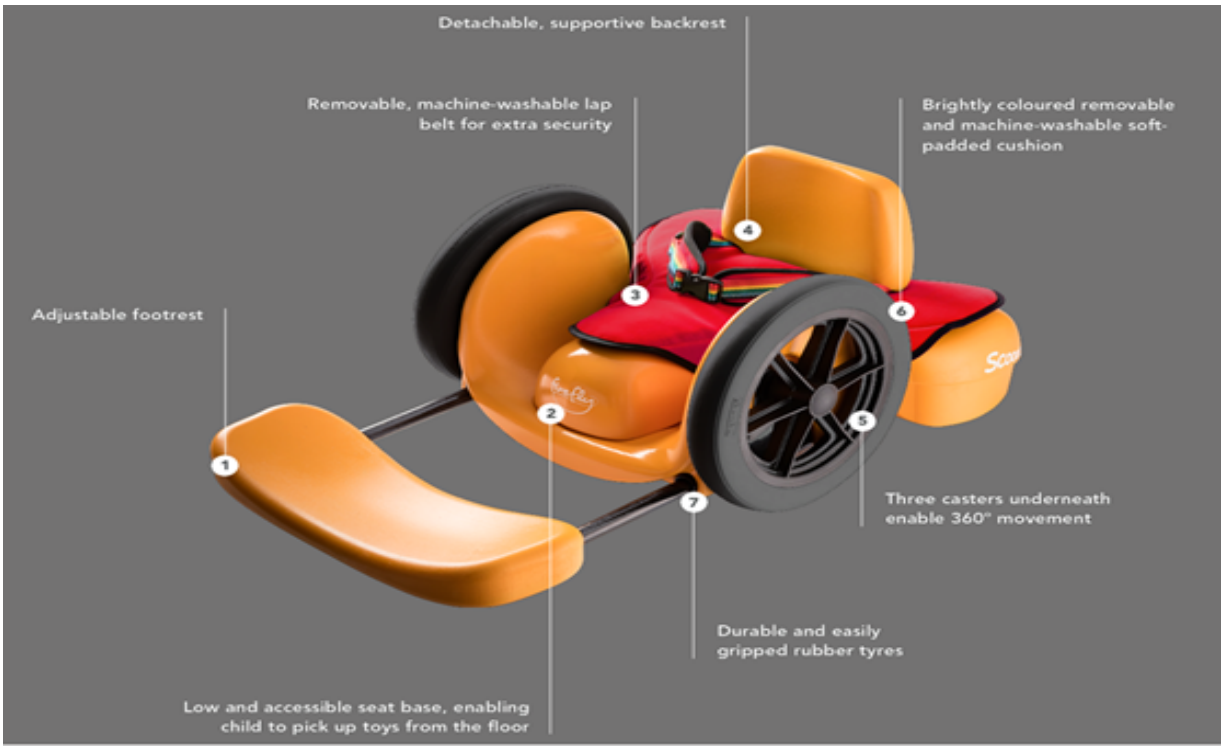


Figure 1 Scoot

3.2.2 Existing Design #2: Current Go Baby Go Retrofit (Electric Car)

The current design for the GBG project is a great system for use by disabled children to socialize and transport themselves freely and independently. Current Go Baby Go retrofits are based on electric toy cars that are modified based on each requirement [1]. The cars are cost-

effective and do not cost much compared to medical solutions that cost much more than the GBG retrofits. This current system relies on electrical power that is controlled by the child in order to accelerate and decelerate. The present solution mostly does not control acceleration – it is only adjusted to one speed. Each retrofit is designed differently depending on the disability of the child.

Figure 2 Current GoBabyGo

3.2.3 Existing Design #3: Scooter

The final existing system that is used is the toy scooter. The chosen system is a three-wheeler retrofit that depends on human energy in order to move [3]. This device is mainly used to transport the child from one point to another using the three wheels attached. Additionally, there is a stick which allows the parent to control the movement of the child with regards to the direction of the scooter. This will give the parents more control over the child in terms of their movement and will therefore not be able to meet the requirements for most disabled children.

Figure 3 Scooter

3.3 Subsystem Level

Any machine or mechanical design must contain a support system for main system mobility – for example, controlling parts and energies. For this GBG project the team will follow the sponsor's requirement with regards to the design in order to help normal and disabled children. During the research stage, there were three main categories of subsystems that the team explored: human power, electrical power and main control system.

3.3.1 Subsystem #1: Human Power

Human power represents energy that is transferred from the human body to power a machine into operating. This may involve using one's arms and legs [4].

3.3.1.1 Existing Design #1: Arms

As shown below in Figure 4, arms are the source of human power of the scoot's main subsystem. It works when a disabled child pushes and rolls the scoot's wheels in order to move

from one place to another.

Figure 4 Scoot Wheels

3.3.1.2 Existing Design #2: Legs

Legs are the most efficient power source for many transport machines, such as a scooter. In the scooter's existing design, we can see that children have the ability to move the scooter by pushing the pedals.

Figure 5 Scooter Pedals

3.3.2 Subsystem #2: Electrical Power

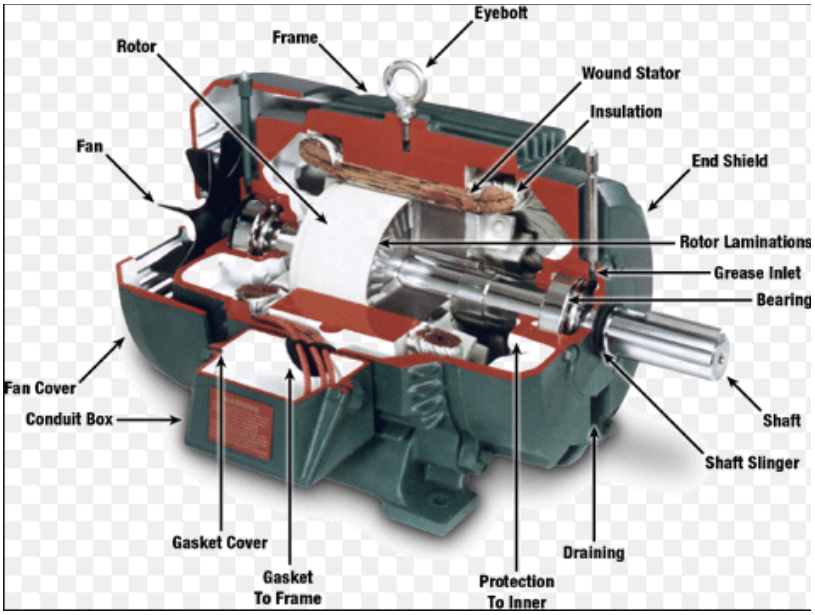
Electricity has been used in everyday human life consistently because it is a strong source for machines. There are two existing designs which showcase the usages of electrical power – this report will now outline two of those: batteries and electric motors.

3.3.2.1 Existing Design #1: Battery

Batteries are good sources of energy. They have chemical energy contained within the case which can be converted to electrical energy. Some batteries can be recharged as well.

Figure 6 Batteries

3.3.2.2 Existing Design #2: Electric Motor



Using an electric motor as a subsystem converts electricity to mechanical energy. Therefore, this piece of machinery will help with the GBG future design.

Figure 7 Electric Motor

3.3.3 Subsystem #3: Main Control System

Every device should have a spatial control system – in cars, this allows the rider to control the vehicle and display its duration. For this subsystem, a steering wheel and pressure pads have been deemed to be the most effective for the purposes of the GBG project.

3.3.3.1 Existing Design #1: Steering Wheel

Most vehicles have steering wheel to control it, and the team might use this control system for the car.

Figure 8 Steering Wheel

3.3.3.2 Existing Design #2: Pressure Pads

Self-balancing scooters have become very popular today. They operate according to a clever idea – the pressure pads are fixed around the scooter. They work by having many small systems implemented under the pads, so that human balance and nerves from the body control how the scooter operates – to move, stop, steer and rotate [5]. The team is interested in using this notion by designing a hand pressure pad instead of self-balancing pressure pads which require the use of the legs. These hand pads will help children who suffer from disabilities involving their legs so that they can control the car by using their hands instead.

Figure 9 Pressure Pads

4 REFERENCES

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