Project Statement

Portable, Compactible, Light Weight Power Wheel Chair

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**Statement of Need**

The purpose of this project is to provide Annalee Hughes a lightweight, portable power wheelchair to allow her to be mobile in social settings other than her home. Annalee is a 10 year girl with Cerebral Palsy. Cerebral palsy is a disorder that affects the body’s balance, movement and posture. It is caused by abnormal development or damage to the part of the brain responsible for control of muscle tone and motor activities. In Annalee’s case this disorder has enabled her to walk or stand unassisted. Due to the baclofen pump placed in her abdomen, Annalee, has very poor trunk strength. Her abdominal and back muscles are not strong enough to keep her in the upright position and she leans forward consistently. She needs supports within her wheelchair seat to hold her to sit safely in her chair. Since, Annalee’s right side of her body has a little better muscle control then the left she uses a joystick to move her power wheelchair in different directions.

Like most people with this condition she can respond appropriately for her age and is very active. She has various wheelchairs, but outgrows them quickly and only one provides the ability for her independently move around. This chair is not feasible because it is very heavy, bulky and not portable. She had two portable wheelchairs but has outgrown both within a year and needs someone to assist her because the chairs are not powered. Annalee’s parents would like a powered wheelchair that can support Annalee’s health needs, but also allow social gathering to be a little easier.

**Introduction and Overview**

The goal is to provide Annalee with a wheelchair that is lightweight, compactable, and powered allowing her more independence in social settings. The powered wheelchair should be light and compactable enough so that any adult individual will be able to transport it in a vehicle. The chair will have adjustments so that it can be accustom to her growth. Most chairs that are used for social settings seem to only last a year, because Annalee is 10 years old and actively growing. The power chair will have a full range of motion that is controlled by a joystick placed on the right side of her body because she has better control of her right side. There will be a manual tilt option that will allow a range of motion form 90° to 105°. This tilt option will help to prevent her from leaning forward all the time. Since gravity is always working against her she tires easily, the larger angle will make it easier for her. Adjustable supportive straps and braces will be placed within her chair so that she will be appropriately anchored to the chair. These mechanisms will allow the support and safety necessary for Annalee to get around independently in social settings. The chair will be battery powered, the battery will only allow for 1-3 hours of activity for it will only be used for short outings. The dimension of the chair will allow for easy maneuvering in standardized environments, such as being able to fit through standardized doors, average width hallways, and in public restrooms.
Realistic constraints
The economic constraint will be the allotted budget the two largest effects on our budget will be the cost of the battery and the motor. Another economic constraint will be finding the cheapest material that is light and durable allowing for portability but easy lifting. The environmental constraint that will affect the design of the chair is its ability to fit and move within common households and other public areas. This constraint will cause limited outdoor mobility. The manufacturability constraints will be that it needs to be fit for one specific individual. Adjustable strap and braces are needed to support Annalee’s condition. The chair will also need to be able to handle the stresses and strain produced by its portability and collision it may have. Additionally the design must be light and portable for easy travel. Sustainability will be a constraint as the chair must be durable and accommodate her growth over the next few years. A little weight battery will also cause a sustainability constraint on the duration of time the power chair will last. Health and safety constraints will be that it needs to provide adequate support for her physical condition. There are no ethical, political or social constraints with this project.

Other Data
She will be held at a 90°-105° in her seat.

Straps for her safety at the waist need to be 45° angle for the best anchorage/

The battery life vs the portability, the existing design for the chair is too bulky, the battery life can suffer (2-3 hrs) for more portability.

Tilt option is need but lift is not necessary.

Size and weight of the motor will be of great concern to maintain function vs. portability.

Annalee leans forward, tilts side to side, and knee are constantly pushed together because of her condition. This will need to be considered for the seat positioning.

Questions
What type of materials would be eligible for the budget?

How much should it weigh? How much weight should it be able to hold?

How long should the battery last? What size battery and motor would be appropriate for the power needed?

Portability requirements? How should the chair collapse allowing for the easiest handling?

Range of motion requirements? How many wheels will be need for this range of motion (4 or 6)? What size tires will be necessary?
Durability? How long should it be able to adjust to her growth?

What are lightest materials that should be used, making lifting easy?

Which materials are the most durable but least expensive?

Which materials should be design or purchased?

What dimensions would be best for portability?

What type of circuits will be required?

What if replaceable parts are needed?