



Automated Rain Shield for a Mechanical Wheelchair

Oscar J. Salgado-García & Christopher M. Pagán-Rodríguez

Liaison: Dr. Agustín Rullán (Dean of Engineering)

Department of Industrial Engineering

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1 Introduction

This project developed a prototype to solve the problem of transportation during various weather condition, particularly rain, while using a wheelchair. The prototype will reduce the risk of illness for handicapped students while not compromising the wheel chair's ability to complete its designed task.

2 Problem Background

There are many gadgets that have been designed and created to facilitate the disabled population, however, other factors like portability, costs and user-friendliness can also represent a barrier towards self-sufficiency and allowance. A fellow student of the University of Puerto Rico, Mayagüez Campus, has spinal muscular atrophy (SMA), a genetic disease affecting the part of the nervous system that controls voluntary muscle movement. As a result of his condition, he is not able to open an umbrella during rainy days making him unable to move between buildings across the campus. By studying the student's needs and individual preferences, a rain shield was design in pursuance of creating an affordable and portable automated system controlled by Arduino.

3 Objectives

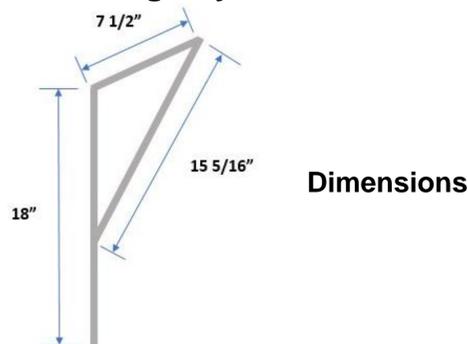
The main objective of this project is to design and build an automated rain shield mechanism. This automated mechanism will enable a person with muscle movement limitations, specifically the hands, to have shelter while moving on a wheelchair on the outdoors during rainy days.

4 Methodology

- **Client interview to identify the problem** – The client was interviewed and his ergonomic preferences were taken into consideration in the construction of the product.
- **Define the problem** – The client's wheelchair did not possess the capacity to protect the user from rain or even excessive sunrays.
- **Research** – A research of the mechanism, materials and motors for the product fabrication was completed.
- **Multiple Decision Criteria** – A selection of multiple materials that can be easily found in the market were studied for the construction of the desired product under the following criteria: weight, hardness, resistivity and cost.

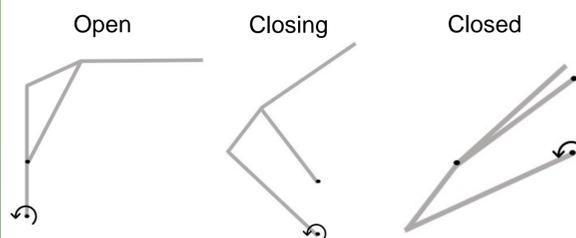
5 Results

3 Bar Linkage System

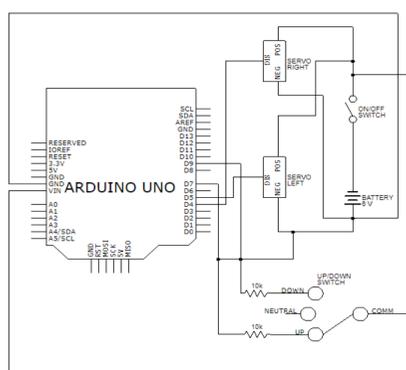


Dimensions

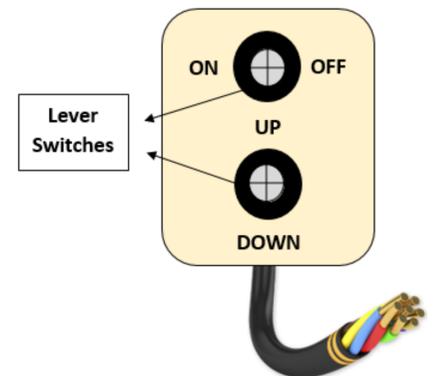
Movement



Circuit



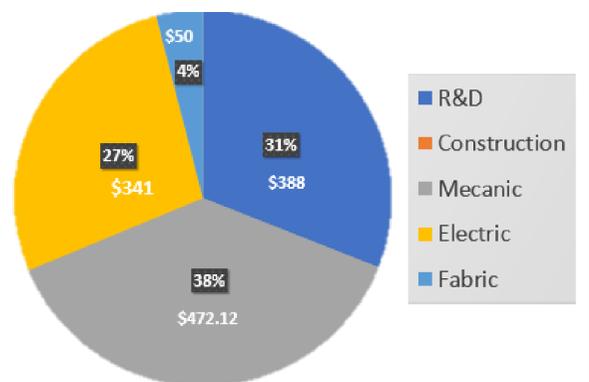
Circuit Controller



Final Design



Costs



6 Recommendations

Further applications has been considered for future development, such as:

- Speech Recognition
- Servomotor Gearbox
- Joystick Controller
- Rain Sensor

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