

Assistive Lifting Device

Designers: Wei Long Qiu, Bibbin Abraham, Louis Ceja and Yue Jun Li
Supervising Professor: Dr. Anurag Purwar
Department of Mechanical Engineering
State University of New York at Stony Brook
Stony Brook, NY 11794-2300



Figure 3. Prototype of Assistive Lifting Device

INTRODUCTION

An assistive lifting device was designed and prototyped to assist people with sitting and standing. This device can safely lift the user on a desirable path of motion and stabilize the body during operation, and function like a walker. It can help people with back problems, leg problems or other lower body impairments to simplify the process of mobility.

SUMMARY OF IMPACT

Called Assistive Lifting Device, this device serves a purpose that is to help people with disabilities to stand and sit safely. The device can reduce the strain in the back and legs when the user wants to sit or stand. After lifting the user up to the walking pose, it provides the support during the walking process like a medical walker. The device provides a powerful mobility device to the targeted users, and enhances the independence of them in daily activities.

TECHNICAL DESCRIPTION

One main challenge to the design is the enhancement of the stability. When a person is being lifted or seated by the walker, there is a tendency to flip backward due to the center of gravity of the user being away from the walker. As a solution, we added an extension leg to the design. During the operation of the device, the extension leg will create the counterforce to the weight of the user and increase the stability. Since the objective of our device is to compensate for a sofa of

28" width and to allow fitting through a standard door of 29" width, we need to design the extension leg to expand and contract at different uses. When the user is being seated or lifted, the device will be expanded to its maximum footprint. When the user uses the device as a walker, the width of the device needs to be less than 29". The solution to this problem is to create an extension leg that will translate and rotate. The rotational motion will expand the leg to the two sides and increase the overall width, and the translational motion will push the leg behind the user to create counter reaction force. The extension leg is power by a linear actuator which provides the translation motion. The extension leg can be retracted to the most compact size by going against a cam profile wheel. A fin is attached to the rotational leg, and it will go against the wheel and rotate downwards. The actuator will also be used to move a knee pad for the user to push again in the lifting process. The knee pad will stabilize the body during the operation of the device.

The device consists of 1" aluminum square tubing frame with 1/8 wall thickness. The two actuators on the sides are used to power the six bar mechanism and also will lift the user from the arm rest. The middle actuator is used to power the extension leg and also the motion of the knee pad. The battery and the actuators are all connected to a controller box. There are four 5" wheels that are mounted at the bottom of the frame to support. The device also provides an easy interface for the user to operate.

The cost of the parts and supplies for this project was about \$1500.

PARTS LIST		
ITEM	QTY	PART NUMBER
1	1	6 Bar Ground
2	4	Telescopic
3	2	Track
4	1	Frame
5	1	actuator fixture
6	1	track
7	1	Track connect
8	1	Actuator (la29)
9	2	Inner Tube
10	2	Outer Tube
11	1	Track Threaded middle rod
12	2	Track bracket
13	1	Knee Pad
14	1	Battery 918500
15	1	Controller Box 06
16	6	Wheel assembly
17	2	6bar assenly
18	2	Linear Actuator (La 31)
19	3	Arm Rest

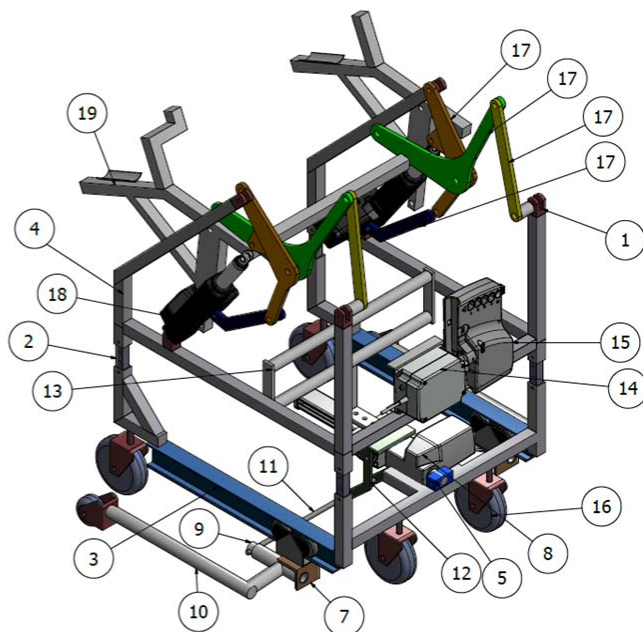


Figure 4. CAD Drawing of the Assembly of Assistive Lifting Device