



Team 8: Benign Incline

Gerald Darkey, Samantha Krupa, Damola Shobowale, Emmett Slater
Calvin University, Grand Rapids, Michigan



Introduction

While public transportation, public building entrance stairs, and home decks have wheelchair accommodation ramps, physically handicapped people in wheelchairs still struggle in environments we take for granted. Leisure activities, such as getting onto a boat from a dock or traversing a muddy terrain while taking a morning stroll, are actions that wheelchair users view with apprehension. Our goal is to provide an attachable-portable ramp for wheelchairs that is user friendly, making their daily lives a little easier.

Objectives

- Allow user to traverse over incline of up to 6 inches
- Safe – no wheel slippage
- Will not affect wheelchair function
- Will be easily operated
- Able to hold a load up to 500 lbs.



Gerald Darkey (ME), Samantha Krupa (ME), Damola Shobowale (ME), Emmett Slater (ME)

Design

Our group designed an attachable-portable ramp for wheelchairs that will allow the user to traverse over small inclines such as a curb. The two aluminum ramps are attached to retractable arms on either side of the wheelchair. A gearbox at the back of the wheelchair will allow the arms to rotate forward until the ramps are in position. Then, after the wheelchair travels over the ramps, the arms extend backwards until the mechanism is back in the initial position.



Fully Functional Prototype

Prototype

We constructed a prototype as a proof of concept for the final design. First, the telescopic arms are fully extended in a vertical position above the user, and the ramps are locked at a fixed angle from the arms. Next, a hand crank on the gearbox is used to rotate the arms forward, as well as the ramps, until they are in the desired position as seen above. Then, the arms are unlocked so they can retract inwards which allows the user to move forward over the ramps. Finally, the arms will complete the 360° motion and will return to their starting position along with the ramps.

Results

Prototype

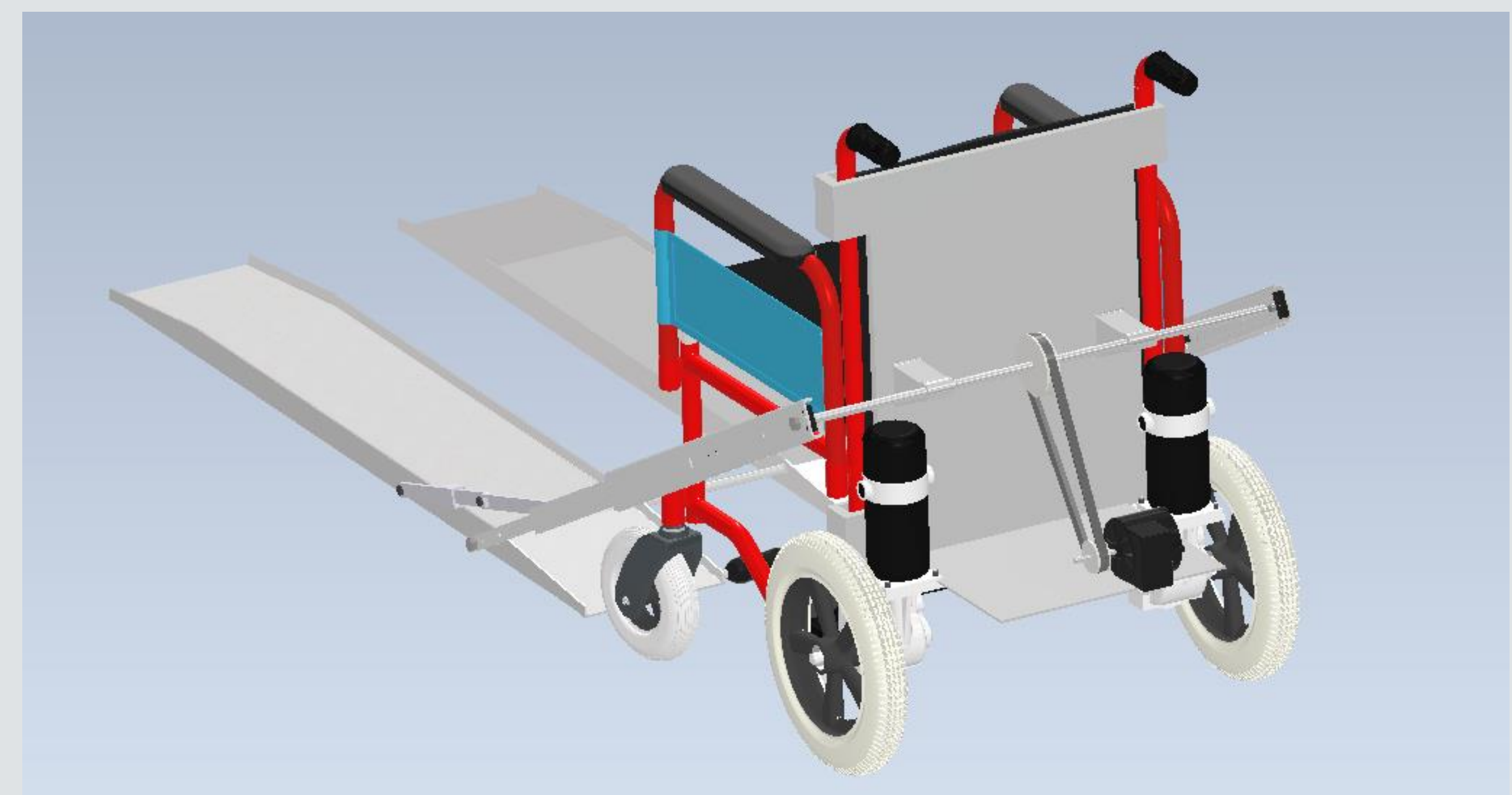
Our prototype proves that our design works as intended and can be manufactured on a large scale.

Final Design

The final design passes all the safety and stress tests performed in CAD and on the physical build. As seen in the picture below, the final design has a motorized belt pulley system that can be controlled by a button, making it a single-user operation.

Conclusion

We set out to devise a creative solution to help lessen the burden of wheelchair users. A prototype that serves the function it was intended for has been created, as well as a design to enhance this innovation.



CAD Model of Our Final Design

Acknowledgments

Team Advisor: Christopher Hartemink

Industrial Consultant: Jeff DeHeer

Manufacturing Consultant: Christian Sorensen