

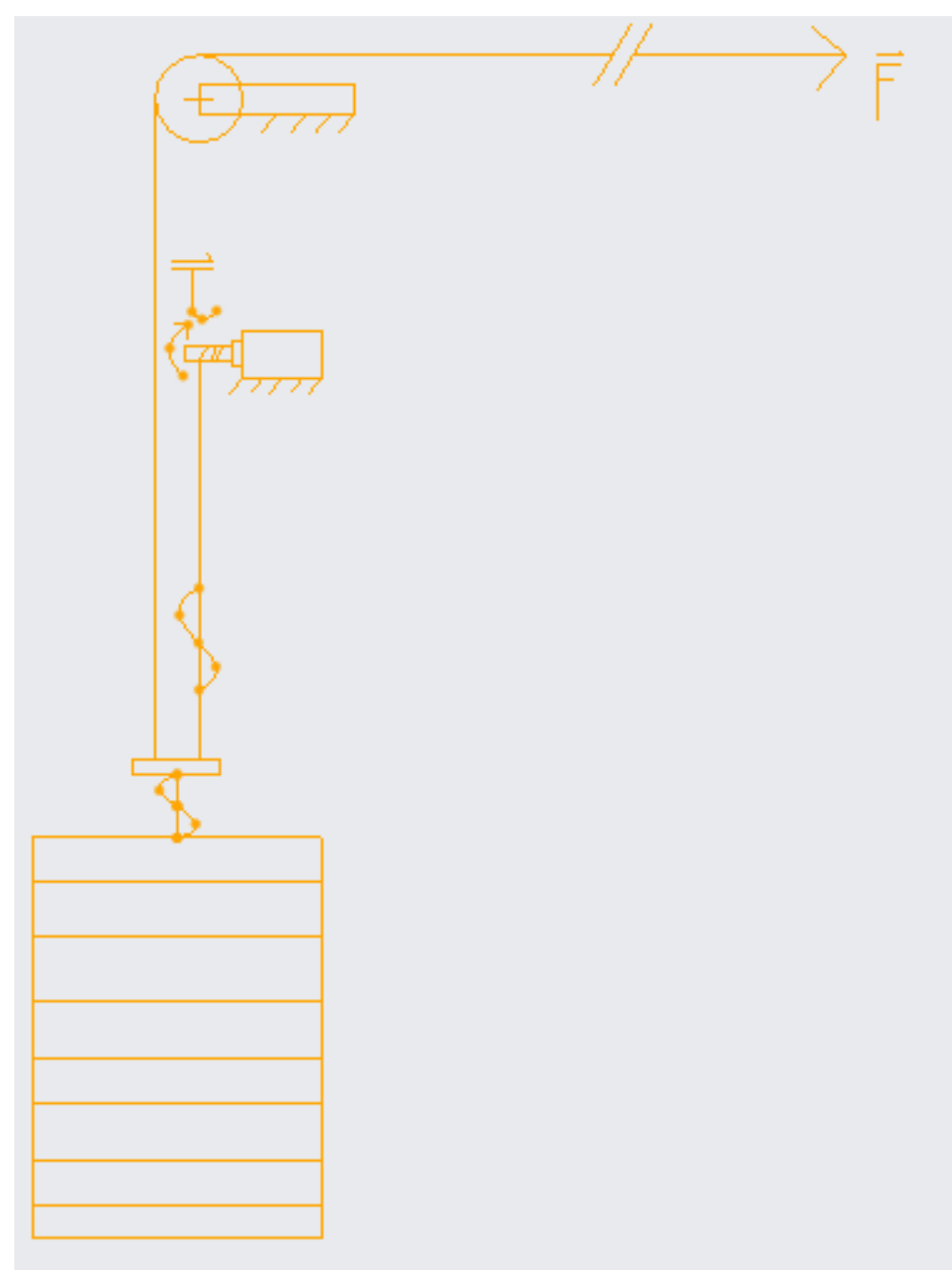


## Abstract

Our apparatus is designed to modify a standard cable weight machine into one that can put focus onto the eccentric portion of the exercise. A motor and cable system applies assistance to the user on the lifting of the weight and supplies no assistance to the user during the lowering of the weight. A series of load cells will monitor the user selected weight and the assistance that the motor is providing to ensure proper functionality.

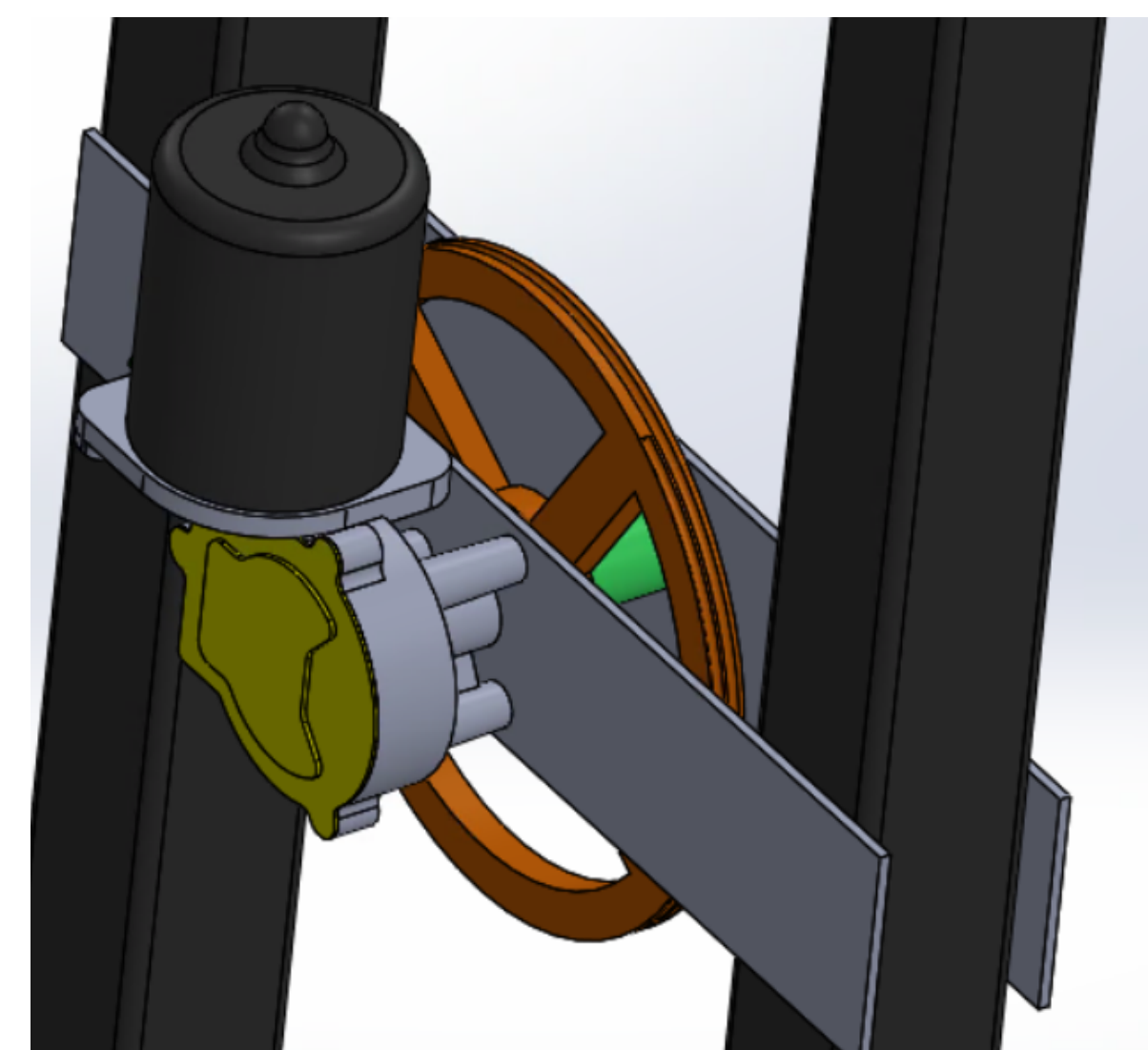
## Introduction

Eccentric exercise is the lengthening of the muscle fibers under load, as opposed to concentric exercise which is the contraction of shortening of the muscle fibers under load. Eccentric focused exercise is more beneficial to hypertrophy, that is, the swelling of the muscle fibers which is a primary agent in muscle growth and is a safer more user friendly alternative to current forms of eccentric focused training.



## Methods | Design | Analysis

Our system uses two load cells and a rotary encoder as system inputs, the lower load cell is used to determine how much weight the user selected. The upper load cell, attached to the motor is used to monitor how much assistance the motor is providing. The rotary encoder, mounted on the pulley wheel will be used to determine the direction of the motion, whether the user is in the concentric or eccentric portion of the exercise. The upper load cell is programmed to read a percentage (15%) of the lower load cell during the concentric, that is; if the user selects 100lbs, during the concentric the motor will apply 15lbs of force and the user will feel only 85lbs, when the user lowers the weight, the motor will apply no assistance so the user will feel the entire 100lbs.



## Results

If there was no interruption due to COVID-19, the results from this project would be the output from the two load cells. Ideally, these graphs would look like two parallel lines of zero slope, one at the user selected weight and one at 15% of that value.

## Conclusion

Our project was almost entirely assembled and all components were tested individually. From this we believe that the connection process would have gone smoothly and simply and all that would remain would be adjusting the code to ensure smooth user operation. We initially designed this projected to be an improvement over a already existing product that accomplishes the same goal with a much more complex and expensive design. If our prototype were to be scaled up to the capacity of the already existing product, we expect to find a cost saving of 60-70%.

## References

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