#TODO remove we and such

Summary:

As part of my Introduction to Mechanical Engineering class I was tasked with creating a mousetrap car capable of traveling 12 ft over terrain consisting of 1in by 2in speed bumps in the fastest time possible. This task was completed through various iterations which eventually resulted in the creation of the fastest car in the class.

Prototypes:

* 1st
  + My initial prototype was not optimized for the fastest time and instead was focused on creating a consistent baseline to revert back to if an iteration failed. This version lacked living hinges as I was still testing different patterns to determine the best amount of flexibility. Additionally, the wheels of this version were made to be thicker than necessary in order to ensure maximum traction was achieved. The 3-D printed part on the axle served to vary the diameter of the axle from larger for a higher torque or smaller for a faster angular velocity as large acceleration was only needed at the beginning of the game.

#TODO Update

* 2nd
  + The second iteration heavily implemented living hinges in an attempt to reduce the effects of the speed bumps and was successful on that account. Additionally, the axle modifier was removed as the lightweight nature of the car made additional torque unnecessary. The previous prototype revealed that no skidding occurred and therefore thinner wheels were used, reducing the acceleration necessary to reach max speed. The results of testing this iteration led to the optimized features below.

Features:

* Variable Axle
  + Realizing that the living hinges allowed the car to maintain its high speed and therefore not need to continually accelerate after every bump, the axle of the mouse trap was whittled down to allow for a smaller lever arm to exist and resulted in faster angular acceleration.
* Living Hinges
  + In order to overcome the issue of the speed bumps essentially placing a maximum speed restriction, I integrated living hinges into my design in order to create a suspension system of sorts. The flexibility which these hinges provided allowed the car to ride over the bumps at a much faster speed without losing control. Additionally, the block like nature of the bumps caused many cars to lose their speed when crossing but the living hinge suspension allowed us to bounce over them with minimal losses. The final design featured a single living hinge as the double version in the second iteration added more weight than be
* Large light Weight Wheel
  + In order to minimize the acceleration needed to reach peak speed, we reduced the mass of the wheels as much as possible to reduce inertial resistance while increasing the diameter to maximize distance per rotation. Because the final design used thin wheels, rubber bands had to be added to the outside in order to increase our traction and avoid spinning out when accelerating.
* Small Lever
  + Our mousetrap car featured an extremely small lever arm as its short length resulted in a faster angular velocity. However, this resulted in a very low initial torque to grant acceleration. Using a small arm was only possible due to our lightweight design and variable diameter axle which granted a boost to torque initially.