Lab 1C: Mousetrap Vehicle Competition

EG 1003, Section G

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**Abstract**

The objective of this lab was to use knowledge of basic motion physics and design in order to create a vehicle that is powered by a mousetrap. This mousetrap vehicle will compete against other vehicles, and the best design will have travelled the farthest linear distance. Some physics concepts that were used included gear ratios, torque, and friction.

**Introduction**

All modern-day vehicles are moved by propulsion, whether the energy for that propulsion comes from electricity, combustion, or a mix of the two. However, there are many ways to provide energy for propulsion, and one of those ways is using a mousetrap if the vehicle is small enough. The experiment was to create a small vehicle capable of travelling a significant distance using the energy from a mousetrap. The only specific rule for the competition was that only a single mousetrap could be used for the vehicle. The experiment required usage of a box of Legos gears, wheels, and blocks in order to create a vehicle capable of harnessing the mousetrap’s energy for propulsion, and the mousetrap was attached to the vehicle using a combination of string and tape. Logic was used to determine a design for the vehicle that would move with the least friction, having a similar design to most modern automobiles.

**Procedures**

The materials used specifically were four small thin grey Lego wheels, two axles, 4 gray clamps to hold the axle in place, two black Lego pieces to extend the wheels out so they wouldn’t hit the body of the vehicle, and one large Lego platform to place the mousetrap upon. To secure the mousetrap to the chassis, tape was used. In order to attach the mousetrap arm to the rear axle for propulsion, string was used, taped to the mousetrap and wrapped around a Lego piece attached to the axle with holes in it to allow the string to pass through.

The steps taken involved first assembling the vehicle, and making sure that it moved with minor force applied at a non-inhibited rate. Once that was complete, the mousetrap was attached to the vehicle, and the string was wrapped around the axle. This method wasted the propulsion from the mousetrap, so it was changed to a circular wheel attached to the axle. However, this method also proved to waste propulsion, since the mousetrap simply pulled the string off of the wheel, applying none of the force to the axle. The final design used a Lego piece that allowed the string to be wrapped through holes on the piece multiple times, ensuring that the string would not fly off and the mousetrap arm’s propulsion would be applied.

**Data/Observations**

Assembly of the model was simple, since all the Legos fit together well, and no tape was needed to get a fully functional vehicle that moved given force applied. However, in order to make use of the mousetrap, tape was needed to secure it to the vehicle, and wrapping the string around the various apparatuses tested on the axle was time consuming. Upon the first test with the string directly attached to the axle, it moved half a tile. Upon the second test where we used the circular wheel, the mousetrap vehicle moved a full tile. On the final official trial, our Lego apparatus attached to the axle made the mousetrap vehicle move three tiles.

On the first trial, the string was completely pulled off the vehicle entirely by the mousetrap arm, since it had a significant amount of force that a simple piece of tape on the axle could not handle. On the second trial, the circular wheel was too smooth, leading to something similar to the first trial although less drastic, letting it travel double the distance. On the final trial, the string ended up staying attached to the axle apparatus, and the propulsion from the mousetrap actually transferred over to the vehicle.

**Discussion/Conclusions**

All in all, the mousetrap car experiment was partially successful, even if it did not win the competition. The major flaws with the vehicle were not having enough propulsion from the mousetrap arm transfer over to the rotation of the axle, and the vehicle not having enough momentum in the wheels to travel a farther distance based on the static amount of energy provided by the mousetrap. Despite that, the benefits of the mousetrap car were its aerodynamic figure, and the minimal usage of parts and tape that were required for it.

The design that won the competition made usage of larger wheels upon their vehicle, which allowed them to take advantage of greater momentum through the physics of how wheels function. Furthermore, by using a gear attached to the axle and the mousetrap the winning design was able to transfer as much propulsion as it could to the vehicle. Engineering concepts such as basic physics and coherent vehicle design allowed robust, functional vehicles to be created that truly embodied the idea behind a mousetrap car.

**Works Cited**

“Mousetrap Vehicle Competition.” *Mousetrap Vehicle Competition - EG1003 Lab Manual*, manual.eg.poly.edu/index.php/Mousetrap\_Vehicle\_Competition.

