Mousetrap Car Post Lab

By Max Edward

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1. **Did your car meet its Goal?**
    a. Our car's goal changed throughout the lab timeframe. Originally, we thought we could design for distance and get the 10 meter distance. However, after our first and second designs, we decided to make the third car have a small distance but a fast velocity as we understood with our timeframe that we were unable to create a car that would go 10 meters. We tweaked and redesigned that car frame with different gear ratios, different weights, and different drive systems: gears and chains vs pulleys and rubber bands. In the end, however, we just tried to make the best designed car and decided to also go for the best UAT designed car. So to summarize, did our car meet its original goal? No and wound up quite far from it. Did it reach the end and final goal we decided on? Yes, it was awarded the best UAT-themed car and so we are happy with that. With what we missed in actual distance or speed we made up for in looks.

2. **How many redesigns of your car did you go through?**
    a. We went through four full redesigns - 3 of which were from the ground up. Our original designed frame was very flimsy and the weight wasn't distributed correctly and so we then went and redesigned that piece as well as the wheels. Our second design had a much more rigid frame and wheels, but the frame became warped from the fabrication process and so we switched from wood to acrylic. Our third design was made from acrylic and again was started from scratch as nothing was really improving data-wise from our previous designs. Our two prior designs were glued together and did not allow for the changing of broken or damaged parts easily - as well as changing out different sized parts. With our third design we made as much as possible modular including the wheels, frame mounting pieces, axles, etc so that if a piece broke or we just wanted to change something out, we could easily do so. Finally, we ended with our fourth design which was a completely new design utilizing a transfer system so that both the transmission and engine (mousetrap) could be rear mounted and allow for more weight in the rear for higher traction as well as variable gearing ratios that could easily be swapped out. ***Pictures of designs are below and listed respectively.***

3. **What was your car's average Velocity?**
    a. Our car’s final average velocity was 1.243 m/s.

4. **What was your car's average Acceleration?**
    a. Our car’s final average acceleration was 0.37m/s2.

5. **What was your car's average Displacement?**
    a. Our car’s final average displacement was 4.403 meters

6. **Discuss the major problems encountered in the performance of your vehicle and what you did to solve them.**
    a. One of the biggest problems we encountered during the designing and testing of our car was that initially it was very light and went further, but was very frail and unstable and so it was not very fast. After redesigning it, it was more robust and went faster because of that, but didn’t go as far. In the end, we compromised on the better velocity as it didn’t decrease our displacement by much, just half a meter or so. I wouldn’t say we solved it as our car was still too heavy and/or not refined enough and so we weren’t able to reach 10 meters displacement or 4m/s velocity or 2m/s2 acceleration. However, we did improve with our revisions - if just by a little - and my partner and I learned a lot about how easy something may look but in reality is a complex balance of parts that needs to be perfect in order to perform as desired.

7. **If you had to redesign your model, what changes would you recommend in your new design? Explain your reasoning.**
    a. If we were to redesign our model one more time, what we agreed on was to start much more simple and work our way to something more complex. After the introductory lecture and getting our materials, we thought it was going to be very simple and we read a few articles and watched a few videos on how it was done and it looked so easy. In reality, designing something that replicated what was in the videos didn’t prove to work as well and actually performed horrible. So, we went on to the complex parts and believed that making it more robust and strong would fix those issues. In some areas it actually made it worse such as distance. In the end, we settled on making it look good and knew that if we spent time on that we would have something other than a pile of parts. The Sunday night before the competition we took everything we had apart and had a pile of parts on the table. We actually discussed just starting all over again and making something super simple. However, doing so wouldn’t have gotten us anywhere and so I am satisfied that we took a deep breath and reassembled something that moved on its own and looked fairly decent. Next time, I would start small and then build upon that - lessen my ambitions and focus on the goals more.

Final Data Table:
Velocity:

Velocity of car	Initial Design	Redesign 1	Redesign 2	Final Design
Trial 1	0.5 m/s	0.93 m/s	0.76 m/s	1.4 m/s
Trial 2	0.8 m/s	1.16 m/s	0.78 m/s	1.215 m/s
Trial 3	0.6 m/s	1.12 m/s	0.72 m/s	1.236 m/s
Average	0.63 m/s	1.07 m/s	0.753 m/s	1.243 m/s

Acceleration:

Acceleration of car	Initial Design	Redesign 1	Redesign 2	Final Design
Trial 1	0.08 m/s2	0.186 m/s2	0.133 m/s2	0.467 m/s2
Trial 2	0.16 m/s2	0.193 m/s2	0.156 m/s2	0.3 m/s2
Trial 3	0.12 m/s2	0.224 m/s2	0.126 m/s2	0.343 m/s2
Average	0.12 m/s2	0.201 m/s2	0.138 m/s2	0.37 m/s2

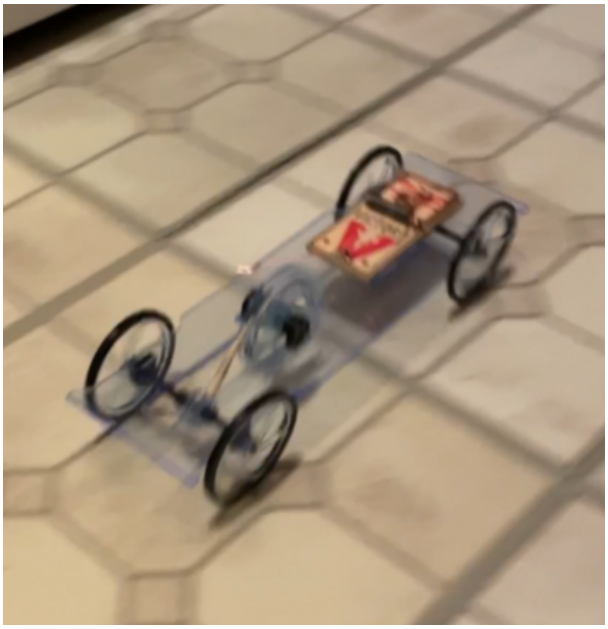
Displacement:

Displacement of car	Initial Design	Redesign 1	Redesign 2	Final Design
Trial 1	3 meters	5.6 meters	5.11 meters	4.45 meters
Trial 2	4 meters	5.8 meters	3.9 meters	4.86 meters
Trial 3	3 meters	5.6 meters	4.15 meters	3.9 meters
Average	3.33 meters	5.67 meters	4.387 meters	4.403 meters

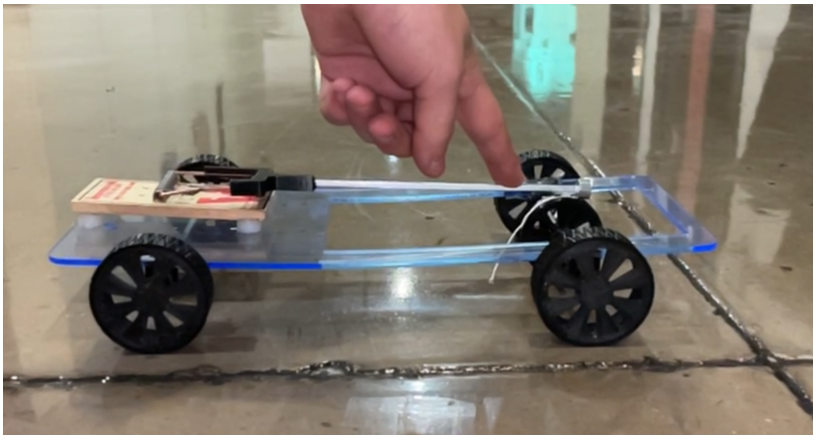
Photos of cars:

First Version:

Second Version:



Third Version:



Final Version: