

Effects of Drag in Different Environments

New Mexico

Supercomputing Challenge

Final Report

April 4, 2018

LLHS53

Los Lunas High School

Team Members:

Brandon (Everest)

Chloe Sawatzki

Teacher:

Anne Loveless

Project Mentor:

N/A

Table of Contents

	<i>Contents</i>	<i>Page</i>
1.	Cover Page	1
2.	Table of Contents	2
3.	Introduction	3 - 4
4.	Description	5
5.	Results	6
6.	Conclusion	7
7.	Acknowledgements & Bibliography	8

Introduction

Executive Summary:

The goal of this project is to create a program that will simulate the effect of drag using data from an external program. Our purpose for choosing this project was to see if wind tunnels would work on older computers because most wind tunnels are intensive on the CPU (Central Processing Unit). This program could have great value to any individual or organization that needs information on drag or lift coefficients.

Background Information:

Drag is the force opposing thrust, or when you push forward, drag pushes back. This occurs during an aircraft's motion during flight and on every part of the plane while motion is transpiring and will exist in all environments. So, our group is going to analyze the effects of drag in different environments. However, the data must be entered manually. There will not be a takeoff or landing part of the simulation, just a mid-flight simulation.

Description

Solution/Method:

The solution to our problem is to make a NetLogo program to simulate the effects of drag. We will use only aircrafts this time to test the effects in different environments, but in the future, we will expand to other sources of transportation. We will also put in some degrees of randomness, such as a fifty percent chance to rise or drop when the simulation is running, instead of that rise or fall being guaranteed. Our program will collect the data, output the data, and then find the statistical results. This means the mean, median, mode, range, etc.

Our step by step method of solving this problem was:

1. Array turtles in a grid
2. Figure out how to get turtle to move around a shape
3. Find the formula for the drag coefficients for that shape
4. Find the formula for the lift coefficient
5. Get inputs necessary for flight forces
6. Calculate the effects from given inputs

Results:

Shape	Sphere	Cube	Nothing
Drag Coefficient Trial 1	0.5049178913135798	Unable to get results	0.25502694074243165
Drag Coefficient Trial 2	Unable to get results	Unable to get results	0.25530215019799885
Drag Coefficient Trial 3	Unable to get results	Unable to get results	0.25521137653564574
Drag Coefficient Trial 4	Unable to get results	Unable to get results	0.25519889384147804
Average Drag Coefficient	N/A	N/A	0.2551848403293885

Conclusion

In conclusion, we have taken on too large a project to do in one school year. We have also found that fluids are more complicated than we have expected. For example, it makes sense that fluids might have their own drag coefficient, as they are constantly interacting with each other.

Acknowledgements & Bibliography

Acknowledgements:

We would like to thank our teacher, Ms. Loveless, for letting us stay after school to work on this project. We also want to thank her for her help and advice on our NetLogo code.

Bibliography:

“The Drag Equation.” NASA, NASA, 5 May 2015, www.grc.nasa.gov/www/k-12/airplane/drageq.html.

“The Drag Coefficient.” NASA, NASA, 5 May 2015, www.grc.nasa.gov/www/k-12/airplane/dragco.html.

“Effect of Size on Drag.” Edited by Nancy Hall, NASA, NASA, 5 May 2015, www.grc.nasa.gov/www/k-12/airplane/sized.html.

“Free Software.” Edited by Tom Benson, NASA, NASA, 12 June 2014, www.grc.nasa.gov/www/k-12/freesoftware_page.htm.

Rohde, Axel. “MicroCFD®.” MicroCFD - 2D Virtual Wind Tunnel, <http://www.microcfd.com/2d.htm>.