New Mexico

Supercomputing Challenge

Final Report

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Team Number: 71

School Name: Melrose Middle School

Aerodynamics of Agricultural Vehicles

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Executive Summary

Agricultural vehicles today have a large use in this country and many others. This will eventually become a problem. As we use so many vehicles today eventually fuel will become extremely expensive or disappear completely. The efficiency of these vehicles must be increased in order for them to continue to be used. We know we can only postpone how long it takes for the world's fuel supply to run out but we hope to stall this disaster until alternative fuels can be found. Today already many new fuels are being searched for and we already have found some, such as solar, wind, electric, etc.

With our project, we have improved the aerodynamics of these vehicles to postpone the disaster until scientists find a way to apply these alternative energy sources to our agricultural vehicles. To do this, we have created two wind tunnels. One, we have created in StarLogo TNG, to actually test our ideas. The other we have built to have a visual aid at our level of understanding. This has really helped since we have little to no computer programming experience.

Problem Statement

With our model we found a way to make agricultural vehicles more aerodynamic, which will increase efficiency which saves the operator money and help conserve the few reserves of fossil fuels we have left. If this is accomplished, everyone benefits.

In order to solve this problem we have found certain ways to create more aerodynamic vehicles. This includes making more streamlined designs for all vehicles, and changing the design of implements that are drug such as the plows and drills. This will create not only more fuel efficient vehicles, but it will also create less need for fuel consumption. This will make it much easier for agricultural vehicle users because fuel prices are going up. We will try different shapes on agricultural vehicles on StarLogo TNG and see which shape works the best to help the aerodynamics of the vehicles.

Description of Method

In our program, we have the computer create the shape of a specific agricultural vehicle. This has presented challenges since we have to have a specific model for a specific shape. Then, we create wind and blow it across the implement. Next, we gather data from our sliders and graphs as to what the resistance rates are and fuel efficiency. Then, we change the shapes in the way we think will decrease the resistance and increase the efficiency. This process continues in a trial-and-error process until we achieve the most satisfying and lowest results.

Model Verification

For our model verification, we have used our home-made wind tunnel and other computer programs like ours. This is probably the easiest part of our project because there are so many people that have gone before us to help solve this problem. This part of our project just consists of minor changes to our model. We have found so many other experiments like ours in the form of apps, programs, and real life models.

Results of Study

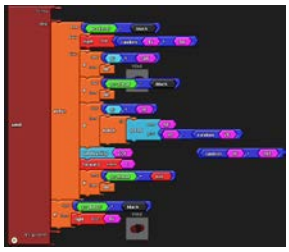
We have found that there are many ways to help solve our problem. In some cases, improving the aerodynamics is as easy as changing the angles of some designs and adding parts in others. Tweaking the little things can improve efficiency and aerodynamics greatly. Or, as we have found, can make the vehicle much less efficient.

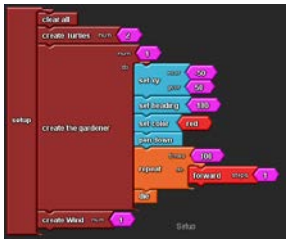
We found that a rounded body is more aerodynamic than a blockier body. Also, we found that the hit counts slows down our vehicle and gives it less efficiency. This is the problem we strive to fix.

Analysis of Results

We have found that if you make little changes to design, motor, fuel, and other contributing factors, the aerodynamics can be greatly improved. We figure that with the improved aerodynamics, the user will save money that could be used in other areas of his agricultural production. Extensive exploration of this project will help the world greatly.

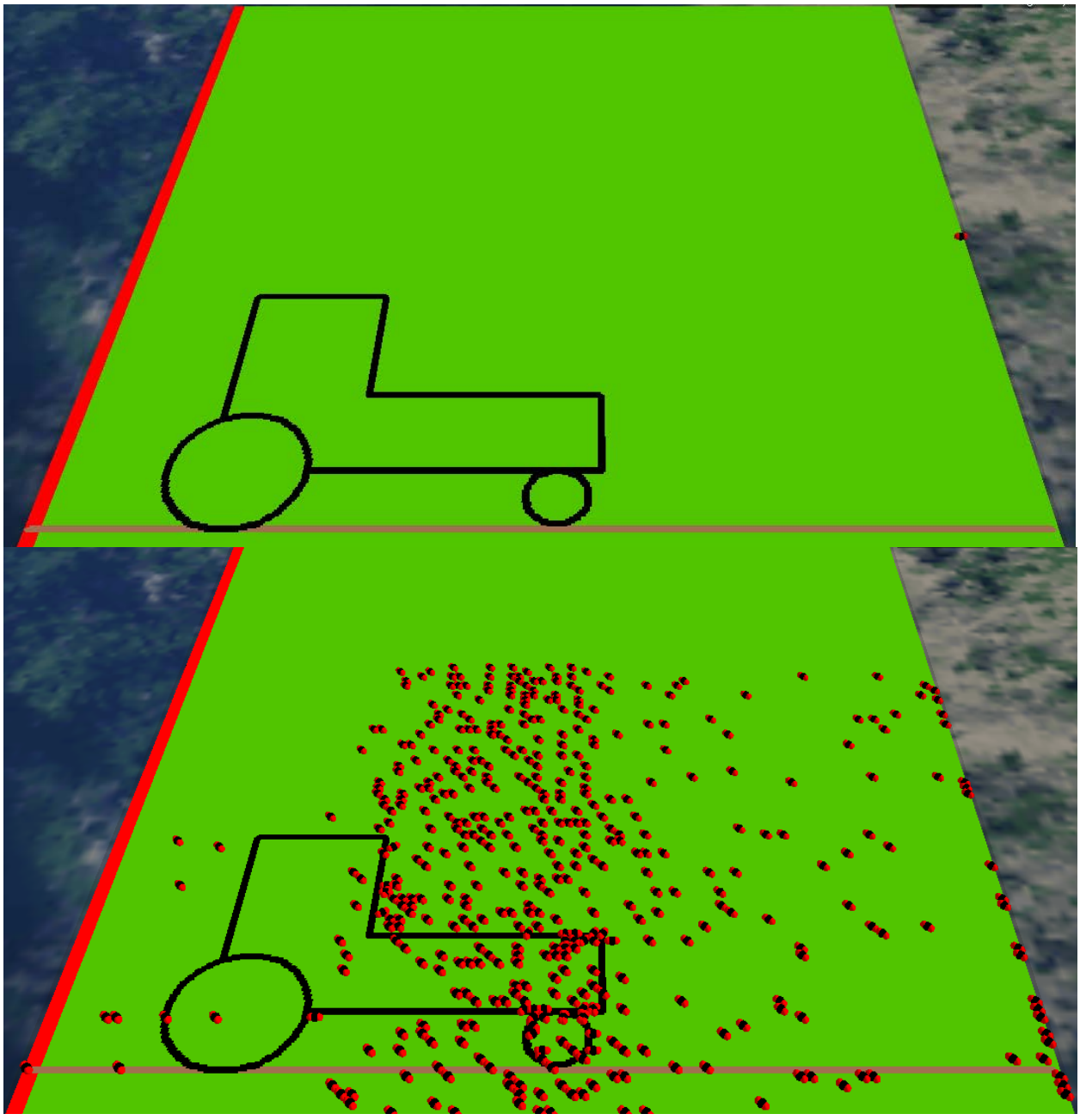
Screen Shots

 This code makes, and tells the wind what to do.

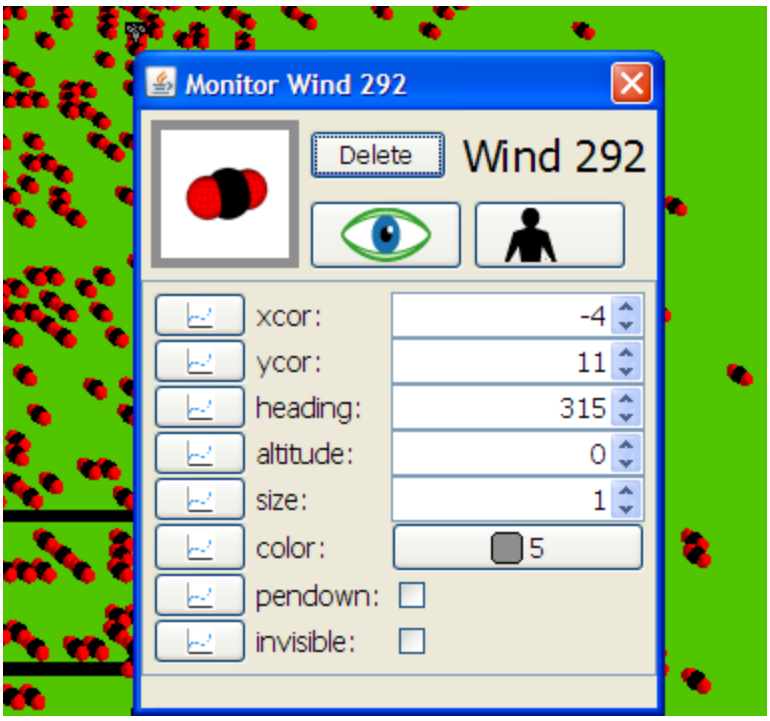


This code tells our wind where to stop.

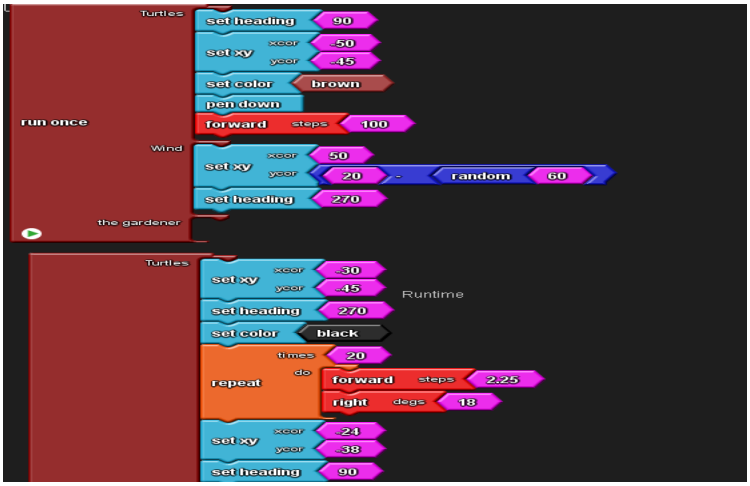
 This code creates our Tractor.



This is our model



This is our counter



Significant Achievements

Our significant achievements include making our model in StarLogo TNG do what we want it to. Many have told us that StarLogo TNG is not a good program for this sort of project. We are a startup team and did not want to have to learn Netlogo. However, we have our model working in StarLogo TNG.

Acknowledgements

We would like to thank all of the Supercomputing Staff for organizing these events. We would also like to thank all of the scientists that make our evaluations possible and take time out of their busy schedules to offer their opinions and references.

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