

Crop Dust

New Mexico Supercomputing Challenge

Final Report

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Team Number 41

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Executive Summary

This project is mainly about using a crop duster to spray fields with different types of chemicals to help the crops. Three types of chemicals will treat the pests that can kill the plants. The model is showing what is done in the real world. It represents a crop duster business.

Our project is about crop dusting, which utilizes an aircraft called a crop duster that sprays plants and crops with specific agricultural chemicals rather than using a tractor, which is more exposed to the chemical in turn it can hurt the farmer or farm hand. Crop dusting is useful because it allows for faster and safer application of sprays, and does not cause any of the crop damage that might result from using other types of ground-based equipment but the ground-based equipment is more precise. However, it poses a problem, the sprays are often seen as a danger to those in the nearby vicinity, and therefore many people oppose its use near their homes or other public spaces.

Because our team and our families have seen crop dusting in our rural farming environment, and because we personally know how local crop-duster works, we thought it would be an interesting project to study. Our aim was to see if crop dusting can be done in a safer manner, and to prevent harmful overspray of the often-dangerous agricultural chemicals.

We made a Net Logo model shows these basic aspects of the crop dusting scenario:

- A. A map of a representative area. This map represents the crop fields, the surrounding pastureland, the amount of houses, and public areas that exist
- B. Agents that move and perform the needed actions. In our case, this includes the crop dusting airplane, and the spray that is released.
- C. Variables that affect the process. We have narrowed these down to 'Wind Speed', 'Wind Direction', 'Spraying Altitude', and 'Chemical Type'.

We think that our model has helped us gain a better understanding of the actions and processes involved in crop-dusting, and we think others can use it as a learning tool.

Problem

Our problem is the exterminating of the weeds, insects, and fungi. This has to be done by flying to the field and spraying it with the chemical that matches up with the problem to kill the pest that is affecting the plants.

We want to continue our project on crop dusting, but change it to more of a simulation of a crop dusting business. Crop dusting is where you use a plane to spray a chemical on crops that protect from bugs, fungi and weeds that in turn make them grow better. Farmers use crop dusters when they need to solve the problem where the field is wet making it hard to use ground equipment and if they do use the ground equipment, it can tear up the soil.

Method / Description –

The model looks like a map with roads that are black, the homes that are all red, all of the fields in the color of dark green, an airplane that is a velvet color with a light blinking, and the weeds that indicate the direction of the wind.

Patches- The different spaces in the Net Logo landscape represent different items like the roads that are black in the model (the airplane will not spray the road). The homes are represented by red squares which the plane will also have to avoid spraying. All of the fields are dark green. These are the main targets for spraying. The grass is the light green over the whole model. If any spray goes here, it is wasted.

Some variables that we used in our model that can change and have different values include the wind and the type of chemical sprayed. Their effects are as follows in Procedures Information:

Procedures

A. The direction of the wind is mostly going to effect the chemicals drift and where it will land, and the speed of the wind will control how much it will drift in the wind's direction.

B. The altitude. The altitude of the plane will also have an effect on the crop dusting because of how high the plane is, which will give the chemicals more airtime before they land on plants.

C. Chemical-types. These are a partner to the wind direction and wind speed. This is because different chemicals spray with different sizes of drops. Large drops fall quickly, while mists tend to drift with the wind more.

These variables will affect how the agents operate and help us determine the amount of safety that crop dusting is showing.

Agents: Our agents include:

Tumble weeds that are light brown. These are a visual indicator of the current wind speeds and directions.

The Airplane, which moves to actually do the spraying of the chemicals.

The Sprayed Chemicals, which are what the farmers want to apply to their crops.

Controls- The controls are the sliders that allow you to vary any of the variables to see how different conditions will affect how the crop dusting works.

Conclusion and results - In conclusion this project is very interesting to do and we hope to learn more about this project. The project is focused on modeling problems and situations that farmers deal with in the world. We learned about using crop duster to spray fields with different types of chemicals to help the crops thrive. The project is a continuation from last year.

Verification

After we received impute from Mr. Tate about the most important things on the project to emphasize, we started to see some accomplishments, Mr. Tate has looked over our project to see if it had the basics or the ideal things that might help us to improve our display or our work, but he said that it had a basic representation of the crop dusting process.

We did talk to a farmer who owns a crop duster and gave us information about flying the aircraft. It was interesting and helped us understand how operating the crop dusting business was done.

Achievements

Our significant achievements on this activity are based on what we had to learn in order to accomplish a completed project. We first made an achievement by learning the basics of Supercomputing and learning how to use computer programming. Then we had to make a display for the crop duster. Another thing that we accomplished is that by doing the entire project we proved we can do a year-long activity as a team. This was a fun project for all of us just as it was very challenging as well. We now know much more about computer coding and other things based on computers as well as about the subject of crop dusting.

Acknowledgments - In this activity with crop dusting, we had much help from our parents and teachers. We would first like to thank Mr. Daugherty, a teacher in the high school who first introduced us to the idea of Supercomputing and taught us about it before starting us on this project. Then there were the ideas from the judges from the ENMU presentation. They had very good ideas to improve the project and we took some of the ideas and put them to use. They also tested our abilities to show our project to others and have helped us get ready for other competitions. We would also like to thank our parents and guardians who helped us with transportation to the places that we needed to be, and for helping get supplies that we needed to complete the project.

