

GRAPHICAL MODELING OF ATMOSPHERIC CHANGE

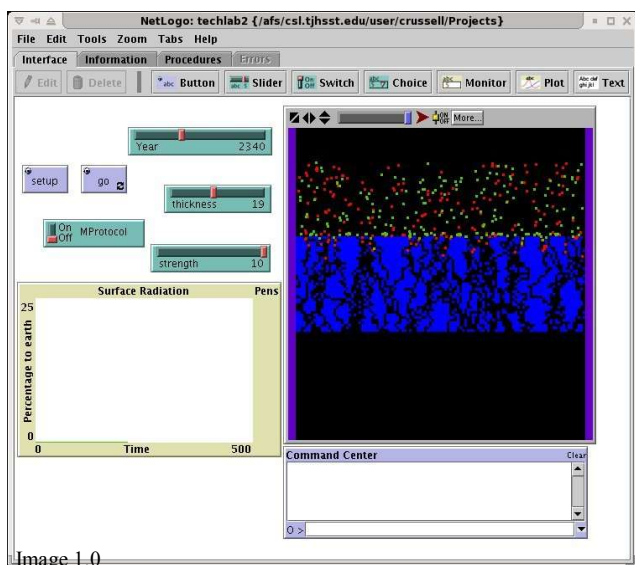


Image 1.0

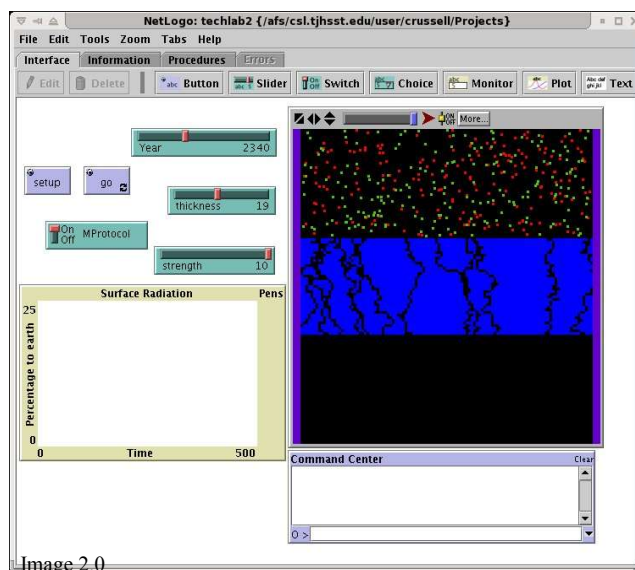


Image 2.0

The screen shots above demonstrate the effect of the Montreal Protocol. Image 1.0 models the atmospheric decomposition in the year 2340 if the Protocol had not been initiated; Image 2.0 models the decomposition in the year 2342 with the Montreal Protocol.

Abstract:

My goal is to create a model of the atmosphere over time, predicting its strength given the increasing amount of pollution as well as the controversial but effective Montreal Protocol. Many projects are in place to save the ozone, and this model will assist in assessing the impact of anti-pollution movements and determine the long-term possible outcome given the many the flexing parameters. This model however, featured unique user-controlled variables, allowing the user to manipulate the year, solar flux, and existence of anti-pollution projects.

Background and References:

NetLogo is a programmable modeling environment for simulating natural and social phenomena. It is particularly well suited for modeling complex systems developing over time. Modelers can give instructions to hundreds or thousands of independent "agents" all operating concurrently. This makes it possible to explore the connection between the micro-level behavior of individuals and the macro-level patterns that emerge from the interaction of many individuals.

This environment plays a very important role in my techlab. It lets users open simulations and "play" with them, exploring their behavior under various conditions. It is also an authoring environment which enabled me to create my own unique simulation. So in summary, NetLogo is simple enough for users to easily run simulations and build their own, and, it is advanced enough to serve as a powerful tool for researchers in many fields.

Sample Code (for your viewing pleasure):

Coding for the setup of the model:

```
breeds [ reds greens ]
turtles-own [ age ] ;;atmos when super strong keeps radiation out,
                    ;;simulated by holding molecules
```

```
;;red means powerful
;;green means big molecule
```

```
to setup
  ca ;;clear all
  setup-patches
  create-molecules 200 reds red ;;creates powerful molecules
  create-molecules 200 greens green ;;creates big molecules
end
```

```
to setup-patches
  draw-atmos
  polute
  draw-boundary ;;established to set a boundary around atmos sample
end
```

Coding for graphical analysis found on bottom right of images:

```
; We need to compute concentrations of reds and greens that made
; it thru the absorbing layer.
```

```
to do-plot
  locals [reds-out greens-out total]
  set-current-plot "Surface Radiation"
```

```
set-current-plot-pen "IR Radiation"
set reds-out (count reds with [ycor < (- thickness)])
plot (100 * reds-out) / 200
;;percentage of powerful molecules to earth
set-current-plot-pen "Benevolent Radiation"
set greens-out (count greens with [ycor < (- thickness)])
plot (100 * greens-out) / 200
;;percentage of big molecules to earth
end
```