Challenge Final Report Submission Information

Information that the judges would like to see about your team and project.

* Required

Team Id *

Mel 45

Your answer

School Name *

Melrose Junior High

Your answer

Project's area of science *

Astronomy

Your answer

Computer language(s) used in your project

netlogo

Your answer

Team members grade levels in school (comma separated) *

8

Your answer

Team members email addresses (comma separated) *

brody.mcalister@

Your answer

SUBMIT

The submission deadline for your final report is **NOON** on April 4th, 2018.

Every team is required to submit an electronic copy of the final report via the Project tab on the myTeam Dashboard; preferably as a PDF file (team_xxx_report.pdf).

After submitting your final report, please fill out our Final Report Information Form

Don't forget to Register for the Expo and Awards Ceremony!

See the Final Report Guidelines for specific information.

More Resources for New Mexico Supercomputing Challenge authors are available at the Writing Reports section of the Resources web page.

Sunsational Sundials

New Mexico

Supercomputing Challenge

Final Report

April 4, 2018

Mel 045

Melrose

Team Members:

Brady Sorgen

Brandon Garcia

Brody McAlister

Xander Chavez

Teacher:

Mr. D

Executive Summary

Our project is about making a modern day sun dial. We learned that people from long ago were able to make a sun dial and we were investigating to see if we were able to use it more in a modern way. Our project will be using the location of the sun with its changing altitudes and directions to hit the window in our model and our program. Based off of that, it will tell the time and date based off of that. We can change the suns angle and its position in the sky and still determine how that affects time and dates.

Problem

Our inspiration of this idea was Stonehenge and the Microsoft Windows wallpaper. We wanted to make this project because we had lots of interest in math and this project fulfilled our needs. Also we think that astronomy is a very interesting topic that we all wanted to learn about.

We want to prove that even though Stonehenge was used 5,000 years ago, it can still be used today in modern society.

Method

Net Logo: We decided to choose Net Logo as our program this year because we have experience with it from last year.

Some components in our model include:

Black Patches around the green to represent the horizon

Green patches as the ground

Black patches in the house as the shadows

Brown patches as the shape of the house

Blue window for the sun to shine through

Black dot in window is the center of the frame is our target

Red line as the east and west line, where the sun rises and sets on equinoxes

Agents:

We are using the sun as an agent to show how the sun moves at different times of different days. We are using different start points and different angle to achieve this.

The sunbeam shows where the sunlight hits the window every day to create shadows to tell the time of the day.

The shadow marks where the sun hits in the house at any time and any angle during the day.

Controls:

There is a slider that is showing the New Mexico latitudes. This is important to show how high the sun's location is in the sky.

There is a slider showing the date with the equinoxes and the solstices. This is important because it shows where the sun is set in the sky.

There is a setup up button that creates the horizon, ground, house, window, and frame.

There is a sun button that creates the sun in a particular place.

There is a solar motion button that makes the sun move side to side from the east to the west horizon.

There is an output showing the time of the day considering the sun's position.

There is a clear all button that clears everything on the screen.

There are 3 counters that counts the sun beams, sols, and the shades.

Procedures:

We have many different procedures such as-

- Setting up the screen including the ground, and horizon.
- Building the house.
- Creating the sun and place it on the correct position on the horizon.
- Moving the sun throughout the sky and shines its beams on the window frame.

- Making the shadows to tell the time and date.
- Outputting the time.
- Calculating the solar discrepancy.
- Using dates to find the suns height angle in the sky.

Verification: Our model can show the way that the sun's angles and altitudes can give an idea of the date and time. However due to other influences its unpredictable for this to be possible.

Results and Conclusions:

We found that our model can tell us the some of the angles the sun sets at but it can't show us everything accurately. For Example it cannot show us the exact angles that the sun is at all the time. Or the exact way the sun hits the window. Our conclusions are that it doesn't show us everything accurately but it can show us basically what the angles and other possibilities are.

Software:

We have chosen to use Net Logo. We decided to use Net Logo because the Supercomputing Challenge provides lots of tutorials on Net Logo. Also the have lots of online tutorials on how to use the program.

Achievements:

We have achieved knowledge about how the ancients used Stonehenge to tell the time and make calendars.

```
breed [ sols sol]
breed [ beams beam]
breed [ shades shade]

patches-own [shadowed original-color]

globals [amplitude sunrise-offset sunangle]

to setup
  ask patches [if pxcor * pxcor  + pycor * pycor < 7744 [set pcolor 66]]
  ask patches [if pxcor < -30 [set pcolor 66]
     if pxcor < -12 and pycor < 88  and pycor > -88 [ set pcolor 66]
     if pxcor = 0 [set pcolor red]]
  buildhouse
  ask patches [set original-color pcolor
            set shadowed pcolor ]
end

to buildhouse
    crt 1 [ set pcolor 34 set shape "dot" set size 6]
  ask turtles[
     setxy -58 0
     set heading 180
     set pen-size 4
     pd
     fd 40  rt 90  fd 32  rt 90  fd 80  rt 90 fd 32 rt 90 fd 40
     set color 95 bk 6 fd 6 set color black stamp
```

```
    set color 95 fd 6 die  ]
end



to sunshape
  find-amplitude
  find-sunrise-offset
  crt 1 [set breed sols set shape "sun" set size 20 setxy (0 + (sunrise-offset * amplitude)) 87 set heading 180 ]
end


to solarmotion
 ask sols [ if pcolor = black [fd 1]
   fd 1 if pcolor = 66 [hatch 1 [set breed beams set shape "sun" set size 8 set heading towardsxy -58 0] set sunangle heading shadow ]]
   if pcolor = black and pycor < -60  [die ask shades[die] ask patches [ if shadowed = 1 [set pcolor green]]]
end


to shadow
 ask beams[ time  if pycor < -39 [die]   if pycor > 38 and pxcor < -19 [die]
   if pxcor > -89[Speed-of-light]
   if pxcor < -87 [die]]
end


to speed-of-light
   ask beams [ repeat 50 [ifelse pxcor > -88 [fd 1] [ hatch 1 [set breed shades set shape "square" set size 1 set pcolor black stamp die  ]]]]
end
```

```
to time
  ask beams[ if heading > 235 [output-print" time is 5 A.M."]]
  ask beams[ if heading > 240 [output-print" time is 6 A.M."]]
  ask beams[ if heading > 245 [output-print" time is 7 A.M."]]
  ask beams[ if heading > 250 [output-print" time is 8 A.M."]]
  ask beams[ if heading > 255 [output-print" time is 9 A.M."]]
  ask beams[ if heading > 260 [output-print" time is 10 A.M."]]
  ask beams[ if heading > 265 [output-print" time is 11 A.M."]]
  ask beams[ if heading > 270 [output-print" time is 12 Noon"]]
  ask beams[ if heading > 275 [output-print" time is 1 P.M."]]
  ask beams[ if heading > 280 [output-print" time is 2 P.M."]]
  ask beams[ if heading > 285 [output-print" time is 3 P.M."]]
  ask beams[ if heading > 290 [output-print" time is 4 P.M."]]
  ask beams[ if heading > 295 [output-print" time is 5 P.M."]]
  ask beams[ if heading > 300 [output-print" time is 6 P.M."]]
  ask beams[ if heading > 305 [output-print" time is 7 P.M."]]
  ask beams[ if heading > 310 [output-print" time is 8 P.M."]]
  ask beams[ if heading > 315 [output-print" time is 9 P.M."]]
end

to find-amplitude
   if latitude < 38 [ set amplitude 30]
   if latitude < 37 [ set amplitude 29]
   if latitude < 34 [ set amplitude 28]
   if latitude < 32 [ set amplitude 27]
end

to find-sunrise-offset
  if date = 3.75 or date = 9.75 [set sunrise-offset 0]
```

```
  if date = 3.5 or date = 4 or date = 9.5 or date = 10 [set sunrise-offset .10]

  if date = 3.25 or date = 4.25 or date = 9.25 or date = 10.25 [set sunrise-offset .20]

  if date = 3 or date = 4.5 or date = 9 or date = 10.5 [set sunrise-offset .30]

  if date = 2.75 or date = 4.75 or date = 8.75 or date = 10.75 [set sunrise-offset .40]

  if date = 2.5 or date = 5 or date = 8.5 or date = 11 [set sunrise-offset .50]

  if date = 2.25 or date = 5.25 or date = 8.25 or date = 11.25 [set sunrise-offset .60]

  if date = 2 or date = 5.5 or date = 8 or date = 11.5 [set sunrise-offset .70]

  if date = 1.75 or date = 5.75 or date = 7.75 or date = 11.75 [set sunrise-offset .80]

  if date = 1.5  or date = 6.0 or date = 6.25 or date = 7.25 or date = 7.5 or date = 12 or date = 12.25 [set
sunrise-offset .90]

  if date <= 1.25 or date >= 12.5 [set sunrise-offset 1.00]


  if date <= 3.75 or date >= 9.75 [set sunrise-offset sunrise-offset * -1]

 end
```