Python Problem

New Mexico
Supercomputing Challenge
Final Report
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Team Number 21
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Executive Summary:

Our code is about pythons and their overpopulation in the Florida Everglades. In our research we found that pythons can eat many mammals, among which include big animals such as alligators and even deer. We found that traps may be able to help control the population of these giant snakes. The point of our project is to see if this is possible and how this may affect the other species in the area.

INTRODUCTION:

Recently the Everglades experienced an abundant increase in the Burmese Python population. They are endangering the welfare of the Everglade ecosystem and many of the indigenous species that live there. Our real-world project is modeling the placement of traps in the Everglades, and how they affect the number of pythons in the ecosystem. We want to try and find the optimal placement of traps in order to relocate the pythons to their original location. Since 2000, trappers brought pythons from Southeast Asia as "exotic" pets. The problem is that these pythons can grow to over 18 feet long. When the pythons become too big, their owners release them into the wild. These pythons are extremely adaptable and have a very flexible diet. Several populations of birds, rodents, and various reptiles have suffered from the large number of pythons. In our model, we have added a breed of rabbits, alligators, pythons, python traps, and grass for the rabbits to eat. We created a terrain for the breeds to live in and modeled the behavior of each breed. The pythons eat the rabbits and the alligators to gain energy. The rabbits eat the grass to gain energy. What we are looking for is if the traps bring the python population under control and if this helps the numbers of rabbits and alligators. We chose this topic because we have been learning about the environment and the affects that the overpopulation of pythons has on the ecosystem. We heard about the overpopulation of Burmese Pythons in the Everglades, and we wanted to find a way to save indigenous species from going extinct.

DESCRIPTION:

We used websites and books to gather research about the python project. We created six breeds to imitate the ecosystem in Florida. We currently have pythons, bunnies, traps, trapped snakes, alligators, and grass. Our current variables are energy for the bunnies, pythons, and alligators, and we have sliders so that we can change the amount of each breed. Our bunnies gain energy from our grass, the pythons gain energy from eating alligators and bunnies, and the alligators gain energy from eating the bunnies. Whenever a python encounters a trap it changes its breed and shape to a trapped python. We have monitors to show the amount of every breed that we have. The first part of our code (which is in the appendix) is mainly changing the patches to look like the everglades.

RESULTS:

We learned that it is a very difficult procedure to make one breed follow another. We have also learned that all of our pythons are either getting trapped or dying because of lack of energy/food, which is why we decided to create alligators so that once all the bunnies die, our model is accurate in that the pythons would find more prey.

CONCLUSION:

Our project showed that if a funded project sent people with MANY traps into the everglades, then this project could be very helpful in lowering the population. In order for it to be affective, they would have to use about 500 traps for every 100 pythons. Our model shows that when there are 500 traps, they trap 90 of the 100 pythons and the rest die of lack of food/energy. Once the pythons are trapped or killed, if there are any bunnies left, their population spikes. If our model is accurate, then the ecosystem in the everglades could be restored back to normal.

RECOMMENDATIONS:

If we could do anything we would most likely choose a different subject and try to make our project simpler. While we were researching pythons, we discovered that they are not anywhere near as interesting as they sound. Also our project is very in depth and if we had a different project we would try to make it simpler because with all the different aspects, it is difficult to try to portray everything using netlogo. Our code (appendix) is also very long and extensive

ACKNOWLEDGEMENTS:

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APPENDIX:

```
;;;this section creates the breeds and gives energy to specific breeds
breed [pythons python]
breed [traps trap]
breed [bunnies bunny]
breed [trappedsnakes trappedsnake]
breed [grasses grass]
breed [alligators alligator]
alligators-own [alligatorenergy]
bunnies-own [bunnyenergy]
pythons-own [pythonenergy]




;;;this section colors the patches to look like the everglades
to setup
  clear-all
  reset-ticks
  ask patches
  [ set pcolor 52 ]
  ask patch 0 0
  [ set pcolor 82 ]
   ask patch -1 0
  [ set pcolor 82 ]
   ask patch -2 -1
  [ set pcolor 82 ]
   ask patch -3 -2
  [ set pcolor 82 ]
   ask patch -4 -3
  [ set pcolor 82 ]
   ask patch -5 -3
  [ set pcolor 82 ]
   ask patch -6 -2
  [ set pcolor 82 ]
   ask patch -7 -1
```

```
[ set pcolor 82 ]
 ask patch 1 1
[ set pcolor 82 ]
 ask patch 2 2
[ set pcolor 82 ]
 ask patch 2 3
[ set pcolor 82 ]
 ask patch 3 4
[ set pcolor 82 ]
 ask patch -8 0
[ set pcolor 82 ]
 ask patch -9 0
[ set pcolor 82 ]
 ask patch 3 5
[ set pcolor 82 ]
 ask patch 4 5
[ set pcolor 82 ]
 ask patch 4 4
[ set pcolor 82 ]
 ask patch -10 -1
[ set pcolor 82 ]
 ask patch -11 -2
[ set pcolor 82 ]
 ask patch -12 -3
[ set pcolor 82 ]
 ask patch -13 -4
[ set pcolor 82 ]
 ask patch -14 -5
[ set pcolor 82 ]
 ask patch -14 -6
[ set pcolor 82 ]
 ask patch -15 -5
[ set pcolor 82 ]
 ask patch -15 -6
[ set pcolor 82 ]
 ask patch -15 -15
[ set pcolor 82 ]
 ask patch -16 -15
[ set pcolor 82 ]
 ask patch -17 -15
[ set pcolor 82 ]
 ask patch -14 -14
[ set pcolor 82 ]
 ask patch -10 -10
[ set pcolor 82 ]
 ask patch -9 -10
[ set pcolor 82 ]
 ask patch -8 -10
```

```
[ set pcolor 82 ]
 ask patch -8 -11
[ set pcolor 82 ]
 ask patch -7 -12
[ set pcolor 82 ]
 ask patch -6 -13
[ set pcolor 82 ]
 ask patch -5 -14
[ set pcolor 82 ]
 ask patch -4 14
[ set pcolor 82]
 ask patch -5 14
[ set pcolor 82]
 ask patch -7 15
[ set pcolor 82]
 ask patch -6 15
[ set pcolor 82]
 ask patch -3 13
[ set pcolor 82]
 ask patch -2 12
[ set pcolor 82]
 ask patch -1 12
[ set pcolor 82]
 ask patch 0 11
[ set pcolor 82]
 ask patch 1 10
[ set pcolor 82]
 ask patch 2 10
[ set pcolor 82]
 ask patch 3 10
[ set pcolor 82]
 ask patch 4 9
[ set pcolor 82]
 ask patch 5 9
[ set pcolor 82]
 ask patch 6 9
[ set pcolor 82]
 ask patch 7 8
[ set pcolor 82]
 ask patch 8 7
[ set pcolor 82]
 ask patch 8 6
[ set pcolor 82]
 ask patch 9 5
[ set pcolor 82]
;;;this section creates the breeds and sets them up
create-pythons pythonslider
create-bunnies bunnyslider
```

```netlogo
create-grasses grassslider
create-alligators alligatorslider
ask pythons
[
  set shape "burmese python"
  set size 3
  setxy random-xcor random-ycor
  set pythonenergy random 30 + 10
  let foundgreenspot false;;creates variable and assigns starting value to false
  while [foundgreenspot = false];all foundgreenspots are going to be false to start with
  [
    set xcor (round(random-xcor));;assigns a random x coordinate for each turtle
    set ycor (round(random-ycor));;assigns a random y coordinate for each turtle
    if ((pcolor = 52) and (count turtles-here = 1));if the turtle lands on a green spot, then the variable is
set to true
    [
      set foundgreenspot true
    ]
  ]
]
ask grasses
[
  set shape "grass"
  setxy random-xcor random-ycor
  set size 2
  set color lime
  let foundgreenspot false;;creates variable and assigns starting value to false
  while [foundgreenspot = false];all foundgreenspots are going to be false to start with
  [
    set xcor (round(random-xcor));;assigns a random x coordinate for each turtle
    set ycor (round(random-ycor));;assigns a random y coordinate for each turtle
    if ((pcolor = 52) and (count turtles-here = 1));if the turtle lands on a green spot, then the variable is
set to true
    [
      set foundgreenspot true
    ]
  ]
]

ask bunnies
[
  set shape "bunny"
  set size 1.5
  setxy random-xcor random-ycor
  set bunnyenergy random 30 + 10
  let foundgreenspot false;;creates variable and assigns starting value to false
  while [foundgreenspot = false];all foundgreenspots are going to be false to start with
  [
```

```
      set xcor (round(random-xcor));;assigns a random x coordinate for each turtle
      set ycor (round(random-ycor));;assigns a random y coordinate for each turtle
      if ((pcolor = 52) and (count turtles-here = 1));if the turtle lands on a green spot, then the variable is
set to true
      [
        set foundgreenspot true
      ]
    ]
  ]


  if traps?
  [
    create-traps trapslider
    ask traps
    [
      setxy random-xcor random-ycor
      set breed traps
      set shape "trap"
      set size 2
    ]
  ]
  ask traps
  [
    let foundgreenspot false;;creates variable and assigns starting value to false
    while [foundgreenspot = false];all foundgreenspots are going to be false to start with
    [
      set xcor (round(random-xcor));;assigns a random x coordinate for each turtle
      set ycor (round(random-ycor));;assigns a random y coordinate for each turtle
      if ((pcolor = 52) and (count turtles-here = 1));if the turtle lands on a green spot, then the variable is
set to true
      [
        set foundgreenspot true
      ]
    ]
  ]
  ask alligators
  [
    set shape "alligators"
    set size 2
    set alligatorenergy 20
    let foundgreenspot false;;creates variable and assigns starting value to false
    while [foundgreenspot = false];all foundgreenspots are going to be false to start with
    [
      set xcor (round(random-xcor));;assigns a random x coordinate for each turtle
      set ycor (round(random-ycor));;assigns a random y coordinate for each turtle
      if ((pcolor = 52) and (count turtles-here = 1));if the turtle lands on a green spot, then the variable is
set to true
      [
```

```
      set foundgreenspot true
     ]
    ]
  ]



end

to alligatormovement
  ask alligators
  [
    let colorofPatchAhead 82
    ask patch-ahead 1
    [
      set colorofPatchAhead pcolor
    ]
    if (colorofPatchAhead = 82)
    [
      left 180
    ]
    if (colorofPatchAhead = 52)
    [
      forward 1
      set alligatorenergy alligatorenergy - 1
      if alligatorenergy <= 0
      [
        die
      ]
      if count bunnies-here > 0
      [
        set alligatorenergy alligatorenergy + 12
      ]
    ]
  ]
    end
;;;this section creates the code to move the bunnies around and to kill them when they encounter a
python, and to give them energy when they encounter a patch with grass on it.
to bunniesmovement
  ask bunnies
  [
    let colorofPatchAhead 82
    ask patch-ahead 1
    [
      set colorofPatchAhead pcolor
    ]
    if (colorofPatchAhead = 82)
    [
```

```
      left 180
    ]
    if (colorofPatchAhead = 52)
    [
      forward 1
      set bunnyenergy bunnyenergy - 1
      if bunnyenergy <= 0
      [
        die;;tells turtles to die if above statement is true
       ]
    ]
    if count grasses-here > 0
    [
      set bunnyenergy bunnyenergy + 12
    ]
  ]
end
;;;this section sets up the python's movement and gives them energy when they encounter a bunny
to pythonmovement
  ask pythons
  [
    let colorofPatchAhead 82
    ask patch-ahead 1
    [
      set colorofPatchAhead pcolor
    ]
    if (colorofPatchAhead = 82)
    [
      left 180
    ]
    if (colorofPatchAhead = 52)
    [
      forward 1
      set pythonenergy pythonenergy - 1
      if pythonenergy <= 0 ;;sets energy to less than or equal to zero
  [
    die;;tells turtles to die if above statement is true
  ]
    ]

  ]
  end


;;;this section sets up the reproduction for the pythons
to reproduce
  ask pythons
  [
```

```
    if pythonenergy > 50
    [
      hatch 1
      [
        set breed pythons
        set shape "python"
      ]
      set pythonenergy pythonenergy - 30
    ]
  ]

end
;;;sets up the reproduction for the bunnies
to bunniesreproduction
  ask bunnies
  [
    if bunnyenergy > 150
    [
      hatch 1
      [
        set breed bunnies
        set shape "bunny"
      ]
      set bunnyenergy bunnyenergy - 30
    ]
  ]
end

to alligatorsreproduction
  ask pythons
  [
    if pythonenergy > 150
    [
      hatch 1
      [
        set breed alligators
        set shape "alligators"
      ]
      set alligatorenergy alligatorenergy - 30
    ]
  ]
end
;;;kills the bunnies if they get on a patch with a python
to bunniesdeath
  ask bunnies
  [
    if count pythons-here > 0;;checks  to see how many yoshis are around him
    [
```

```
      die ;;#diealready...you know you're bored with commenting when...
    ]
    if count alligators-here > 0
    [
      die
    ]
  ]
end
;;;sets the energy of the pythons if they get on a patch with a bunny
to pythonfood
  ask pythons
  [
    if count bunnies-here > 0
    [
      set bunnyenergy bunnyenergy + 15
    ]
  ]
  end
;;;traps the pythons if they get on a patch with a trap, and sets the breed to a trapped snake
to pythontrap
  ask pythons
  [
    if count trappedsnakes-here > 0
    [
      die
    ]
  ]
end
;;;kills the grass if a bunny eats it
to grassdeath
  ask grasses
  [
    if count bunnies-here > 1
    [
      die
    ]
  ]
end
;;;changes the traps to trapped snakes
to trapcatch
  ask traps
  [
    if count pythons-here > 0
    [
      set breed trappedsnakes
      set shape "trapped python"
    ]
  ]
```

```
    end


;;;puts all of the procedures into a single procedure
 to go
    pythonmovement
    bunniesmovement
    alligatormovement
    bunniesdeath
    trapcatch
    pythontrap
    bunniesreproduction
    alligatorsreproduction
    reproduce
    pythonfood
    grassdeath
    tick
  end
```