

Talking Trash

New Mexico
Supercomputing Challenge
Final Report
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Team 141
Taos High School

Team Members:

Kobe Bellas (grade 11)

Noe Garcia (grade 10)

Adrian Hernandez (grade 11)

Scott Nevels (grade 10)

Teachers:

Ms.Galligan - Sponsoring Teacher

Mr.Gilroy - Project mentor

Executive Summary:

In the cities the amount of trash bins in an area affect how people throw away their trash. The question is if more trash bins are placed how would it affect the way that trash is disposed in an area. We examined the effects of adding trash bins to a town model and see whether that would decrease the amount of littering in a town.

Problem Statement/Intro:

We are examining if trash can be reduced by adding trash bins in an area of a town. The Netlogo model will consist of trash, people and trash bins. We hope to answer how much trash bins it would take to maintain an area of a town clean.

Method:

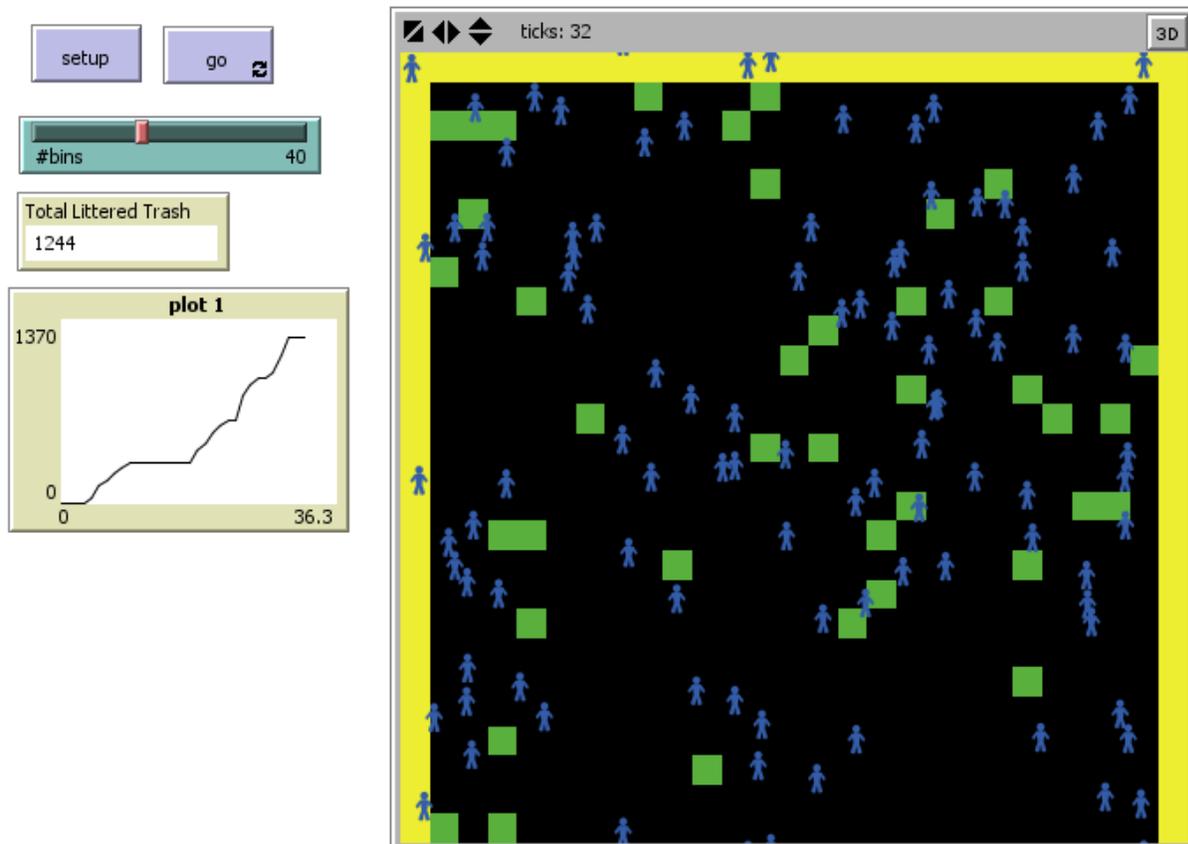
The program is ran in a netlogo environment with an initial of 44 pieces of trash located in a variable carried by people. There is 100 people in the model, their initial location is random. The number of bins can be adjusted according to the slider labeled #bins. Once the program is started people do a random walk and check if there is a trash bin where they walk. The person will then check if the trash bin is full or not. If the trash bin is still not completely full the person will put trash in it taking trash away from the trash variable carried by the person. Once the trash bin is filled the person will litter have to either find a new bin or litter his trash.

Verification and Validation:

The netlogo model was designed to be similar to a square mile of the Town of Taos. In the model we have a grid that has 640 acres, which is equal to a square mile, each acre is represented by 1 patch. According to the U.S. Census Bureau in 2012 Town of Taos had 1003.5 people per square mile. Using the information from the 2012 Census it was calculated that the model could contain 100 turtles. The turtles would represent about 10 people each. In order to Calculate the trash that

would be used in the model we decided to look up the average weight of trash that a person throws away per day. The average amount of trash thrown by one person per day was 4.4lbs. This means that if Taos has 1003 people per square mile, the trash generated each day would be about 4413 lbs/square mile. In the model the amount of trash created is 100 trash turtles each piece represents about 44 lbs. The Amount of trash did not include trash generated by business which add a great amount of weight.

Program



Code

```
breed[people]
breed[trash]
globals[totalrestfloor trashAllBins totaltrash2]
patches-own[totaltrash binspace freebinspace resttofloor]
people-own[trashlbs]
```

```
to setup
  clear-all
  reset-ticks
  reset-timer
  ask patches
  [
    set pcolor black
    if pxcor >= 13 or pycor >= 13 or pxcor <= -13
    [
      set pcolor yellow
    ]
  ]

  while [ count patches with [ pcolor = green] < #bins ]
  [
    ask patch random 1000 random 1000
    [
      if pcolor = black
      [
        set pcolor green
      ]
    ]
  ]
  create-people 100
  [
    set trashlbs 44

    setxy random 1000 random 1000
    while [ count people-here >= 2 ]
    [
      setxy random 1000 random 1000
    ]
    set size 1
    set shape "person"
    set color blue
    while [ pcolor = yellow]
    [
```

```

    setxy xcor + 5 ycor - 1
  ]
]

ask patches
[
  set binspace 175
  set freebinspace 175
  set totaltrash 0
  set totalrestfloor 0
]
end

to go
  while [ticks <= 1000]
  [
    tick
    walk
    find-bin
  ]
end

to walk
  ask people
  [
    forward 1
    left random 30
    right random 30
  ]
end

to litter

  set totalrestfloor totalrestfloor + trashlbs
end

to find-bin
  ask people
  [
    if trashlbs >= 1
    [
      if count patches with [ pcolor = green ] in-radius 5 = 0
      [
        litter
      ]
    ]
  ]
  ifelse pcolor = green or pcolor = red

```

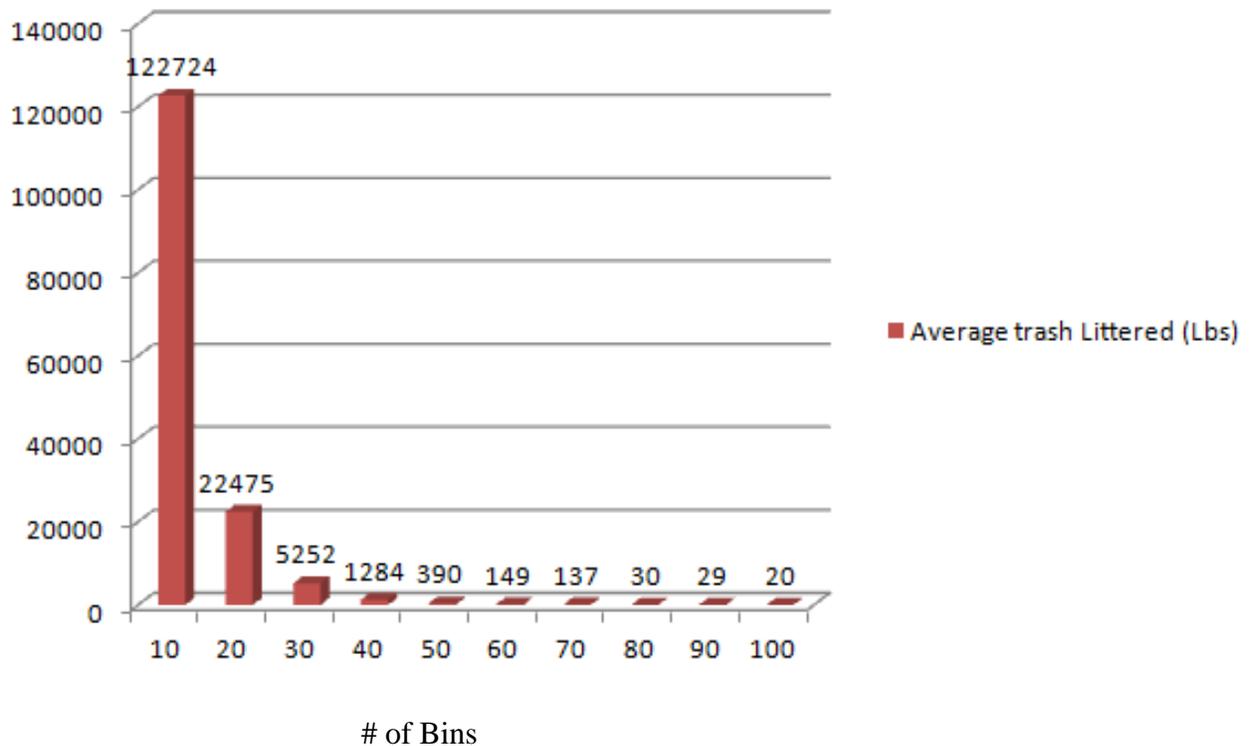
```
[
  set freebinspace binspace - totaltrash
  if trashlbs > freebinspace
    [
      set resttofloor trashlbs - freebinspace

    ]

    set totaltrash totaltrash + trashlbs
    set totalrestfloor totalrestfloor + resttofloor
    set totaltrash2 totaltrash + totaltrash
    set trashAllBins totaltrash2 - totalrestfloor
    set trashlbs 0
  ]
]
]
end
```

Results:

Average trash Littered (Lbs)



Conclusions:

The amount of trash being littered is dependent on the number of trash bins in the model. If there is fewer trash bins they will get filled fast. The people who were too slow to find a bin have to litter their trash. When there is more trash bins people are able to find the bins quicker and dispose their trash. There is also more room and storage for trash when there is more bins. This prevents the trash from ending up being littered.

Achievement:

The most significant achievement in the project was being able to learn even more about netlogo programming. The team was also able to learn many things involving the environmental hazards of littering.

Acknowledgements:

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References

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