# When Yawning Attacks… Will You Be Ready?

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# Introduction

For the supercomputing challenge we decided to base our project on how yawning spreads. We all were intrigued by the fact that a popular rumor says that yawning spreads from person to person. Our group wanted to know if this rumor was true. So we modeled the spread of yawning and found that yawns do propagate. We also found other interesting facts. Yawns last for six seconds, some babies yawn in the womb, and almost all vertebrates yawn.

# Description of Project

We modeled the propagation of yawning using StarLogo TNG. As the basis of our model, we used some of the principals of the Paintball StarLogo TNG program. We modified the program quite a lot, but we got the general idea from the Paintball program. We used the idea of paintballs to model yawns, the launching of paintballs and the movement of the Yawner from the Paintball game as the basis of the model.

First we built a base model and then we added somethings. We kept the idea simple. We made sure that idea worked properly, and we fixed all the bugs we came across. Once we did that, we elaborated on that idea and turned those elaborations into layers on our base. In our model we used a Yawner Rabbit to start the yawning, yawns were paintballs, and the Mongeese were the yawnees. We had three different setups: one setup

was where the Mongeese were randomly scattered, and two setups were where the Mongeese were arranged in rows.

There were many problems we came across. Here are some of the more interesting ones. We would start out with one yawn and somehow it would turn out into multitudes! I mean like lines and lines. We finally fixed that one by killing the yawns if they hit the edge. Another problem was setting our 'classroom mode'. When we pressed 'classroom setup' the computer would freeze. We fixed that one by taking out some weird black blocks that were not working. Another problem was when the Mongeese were in rows. The Mongeese didn't move around and the yawns all went in one direction. We fixed this by making the Mongeese fidget.

# Description of Yawning Program

StarLogoTNG programs are made up of program blocks that are put together to create modules. StarLogo also allows you to create variables that can be used in the rest of the program. The modules used for our Yawning program were:

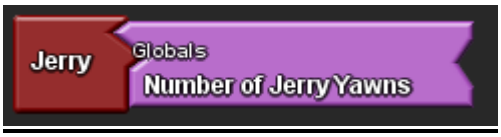
## Global Variables

### Yawning Probability

This is the probability that a yawn would propagate. This variable and the next variable can be changed while the program is running by using a slider.

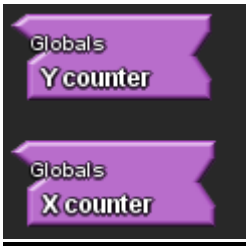

Number of Jerry Yawns

This is the number of yawns a Mongoose creates if it is going to yawn.




Y Counter and X Counter

These are counters used in the Classroom setups.

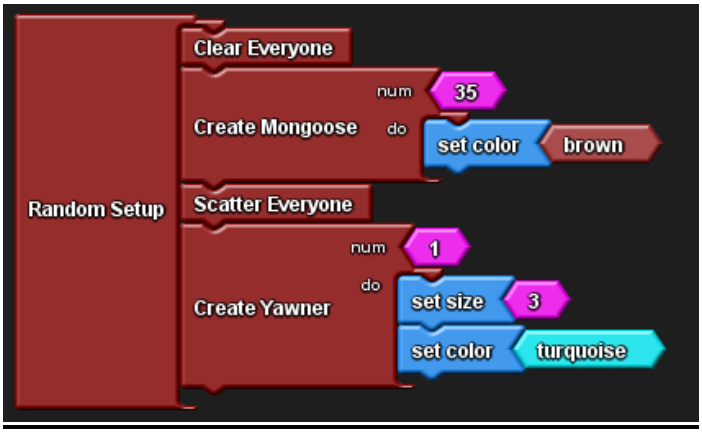



## Setup Modules

Setup puts the agents on the Spaceland plane in StarLogo TNG. There are three setup modules in our program.

Random Setup

The first setup module randomly scatters the Mongeese on the Spaceland plane. First we clear everyone, and then we create 35 brown Mongeese. Then we scatter everyone. Then we create a Yawner Rabbit –using the blocks Create Yawner 1, set size 3, and set the Yawner color turquoise.




Close Classroom Setup

This sets up the Mongeese in rows like a classroom. First it clears everyone. Then it sets its 'Y' counter to zero. After that it creates 7 Mongeese and sets their xcor to 0 and ycor to Y counter. It sets heading to 90, increments the Y counter to 2 and sets color to brown. Then it sets Y counter to 0. Repeat the '7 Mongeese' – 'sets Y counter' steps, change the 'xcor zero', which goes up by 15. Now create one size 3 turquoise Yawner at 4x xcor and 6 ycor. Set heading of the Yawner to 270.

Classroom setting:

Do same as 'close classroom setting' except it increases xcor by 10's not 5's.


Clear Everyone
Globals
set Y counter
0
Globals
set Y counter
0
num
7
do
Create Mongoose
xcor
0
set xy
ycor
Globals
Y counter
set heading
90
Globals
inc Y counter
2
set color
brown
Globals
set Y counter
0
num
7
do
Create Mongoose
xcor
5
set xy
ycor
Globals
Y counter
set heading
90
Globals
inc Y counter
2
set color
brown
Globals
set Y counter
0
num
7
do
Create Mongoose
xcor
10
set xy
ycor
Globals
Y counter
set heading
90
Globals
inc Y counter
2
set color
brown
Close Classroom Setup


num
1
do
Create Yawner
set size
3
set color
turquoise
xcor
48
set xy
ycor
6
set heading
270

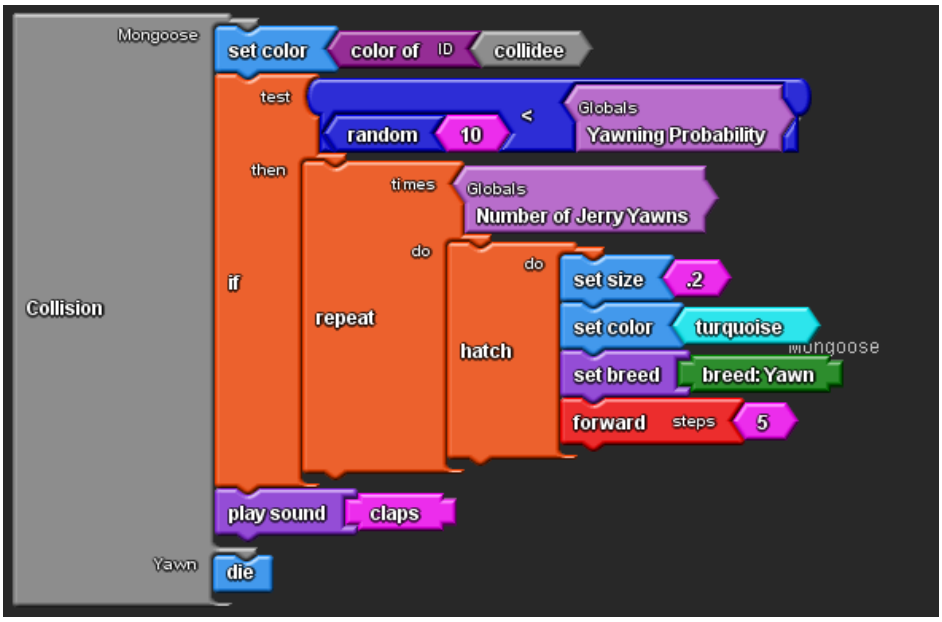
# Mongoose-Related Modules

## Mongoose Wander

This makes the Mongoose agents move forward 0.1 steps then turns left a random 20 degrees then right a random 20 degrees.


## Mongoose/Yawn Collision:

This module describes the collision between a Mongoose and a yawn. When those two collide, the Mongoose sets it's color to the color of the yawn, tests if a random number between 1 and 10 is less than the yawn probability and if it is, lets out how many yawns are said in the number of yawns and hatches those yawns at size 0.2 and color turquoise and the yawn moves forward 5 steps (repeated). And then the Mongoose plays the sound (claps). The yawn dies.



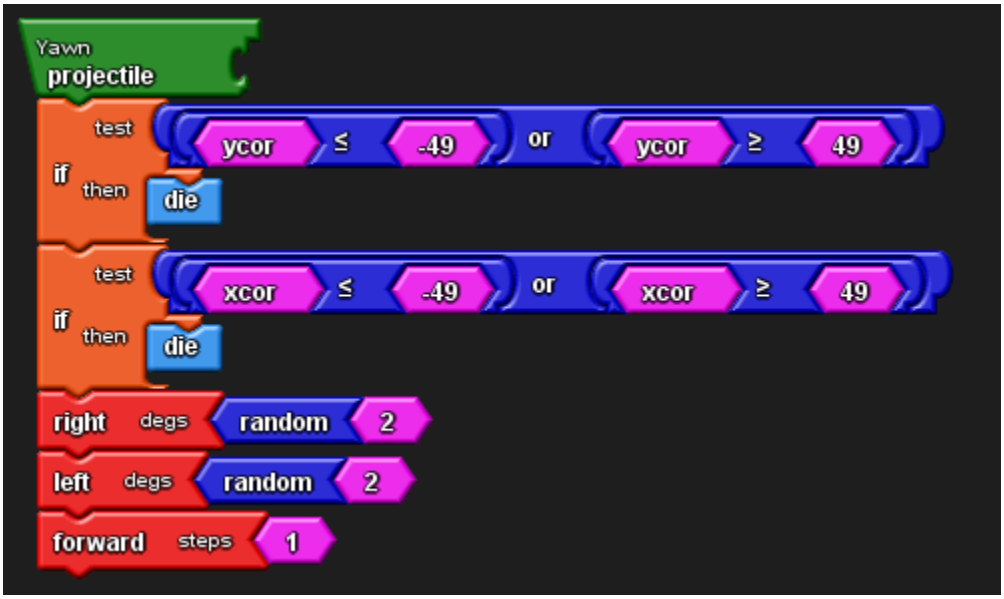

Mongoose Fidget:

This module is used only with the classroom setups. It lets the Mongoose face different directions so that the yawn does not have to fire straight ahead. Moves left random 360 and moves right randomly 360.


## Yawn Related Modules

Yawn Projectile:

The yawn tests if the ycor is less than –49 or if the ycor is greater than 49 and if it is, the yawn dies. The yawn also tests if the xcor is less than –49 or if the xcor is greater than 49 and if it is, it dies. If it is still alive, it turns right random 2 degrees then left random 2 degrees and forward one step.




## Yawner Related Modules

Yawner Move:

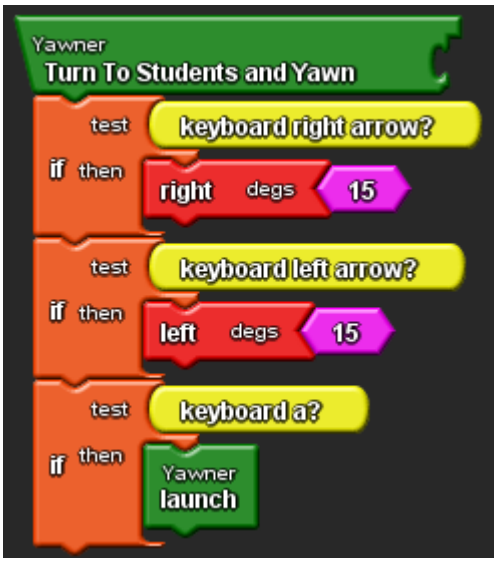
If keyboard and left arrow is pressed, Yawner turns left 5 degrees, right arrow turns right 5 degrees, if up arrow moves forward 2 steps, if down arrow back 2 steps.


Yawner Launch

Hatches a yawn if “a” is typed.

Yawner turns to students and yawn.

The Yawner tests if the right arrow key is pressed down, if so, the Yawner turns 15 degrees to the right. It then tests if the left arrow key is pressed down, if it is, the Yawner turns 1st to the left. Finally, it tests if the keyboard a is pressed down, if so, it launches a yawn (see “launch” in “Yawn”).




## Runtime Related Modules

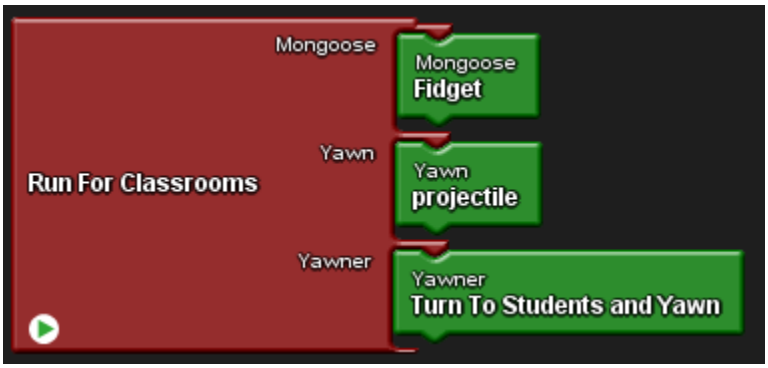
We have two types of run modules.

Run Module

This module runs the program when the Mongeese are randomly scattered. The Mongeese wander, Yawns are hatched, and the Yawner can be moved with keyboard controls.


Run for Classrooms

This module runs the program when the Mongeese are in the classroom setup. The big difference is that the Mongeese do not move; they fidget. Another difference is that the keyboard controls make the Yawner turn from side to side.



# Results

We had three different types of tests that we modeled. We ran each test 3 times and took the average of the results.

Test 1

Test 1 was a classroom setting with 7 columns and 5 rows of Mongeese. The rows are set at about two rows in between each row of Mongeese. The Yawner stands at the front (two rows in front of the first row of Mongeese) in front of the middle Mongoose. The Mongeese fidget back and forth.

| Data for Test 1 | | |
|---|---|---|
| Number of Initial Yawns | Yawning Probability | Average Number of People who yawned in 20 seconds |
| 5 | 5 | 3 |
| 10 | 5 | 1 |
| 5 | 10 | 5 |
| 10 | 10 | 4 |
| 0 | 0 | 1 |

Test 2

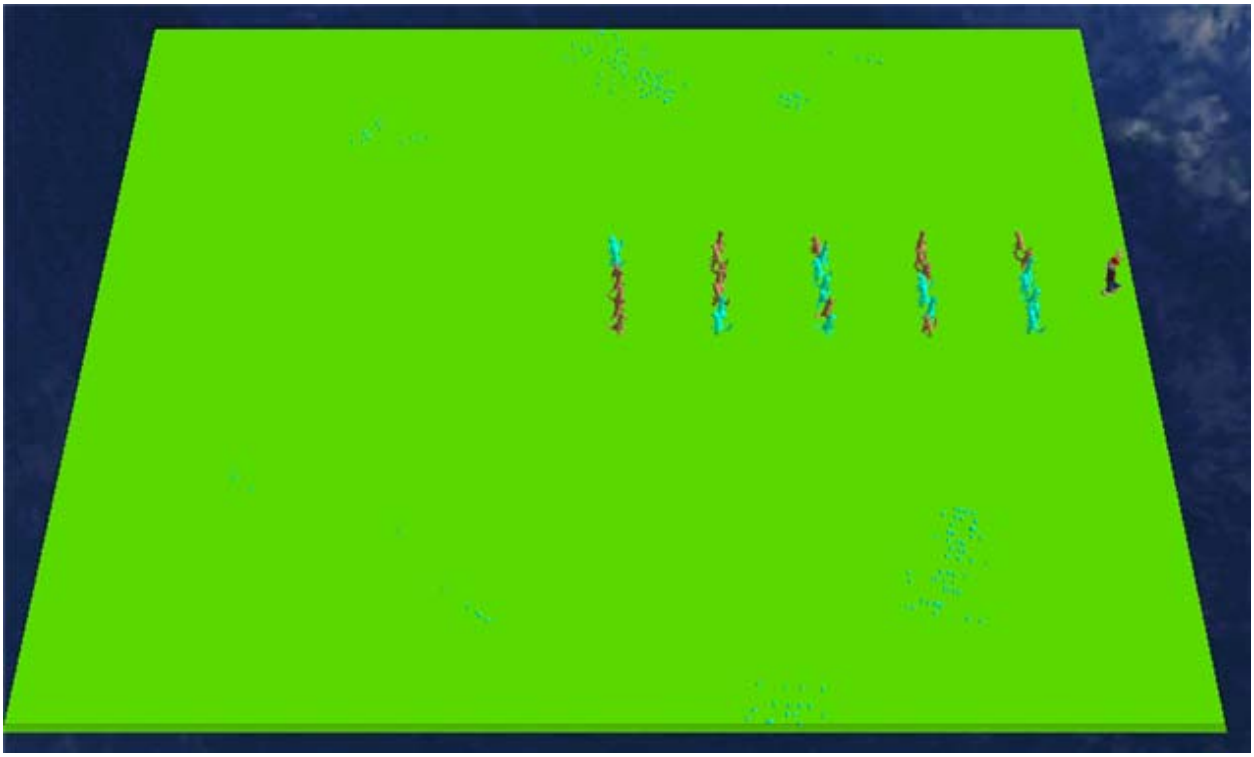
Test 2 was a classroom setting with 7 columns and 5 rows of Mongeese. These rows have less space in between the rows. The Yawner is front and center facing the middle/front Mongoose. It is one row away from the first row of Mongeese. The Mongeese fidget back and forth.

| Data for Test 2 | | |
|---|---|---|
| Number of Initial Yawns | Yawning Probability | Average Number of People who yawned in 20 seconds |
| 5 | 5 | 3 |
| 10 | 5 | 1 |
| 5 | 10 | 23 |
| 10 | 10 | 12 |
| 0 | 0 | 1 |

Test 3

Test 3 was a random setting with the Yawner in the exact middle. The Mongeese moved around randomly.

| Data for Test 2 | | |
|---|---|---|
| Number of Initial Yawns | Yawning Probability | Average Number of People who yawned in 20 seconds |
| 5 | 5 | 1 |
| 10 | 5 | 1 |
| 5 | 10 | 10 |
| 10 | 10 | 1 |
| 0 | 0 | 1 |



# Conclusions

After the series of tests that we did, we concluded that the yawns spread the fastest when Jerry Yawn (the number of yawns hatched) was set 5, the Yawn probability was set to 10 in all setup cases. The mast yawns were spread in twenty seconds in the close classroom environment under these settings. This gave us about 23 Mongeese who yawned. This was probably true because the Mongeese were closer together and stayed closer together.

# Recommendations

There are several things we would recommend to you before you attempt this program.

1. We would suggest that you program in these steps: First, make your basic program. Make sure all imperfections are perfected. Second, elaborate. Add small things onto your base. Keep perfecting and elaborating.
2. Try to get an experiment going so that you can compare real life experiments to programming.

# Bibliography


1. How Stuff Works, <http://health.howstuffworks.com/question572.htm>
2. Neuroscience for Kids
   <http://faculty.washington.edu/chudler/yawning.html>
3. Wikipedia, < http://en.wikipedia.org/wiki/Yawn>.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