Introduction

We are simulating channel occupancy with this Bozon simulator. The Bozon has two states either Sleeping or Yodeling (listening, broadcasting). To run the simulator we need to compile the simulator.c file which can be done with the following command:

```
gcc -o simulate simulate.c -lm
```

After successful compilation we can execute the program with the following command at terminal:

```
./simulate
```

Testing:

The program generates Bozons in sleeping state with random duration which are then is stored in a list Once all the Bozons are initialized we start the simulation loop.

We look for the smallest state duration of the Bozon state times, which is the event that will be the imminent occurring first. This value is then subtracted to all the duration values in the list of Bozons.

The current Bozons state is then flipped (if sleeping then yodeling, or if yodeling sleeping) and a new random duration is generated and appended based on its state.

This process then starts to repeat to find the smallest state duration until we reach the duration we indicated the simulation to run until.

Results

Small Bozon Colony (S = 100, Y = 10):

Total time observing channel:	1000000.000	
Idle time on the channel:	618765.200	61.87%
Melodious time on the channel:	311670.264	31.17%
Screech time on the channel:	69603.648	6.96%

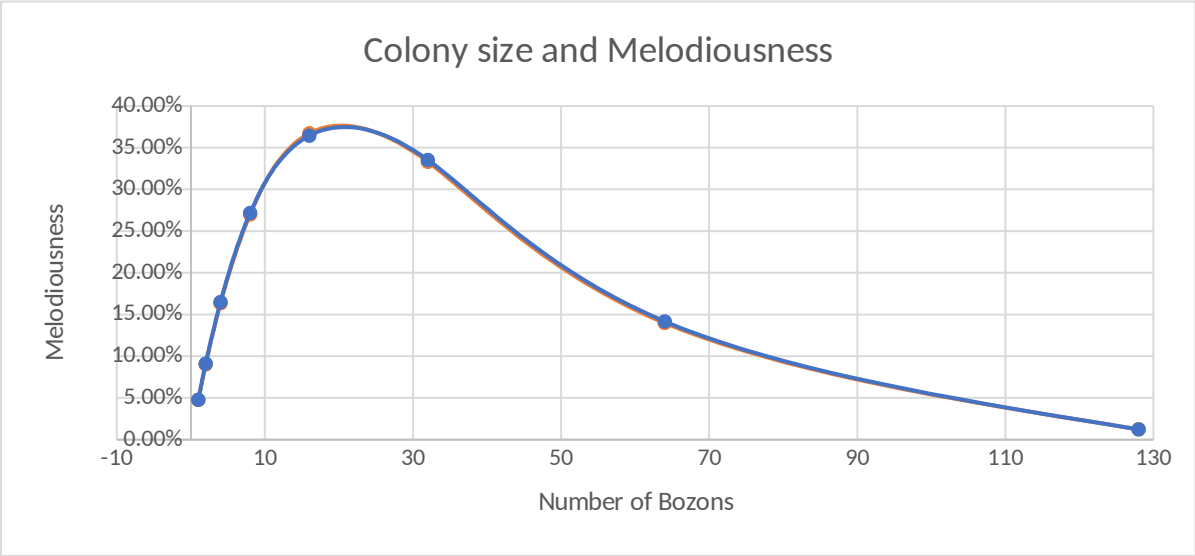
Optimal number of Bozons (S = 100, Y = 10):

M	Melodious Percentage
0	0.00%
1	9.05%
5	31.17%
10	38.43%
11	38.55%
12	38.24%
15	35.81%
25	23.04%
40	8.82%
65	1.35%
100	0.07%

From the data gathered through our simulation we conclude that at 11 Bozons the colony is the most melodious, at a rate of 38.55%.

Optimal number of Bozons (S = 200, Y = 10):

M	Melodious Percentage
1	4.78%
2	9.11%
4	16.49%
8	27.17%
16	36.44%
32	33.53%
64	14.17%
128	1.22%



Bonus (S = 200, Y fixed @ 10.0):

M	Melodious Percentage
1	4.77%
2	9.01%
4	16.34%
8	26.99%
16	36.73%
32	33.30%
64	13.98%
128	1.24%

Looking at the results we can say that the fixed time at 10 prefers slightly bigger Bozon colonies. At M=1 we have 4.78% with random time and 4.77% at fixed time, whereas at M=128 we have 1.22% for random and 1.24% at fixed time. But when I further examined it with more variables such as S=100 and Y=100, the opposite was true. This leads me to conclude that the melodious percentage is minimally affected.

Summery

In this assignment we implemented a Bozon protocol simulator. When testing out different values we can see that the Bozons prefer shorter sleep times to be more melodious from tables S=100 and S=200. But in further tests I examined increasing the yodel time which resulted in higher values but for a smaller size colony. So Varying the sleep time has an effect on the melodiousness of the colony and varying the yodel time has an effect on the melodiousness peak in relation to the colony size.