

## Abstract

The key concepts of this program were to create simulations with trail and error and multidimensional lists. This program is a two part simulation so what the first part of the program is meant to do is simulate an elephant population and find the different factors and the population distributions between the two population control methods, culling and contraceptives. The second part of the program was meant to see how many female elephants could get the contraceptive in order to stabilize the population without culling depending on different factors.

## Methods

In this project, one place I used computational thinking was modeling the survival and reproduction of elephants in the simulated population. To do this, I had to break the population down into different ages and genders and assign different survival probabilities to each group. I could simulate the real-world scenario where younger elephants have higher survival rates than seniors. This approach helped me show the elephant population in a way that was more similar to real life and make the simulation more realistic. This computational thinking allowed me to create a simulation that could be used to decide different techniques of regulating an elephant population based on different factors.

## Results

```
Project05 — -zsh — 80x24
Average Results:
Average total population: 1653.2166666666667
Average number of calves: 0.31666666666666665
Average number of juveniles: 61.125
Average number of adult males: 742.2
Average number of adult females: 733.8666666666667
Average number of seniors: 115.70833333333333
[svitakiran@Svitas-MacBook-Pro Project05 % python3 elephant.py 0.453 ]
Average Results:
Average total population: 6216.56
Average number of calves: 128.15
Average number of juveniles: 1183.81
Average number of adult males: 2343.895
Average number of adult females: 2348.935
Average number of seniors: 211.77
[svitakiran@Svitas-MacBook-Pro Project05 % python3 elephant.py 0.435 ]
Average Results:
Average total population: 7520.185
Average number of calves: 165.9
Average number of juveniles: 1508.37
Average number of adult males: 2844.39
Average number of adult females: 2761.555
Average number of seniors: 239.97
svitakiran@Svitas-MacBook-Pro Project05 %
```

```
[svitakiran@Svitas-MacBook-Pro Project05 % python3 elephant.py 0.435
Average Results:
Average total population: 7520.185
Average number of calves: 165.9
Average number of juveniles: 1508.37
Average number of adult males: 2844.39
Average number of adult females: 2761.555
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svitakiran@Svitas-MacBook-Pro Project05 % █
```

Fig. 1

As we can see in Fig. 1, the current darting probability used is 0.435 we can see the results generated from that probability. This outcome makes sense because first, the carrying capacity of this park is 7000 elephants, so the average total elephant population being around 7000 is correct. The elephant species increasing over time until seniority also makes sense because there are the least number of calves and as the age gets older, there are more juveniles and then most adult elephants. Then the numbers decrease again with seniors because they die out.

### **Reflection**

The program could be used to make real-world connections to population conservation of different species such as endangered ones or ones that are in abundance for their environment (like in this model) and the spread of diseases. This program could also help to understand the factors affecting endangered species' survival. Similarly, in disease spread, these models could help different measures during pandemics, which is related to our daily lives because it could be used for common illnesses like the flu.

### **Follow-up Questions**

1. Tuples and lists are similar but lists can be changed and edited. You can also add or remove items from lists but you can't do any of those things for tuples. Lists also use square brackets while tuples use rounded ones.
2. Using index names instead of numbers makes it easier to read and understand and reduces errors happening.
3. Errors would impact the simulation if the parameters were wrong because the simulation outcome numbers would also be wrong. I would ensure that it is providing reliable results by comparing it with other simulation data and real life data.

### **Extensions**

I originally attempted an extension but I am turning this in late now so I didn't end up doing the extension.

### **References/Acknowledgements**

I went to TA hours and got help from Yubin. I also got help during the lab period on wednesday from Professor Harper, Yubin again, and Madeline. I imported libraries random, stats, and sys. I also used online resources w3schools and stack overflow.