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**CS 152 – B**

**Project and Lab 5**

**Simulating the elephant population in Kruger National Park, South Africa project via python**

**Abstract:**

The project’s main goal is to simulate the elephant population in Kruger National Park. The park’s maximum capacity is 7000 elephants hence the simulation will project the current population and the number of Elephants that need to be culled or darted. The code also considers the survival rate for different age groups to account for natural death. furthermore, the project will also project the number of female elephants to be darted using contraceptives to maintain the population to minimize the number of elephants that have to be culled.

First, the program will assign characteristics to be given to every elephant individual in accordance with the odds. Those include age, gender, and pregnancy. Next, a list of the individuals will be created with each elephant carrying its characteristics. For the next few functions, the program will simulate the program and decide which elephant will survive, be culled, or get pregnant according to the appropriate odds. Following that, the program will simulate the population per month for a year. Lastly, the population will output the average number of the population for many simulations with the number of each gender and age group being present.

The program uses a wide range of programming tools, most notably multi-dimensional lists. To elaborate, it is a basic python programming principle, where lists can have lists inside, and the lists inside can even have lists inside. In this program, we used a list of all the parameters, many parameters like the population list, for instance, is a list that has a list inside (elephant list). They are very significant for allowing of creation multiple data structure formats such as linked lists and trees. Besides the multidimensional lists, the program also uses the random command in python, which allows for a certain number to appear according to a specified probability.

**Reflection**

The project is real evidence of the power of programming. Although the program was not complete accuracy and did not take into account diseases, healthcare, and many factors that could influence the survival of the elephants, it demonstrated that the results were still very realistic and do not deviate greatly from the average. Those programming tools are useful now more than ever in simulating rising seas level, temperature rising, and social issues(for example: unemployment) or wildlife management. This time of simulations frees resources and time and offers a safe way of collecting data and deciding future actions.

**Follow-up questions:**

1. **What is the difference between a tuple and a list?**

The main difference is that lists are changeable while tuples are not, in other words, lists are immutable while tuples are robust.

**2. Why is it helpful to use a variable like IDXNumYears instead of a number (e.g., 3)**

**when accessing a particular element of a list?**

Allows for easier code debugging and is helpful for code reuse.

1. **Where might you anticipate errors might be made in the simulation that would impact the results? How would ensure the final simulation model would produce reliable results to support well-informed wildlife conservation decisions about this elephant population?**

First, the main errors might arise by giving the parameters inaccurate or wrong values or by using the wrong parameter at the wrong place in the code. Also, random errors may include “<” wrong sign directions or appending the wrong value in the list. To eliminate the errors, it is important to divide the code into subprograms using code-splitting techniques, that we allow testing every individual function multiple times. To get realistic expectations, it would be helpful to look at previous results. Also to eliminate extreme simulation scenarios, it is important to repeat the simulation several times and take the average outcome.

**Reference:**

Aleksandra Avramenko, helped fix the main function

Magzhan tressov, fixed issues in my lab part

David Istrai helped me do simulate\_year function

Pramithus, Help within the lab part

Geeks for geeks website, multi dimensional data information