Food Web Visualization in an Ecosystem

Abstract

In an ecosystem there is a balance between prey, and predators. Effect in any of the species may result in a negative effect to that ecosystem. These effects may arise due to various natural causes such as disaster or forest fires. The idea was to take a note of a ecosystem and keep studying its species details. And alert the users in the case a species becomes too low in count and which species it is affecting.

Introduction

A food web (or food cycle) is the natural interconnection of food chains and a graphical representation (usually an image) of what-eats-what in an ecological community. Ecologists can broadly lump all life forms into one of two categories called trophic levels: 1) the autotrophs, and 2) the heterotrophs. The base or basal species in a food web are those species without prey and can include autotrophs or saprophytic detritivores (i.e., the community of decomposers in soil, biofilms, and periphyton). Feeding connections in the web are called trophic links. The number of trophic links per consumer is a measure of food web connections. Linkages connect to nodes in a food web, which are aggregates of biological taxa called trophic species. Trophic species are functional groups that have the same predators and prey in a food web. Common examples of an aggregated node in a food web might include parasites, microbes, decomposers, saprotrophs, consumers, or predators, each containing many species in a web that can otherwise be connected to other trophic species.

Our main objective is to create an application which stores information of all the species and represents them graphically on the application. For this there are various information needed such as:

1. The name of the species and the trophic levels they are already the part of. For e.g. plant are the autotrophs etc.
2. The edge is a directed line with head on the predator and tail on the prey
3. The count of each species in the ecosystem which represents the node size.

4. We also need an annual growth rate which represents how many animals will be left after a year by calculating it from birth rate and dead rate.

All this information will be used to represent our system graphically. We are also going to consider the various sources for taking information about the species. We also can register accidents such as forest fires and other natural disasters which will tell about the loss of animals.

Software Requirements and Specifications

2.1 Product Perspective:

The purpose of this project is to provide a proper graphical representation of the various species, maintain their count and register accidents so that in case of natural disasters or forest fires we can look about the loss of species and take proper measures to save the species from becoming endangered or extinct. It is useful if we want to study the interconnectivity of the various species in the ecosystem and see what the alternatives of food for a species are.

2.2 Specific Requirements

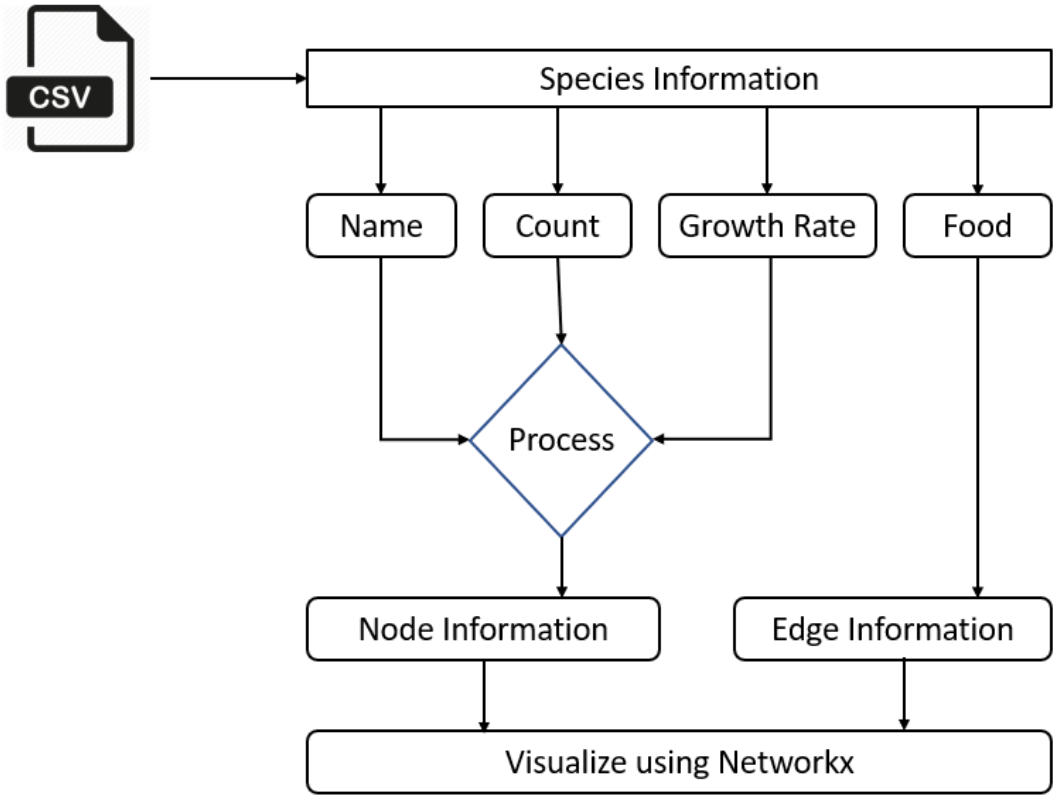
This whole project work is develop using the Jupyter Notebook, in which we are using Python language and using various libraries such as networkx, matplotlib, NumPy etc. As the product the application developed by us can be used in mobile or computers. In that scenario the whole internal working will be abstracted from the actual users of the application.

2.3 Design Constraints

The networkx library is being used for visually displaying the graph, as it is better for representing directed graphs which is fast and is representing various nodes where each node represents a species.

Design Strategy

First, we had to study about a geographical area regarding the species that are found in there and had to collect all the data regarding their preys and predators as well. Other information such as their birth rate and death rate were also calculated. After studying these data, we implemented it into a GUI based application to visualize it efficiently.



Future Work

The networkx library being used is showing a cluttered when there are a lot of species so various other libraries would be used to visualize it. Furthermore, we can also implement various designing strategies and add information on nodes such that on hover it will tell it count and on click it will give the species information along with its image.

Conclusion

The work of food web representation in an ecosystem is a research-based project work which keeps on taking its own course along the whole timeline of work. We have to learn various aspects of many libraries and packages so as to implement our product efficiently as well effectively.