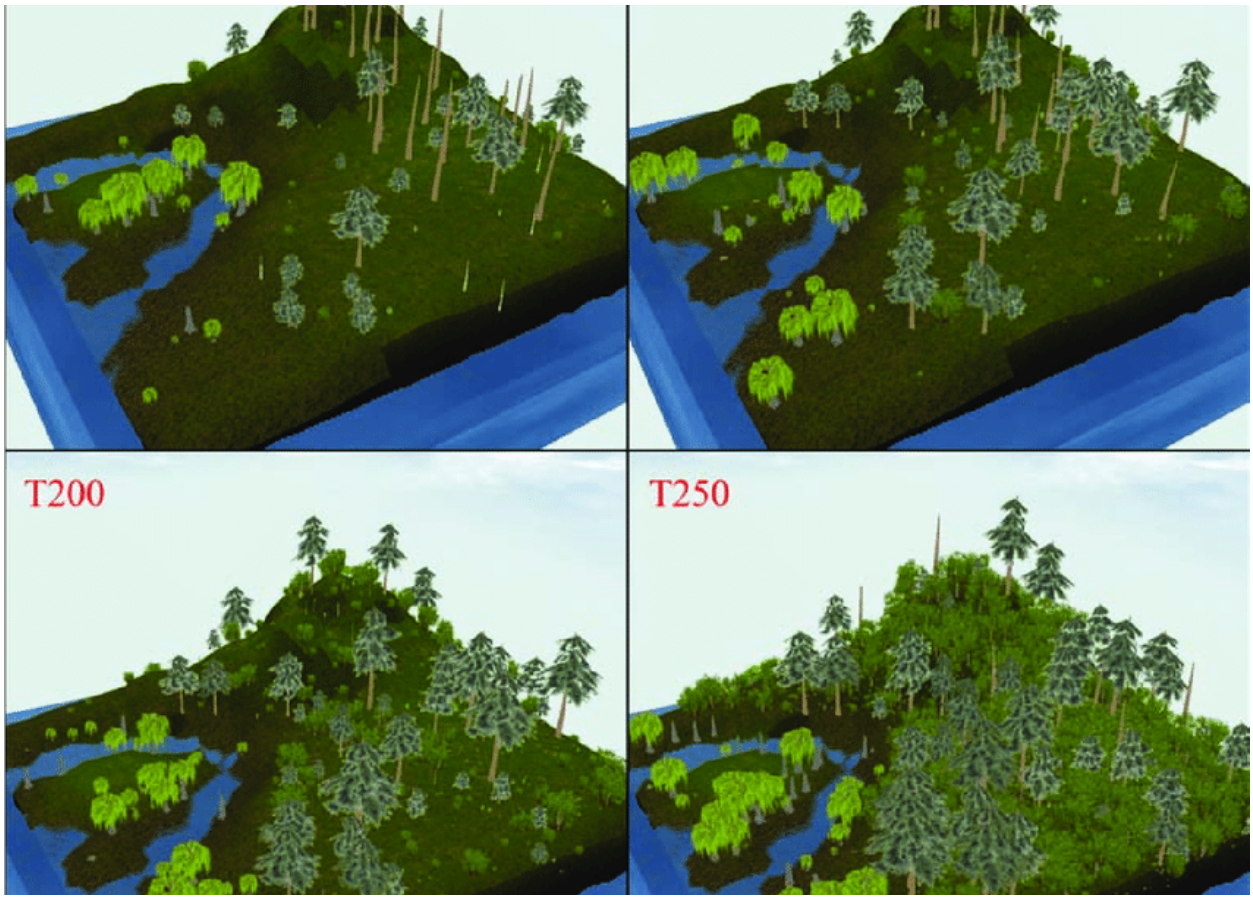
Data Simulation Lab
18B17CI473

Project Report: Ecosystem Simulation with SimPy

Abstract



This project aims to simulate an ecosystem using SimPy, a process-based discrete-event simulation framework in Python. The simulation models the interactions between plants, herbivores, and predators within the ecosystem. The objectives were to understand the

dynamics of the ecosystem, observe the effects of varying organism populations, and explore the concept of ecological interactions.

Introduction

The ecosystem simulation project focuses on studying the relationships and behaviors of organisms within an artificial ecosystem. By implementing a simulation model using SimPy, we aimed to analyze how plants, herbivores, and predators interact and influence each other's populations and overall dynamics.

Methodology

The simulation was implemented using the SimPy library in Python. The ecosystem was represented by classes for plants, herbivores, and predators, each inheriting from a base organism class. The interactions between organisms were defined within the ecosystem class, which managed the simulation environment and time steps.

Results and Analysis

The simulation was executed with initial populations of 10 plants, 5 herbivores, and 2 predators. The simulation run for 10 time units yielded the following results:

- The plant population exhibited growth over time, with each plant increasing its size by 1 unit per time step.
- Herbivores consumed plants to satisfy their hunger, resetting their hunger levels to zero.
- Predators hunted and ate smaller organisms, resetting their hunger levels as well.

The simulation demonstrated the dynamic nature of the ecosystem, with organisms experiencing hunger and growth. The interactions between herbivores, plants, and predators affected the populations and survival of each organism type.

Discussion

The ecosystem simulation provided insights into the interdependencies and interplays within an artificial ecosystem. By manipulating parameters such as initial populations, growth rates, and size thresholds, we can observe how changes impact the ecosystem's stability, species composition, and overall dynamics.

The simulation's simplicity and abstraction enable quick experimentation with different scenarios and exploration of various ecological concepts. It serves as a foundation for further research and more complex ecosystem simulations.

Conclusion

The ecosystem simulation project successfully implemented a basic ecosystem model using SimPy. The simulation allowed for the observation and analysis of plant growth, herbivore feeding, and predator-prey interactions. It provides a starting point for studying and understanding the dynamics of ecological systems and exploring how changes in parameters can impact ecosystem behavior. Future work may involve extending the simulation to incorporate additional organism types, introducing environmental factors, or implementing more advanced ecological concepts to enhance the realism of the model.