Finding the Difference Between Cartesian Coordinates and Polar Coordinates in Predator-Prey with Agent-based Modeling

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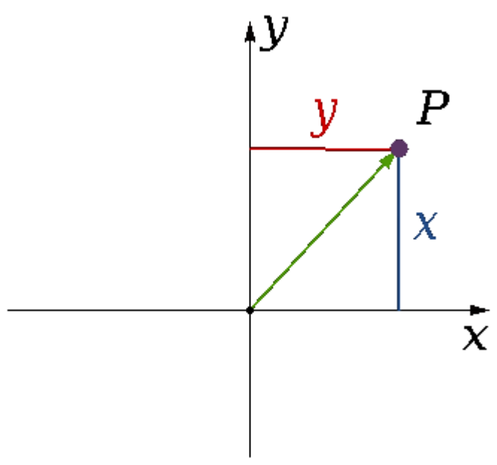
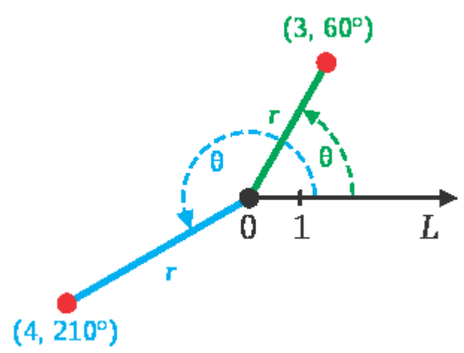
Abstract

This project aims to use an agent-based system to model a multiple-predator multiple-prey system, and then find an equation to ascertain the number of predators and prey at any point in time.



Cartesian



Polar

http://upload.wikimedia.org/wikipedia/commons/4/49/Coord_XY.svg

http://upload.wikimedia.org/wikipedia/commons/1/11/CircularCoordinates.svg

Background

Understanding of different ways to model population and a cursory understanding of the Lotka-Volterra equations is essential to understand population modeling in general The Lotka-Volterra equations are a set of differential equations governing how population behaves when the two interact with each other. It assumes simple exponential growth/decay for each group, the predator and the prey, and adds a factor to decrease, for the prey, or increase, for the predator, the populations based on interactions between the two populations. Polar and Cartesian are the two most common ways to express coordinates in two dimensions. Cartesian expresses coordinates in terms of x, horizontal distance traveled, and y, vertical distance traveled. Polar expresses coordinates in terms of r, distance from the origin, and \theta, counterclockwise angle from the Polar axis, the x-axis in Cartesian.

Procedure

Python will be used to implement the simulations and collect the data using TKinter for a graphical model. After this is complete, differences, if any, between the models will be found. Currently, neither program is finished, although the polar program is almost done.

Results

This project should find any differences between choosing Polar and Cartesian for representing the predator-prey system. This will hopefully help when trying to pick a coordinate system to run a Predator-Prey model in. Potentially, this could be expanded to any agent-based modeling simulation.

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