NUMERICAL METHODS IN THE SOLUTION OF DELAY DIFFERENTIAL EQUATIONS IN THE STUDY OF POPULATION DYNAMICS

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The sudden population decay seen in Easter Island has always been a fascinating case for archeologists and historians. Due to the island's relative isolation from the rest of world and thus its limited number of natural resources it is possible to construct a mathematical model to describe the population decay seen there. For a model to the problem to be complete and accurate it must illustrate a population growing faster and harvesting natural resources (food, timber) quicker than the environment can replenish them and once the breaking point is reached the model must collapse down to a baseline. Following in the work of Dr. Basener and Ross, regular mathematical models such as the predator-prey model can be modified to overcome earlier shortcomings in their ability to show sudden population decay. To try and match the archeological data, delay differential equations and numerical analysis will be used to capture the sudden collapse of the population. We will generalize an Adams-Bashforth technique for delay differential equations and investigate different possible modifications of the mathematical model discovered by Basener and Ross.