Modeling and Simulation, CS302

Lab-3

Due Date -Sunday 7th, February.

1. Consider a model of population growth in which apart from the constraint due to population there is also harvesting. Consider the following situations of harvesting:

   (a) a constant harvesting with rate h.

   (b) harvesting depending on the instantaneous population with rate ϵ.

   Using logistic equation as the base model of population growth analyze the two situations and present your conclusions in the context of population of a species.

2. Logistic equation may be considered to be over simplified since it predicts that any initial population over zero leads to a non zero final population. A more realistic situation would be that a nonzero final population results *only* if the initial population is above a threshold. Refine the logistic model to accommodate this feature and then extend your analysis of 1 above to this situation.

Important Points

- In all the models above there will be multiple constants. To reduce the number of free parameters you should try to make the equation dimensionless. The results should however, present the discussion in the context of the free parameters.
- In the first model try to qualitatively capture all the possible behavior that the model presents. Identity if there is something nonphysical and comment on them.
- In the second model you should attempt to come up with a minimalist model. The class discussion would have to be extended and results should be presented in comparison with the logistic model.