Guided Study Program in System Dynamics
System Dynamics in Education Project
System Dynamics Group
MIT Sloan School of Management[1]

Assignment #30

Reading Assignment:

Please read the following paper:

- Properties of Damped Oscillations Systems, by Helen Zhu (D-4767)

Exercises:

1. Properties of Damped Oscillations Systems

Please read "Properties of Damped Oscillations Systems" (D-4767). This paper dampens the first model in "Oscillating Systems II: Sustained Oscillations" (D-4602). In this exercise, you study a damped version of the second model in "Oscillating Systems II: Sustained Oscillations" (D-4602).

After reading "Properties of Damped Oscillations Systems" (D-4767) please refer back to "Oscillating Systems II: Sustained Oscillations" (D-4602), and re-read the description of the Cleanliness of a College Dorm Room model.

Kevin's roommate is not the only one who grows sick of seeing all of Kevin's laundry on the floor. Eventually Kevin realizes that he himself is unable to find the papers that he needs for class or the pizza that he had ordered the night before. Kevin can really only tolerate a maximum of eight articles of clothing on the floor before his messiness begins to impede his lifestyle. When Kevin changes his clothes, he either drops them on the floor or, if he feels that his floor is too cluttered, goes to the trouble of putting them away.

A. Change the Cleanliness of a College Dorm Room model to reflect Kevin's reaction to excessive laundry buildup. In your assignment solutions document, include the model diagram, documented equations, and graphs of the model behavior. Explain the behavior of the model in one or two paragraphs, contrasting the behavior of this model and the behavior of the model in the paper.

B. How would the behavior of the model change if Kevin dropped his clothes on the floor more frequently? Why? Justify your answers with graphs of model behavior.

C. How would the behavior of the model change if Kevin's tolerance for laundry on his floor increased? Why? Justify your answers with graphs of model behavior.

2. Independent Modeling Exercise

[excerpts from "The Essential Element of Fire" by Michael Parfit, *National Geographic*, September 1996, removed due to copyright restrictions]

Conceptualize and formulate a system dynamics model that addresses the problem of overprotection of forests by demonstrating the long-term costs of fighting forest fires.

We would like to encourage you to begin by reading the above *National Geographic* article in its entirety, if possible. Feel free to also refer to other sources in order to conceptualize and formulate the model. In your assignment solutions document, include the model diagram, documented equations, and graphs of model behavior. In a few paragraphs, explain why the system and the model produce the observed behavior. In the model documentation, make sure to explicitly state where you obtained the data for the parameters in the model. If you estimate the parameters, include proof that your model generates consistent and realistic behavior over the range of realistic parameter values, and explain why that range is, indeed, realistic. Then use the model to propose a cost-minimizing policy for fighting forest fires that takes into account both short-term and long-term effects.