

3936117 SCAM/M : MAJOR : APPLIED MATHEMATICS;  
M.Sc. (APPLIED MATHEMATICS)

KEY WORDS : CHAOS / FEEDBACK CONTROL LAW / HARVESTING  
KOLMOGOROV TYPE MODEL / REPLENISHMENT

ADOON PANSUWAN : CHAOS AND CONTROL ACTION IN A  
KOLMOGOROV TYPE MODEL FOR FOOD WEBS WITH HARVESTING OR  
REPLENISHMENT. THESIS ADVISORS : YONGWIMON LENBURY, Ph.D.,  
NARDTIDA TUMRASVIN, M.S., 84p. ISBN 974-662-257-9

In this thesis, we apply the feedback decoupling technique to a Kolmogorov type model for three species food webs with harvesting or replenishment. A feedback control law is derived to decouple the effect of the predators from the prey dynamics. We found that the necessary and sufficient condition for the existence of the decoupling control law relies on the persistence of the prey population and the fact that the specific growth rate of prey depends explicitly on the superpredator population density at any moment in time. We show that, without any control action of regulate replenishment or harvesting, irregular or chaotic behavior is possible in such a process for certain ranges of the system parameters. This is illustrated by the construction of a bifurcation diagram for a model of three species food webs with response functions of the Holling type. To make the system output or variables less sensitive to irregular disturbances, the feedback control technique is applied which produces the desirable effect of stabilizing the system.