明治大学先端数理科学インスティテュート

MIMS現象数理カフェセミナー

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Optimal resource utilization in internal stochasticity

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Abstract: Life history of organisms is exposed to uncertainty generated by internal and external stochasticities. Internal stochasticity is generated by the randomness in each individual life history, such as randomness in food intake, genetic character and size growth rate, whereas external stochasticity is due to the environment. For instance, it is known that the external stochasticity tends to affect population growth rate negatively. It has been shown in a recent theoretical study that internal stochasticity can affect population growth rate positively or negatively. However, internal stochasticity has not been the main subject of researches.

 Taking account of effect of internal stochasticity on the population growth rate, the fittest organism has the optimal control of life history affected by the stochasticity in the habitat. The study of this control is known as the optimal life schedule problems. In order to analyze the optimal control under internal stochasticity, we need to make use of "Stochastic Control Theory" in the optimal life schedule problem. There is, however, no such kind of theory unifying optimal life history and internal stochasticity. This study focuses on an extension of optimal life schedule problems to unify control theory of internal stochasticity into linear demographic models. we apply our theory to a two-resource utilization model for semelparity. Consequently, we show that the diversity of resources is important for species in a case.

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