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OPTIMAL CONTROL OF A PREDATOR-PREY SYSTEM BASED ON AGE DEPENDENT AND WEIGHTED SIZE*

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Abstract. This work analyzes the optimal control of predator-prey system with fertility and mortality depending on age and weighted size. We demonstrate existence of solution of the optimal control problem using Mazur's Theorem, and by means of normal cone, we obtain the first order necessary condition of optimality for problem. Our conclusion generalizes many results in the literatures.

Keywords. predator-prey system; optimal control; age dependent; weighted size; Mazur's Theorem.

References

[1] S. Anita, *Analysis and Control of Age-Dependent Population Dynamics,* Dordrecht: Kluwer Academic Publishers, 2000.

[2] He Zherong, Wang Miansen, " Optimal birth control problem for a nonlinear population dynamics with age-structure and immigration ," *Mathematica Applicata* , Vol. 16, pp. 136-142, 2003.

[3] Zhao Chun, Wang Miansen, He Zerong, Zhao Ping,"Well posedness and optimial control problems for a class of periodic population dynamic,"*Math.Appl.*,Vol. 17, pp. 551-556, 2004.

[4] Zhixue Luo, Zerong He, Wantong Li, "Optimial birth control for predator-prey system of there species with age-structure ," *Applied Mathematics and Computation*,Vol. 155, pp. 665-685, 2004.

[5] He Zherong, " Optimal birth control of age dependent competitive species," *J.Math.Anal.Appl.* , Vol. 29, pp. 286-301, 2004.

[6] Luo Zhixue, Wang Miansen, "Optimal harvesting control problem for linear periodic age-dependent population dynamic system," *Acta Mathematica Scientia* , Vol. 25, pp. 905-912, 2005.

[7] Zhao Chun, Wang Miansen, Zhao Ping,"The well posedness and the optimial havesting problem for a class of population dynamic," *J. sys. Sci. Math. Scis.*,Vol. 25, pp. 1-12, 2005.

[8] He Zerong, "Optimal Harvesting for an Age-structured Predator-prey System," *Mathematica Applicata*, Vol. 26, pp. 467-483, 2006.

[9] He Zerong,Zhu Guangtian, "Optimal harvesting for a Population System Based on Age Distribution and Weighted Size," *Advances in Mathematics*, Vol. 35, pp. 315-324, 2006.

[10] Luo Zhixue, "Optimal control for periodic age-dependent population dynamics," *Journal of Biomathematics* , Vol. 22, pp. 53-58, 2007.

[11] Luo zhixue, " Optimal Harvesting Control for a Predator-Prey System with Age-dependent," *Mathematics in Practice and Theory* , Vol. 37, pp. 115-120, 2007.

[12] Gu Jianjun, Lu Dianchen, Wang Xiaoming, "Optimial havesting for predator-prey system of there species with spatial-diffusion and age-structure ," *Mathematics in Practice and Theory*,Vol. 38, pp. 101-108, 2008.

[13] Luo Zhixue,Guo Jinsheng, " Optimal harvesting for three competing species with age-dependent and diffusion," *Advances in Mathematics*, Vol. 38, pp. 209-219, 2009.

[14] Xu Chunrong , Zhao Chun,"Optimial inputting rate control of n species nonlinear competing system ," *Journal of Tian Normal University(Natural Seience Edition)*,Vol. 30, pp. 1-6, 2010.

[15] Sun Hongyu, Zhao Chun," Well posedness of three competing species with age dependence," *Journal of Tian Normal University(Natural Seience Edition)*,Vol. 31, pp. 1-5, 2011.

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