

ON LIAPUNOV-TYPE INTEGRAL INEQUALITIES FOR THIRD ORDER DYNAMIC EQUATIONS ON TIME SCALES

Saroj Panigrahi

Department of Mathematics, University of Tennessee
Chattanooga TN 37403-2598, USA

Corresponding author email:panigrahi2008@gmail.com

Abstract. In this paper, Liapunov-type integral inequalities has been obtained for third order dynamic equations on time scales by using elementary analysis. A criterion for disconjugacy of third order dynamic equation is obtained in an interval $[a, \sigma(b)]$.

Keywords. Liapunov-type inequality, disconjugacy, third order dynamic equations.

AMS (MOS) subject classification: 34 C 10, 34 N 05.

References

- [1] R. Agarwal, M. Bohner and A. Peterson, Inequalities on time scales: A Survey, *Math. Ineq. Appl.* **4** (4) (2001), 535-557.
- [2] E. Akin, Boundary value problems for a differential equation on a measure chain, *Panamer. Math. J.* **10** (3) (2000), 17-30.
- [3] M. Bohner, A. Peterson, *Advances in Dynamic Equations on Time Scale*, Birkhäuser, 2002.
- [4] M. Bohner, S. Clark, J. Ridenhour, Liapunov inequalities for time scales, *J. of Inequal. Appl.* **7** (1) (2002), 61-77.
- [5] R. C. Brown, D. B. Hinton, Opial's inequality and oscillation of 2nd order equations, *Proc. Amer. Math. Soc.* **125** (1997), 1123-1129.
- [6] S. S. Cheng, A discrete analogue of the inequality of Liapunov, *Hokkaido Math. J.* **12** (1983), 105-112.
- [7] S. S. Cheng, Liapunov inequalities for differential and difference equations, *Fasc. Math.* **23** (1991), 25-41.
- [8] D. Çakmak, Liapunov-type integral inequalities for certain higher order differential equations, *Appl. Math. Comput.* **216** (2010), 368 - 373.
- [9] R. S. Dahiya, B. Singh, A Liapunov inequality and nonoscillation theorem for a second order nonlinear differential-difference equations, *J. Math. Phys. Sci.* **7** (1973), 163-170.
- [10] S. B. Eliason, A Liapunov inequality *J. Math. Anal. Appl.* **32** (1972), 461-466.
- [11] S. B. Eliason, A Liapunov inequality for a certain nonlinear differential equation, *J. London Math. Soc.* **2** (1970), 461-466.
- [12] S. B. Eliason, A Liapunov inequalities for certain second order functional differential equations, *SIAM J. Appl. Math.* **27** (1) (1974), 180-199.
- [13] G. Sh. Guseinov, B. Kayamkçalan, On disconjugacy criterion for second order dynamic equations on time scales, *J. Comput. Appl. Math.* **141** (1-2) (2002), 187-196.
- [14] P. Hartman, *Ordinary Differential Equations*, Wiley, New york, 1964 an Birkhäuser, Boston, 1982 MR 30 1270.
- [15] S. Hilger, *Ein Maßkettenkalkül mit Anwendung auf Zentrumsmannigfaltigkeiten*, Ph. D. Thesis, Universität Würzburg, 1988.
- [16] B. Karpuz, B. Kayamkçalan, and Ö. Öcalan, A generalization of Opial's inequality and applications to second-order dynamic equations, *Differ. Equ. Dyn. Syst.* **18** (1-2) (2010), 11-18.
- [17] M. K. Kwong, On Liapunov's inequality for disfocality, *J. Math. Anal. Appl.* **83** (1981), 486-494.
- [18] A. M. Liapunov, Probleme général de la stabilité du mouvement (French translation of Russian paper dated 1893), *Ann. Fac. Sci. Univ. Toulouse*, **2** (1907) 27 - 247, Reprinted as *Ann. Math. Studies.* **17**, Prineton, 1947.
- [19] B. G. Pachpatte, On Liapunov-type inequalities for certain higher order differential equations, *J. Math. Anal. Appl.* **195** (1995), 527-536.
- [20] B. G. Pachpatte, Liapunov-type integral inequalities for certain differential equations, *Georgian. Math. J.* **4** (2) (1997), 139-148.
- [21] B. G. Pachpatte, Inequalities related to the zeros of solutions of certain second order differential equations, *Facta Universitatis. Ser. Math. Inform.* **16** (2001), 35-44.
- [22] S. Panigrahi, Liapunov-type integral inequalities of certain higher order differential equations, *Electron. J. Differ. Equ.* **28** (2009), 1-14.
- [23] N. Parhi, S. Panigrahi, On Liapunov-type inequality for third order differential equations, *J. Math. Anal. Appl.* **233** (2) (1999), 445-460.
- [24] N. Parhi, S. Panigrahi, Liapunov-type inequality for higher order differential equations, *Math. Slovaca.* **52** (1) (2002), 31-46.

- [25] J. P. Pinasco, Lower bounds for eigen values of one-dimensional p-Laplacian, *Abstr. Appl. Anal.* 2004 **2** (2004), 147-153.
- [26] J. P. Pinasco, Comparison of eigenvalues for the p-Laplacian with integral inequalities, *Appl. Math Comput.* **182** (2006), 1399-1404.
- [27] S. H. Saker, Lyapunov inequalities for half-linear dynamic equations on time scales and disconjugacy, *Dynamics of Continuous Discrete and Impulsive System Series B : Applications and Algorithms*, **18** (2012), 149-161.
- [28] S. H. Saker, Opial's type inequalities on time scales and some applications, *Annales Polonci Mathematici*, **104** (3) (2012), 243-260
- [29] S. H. Saker, New inequalities of Opial's type on time scales and some of their applications, *Discrete Dynamics in Nature and society* Article Number: 362526 DOI : 10.150/2012/362526.

Received December 2011; revised December 2012.

<http://monotone.uwaterloo.ca/~journal/>