UNIVERSIDADE BEIRA INTERIOR

Departamento de Matemática
Centro de Matemática e Aplicações

Seminar

Reduction principle in the theory of stability of dynamic systems on time scales

Andrejs Reinfelds

(Institute of Mathematics and Computer Science - University of Latvia, Rīga, Latvia)

Abstract: In 1988 (Ph.D. thesis), Stefan Hilger introduced the calculus of time scale in order to unify continuous and discrete analysis (see [1]). Many results concerning differential equations carry over quite easily to corresponding results for difference equations, while other results seem to be completely different in nature from their continuous counterparts. The study of dynamic equations on time scales reveals such discrepancies, and helps avoid proving results twice, once for differential equations and once for difference equations.

We consider the dynamic system in a Banach space on unbounded above and below time scale:

$$\begin{cases} x^{\Delta} &= A(t)x + f(t,x,y), \\ y^{\Delta} &= B(t)y + g(t,x,y). \end{cases} \tag{1}$$

This system satisfies the conditions of integral separation with the separation constant ν, the integral contraction with the integral contraction constant μ, nonlinear terms are ε-Lipshitz, and the system has a trivial solution. We prove the theorem of asymptotic phase. Using this result and the centre manifold theorem we reduce the investigation of integral stability of the trivial solution of (1) to investigation of integral stability of the trivial solution of the reduced dynamic system

$$x^{\Delta} = A(t)x + f(t,x,u(t,x)).$$

This work was partially supported by the grant Nr. 345/2012 of the Latvian Council of Science.

References

[1] M. Bohner and A. Peterson, *Dynamic Equations on Time Scales. An Introduction with Applications*, Birkhäuser, Boston, Basel, Berlin, 2001.

[2] A. Reinfelds and L. Sermone, Stability of impulsive differential systems, *Abstract and Applied Analysis*, Vol. 2013, (2013), Article ID 253647, 11 pages.

[3] A. Reinfelds and Dz. Steinberga, Dynamical equivalence of quasilinear dynamic equations on time scales, *Journal of Mathematical Analysis*, Vol. 7, No. 1 (2016), pp. 115–120.

Dia: 13 de outubro de 2016, às 18:15h

Local: Sala de Reuniões, Departamento de Matemática, UBI

FCT Fundação para a Ciência e a Tecnologia
MINISTÉRIO DA EDUCAÇÃO E CIÊNCIA

Funded by the Portuguese Government through the FCT - Fundação para a Ciência e a Tecnologia under the project PEst-OE/MAT/UI0212/2013