Semistability of complex balanced kinetic systems with time delays

György Lipták[1,2], **Katalin M. Hangos**[1,2], **Mihály Pituk**[3], **Gábor Szederkényi**[1,4]

[1]*Institute for Computer Science and Control (MTA SZTAKI), Hungarian Academy of Sciences, Budapest, Hungary (e-mail: lipgyorgy@scl.sztaki.hu, hangos@scl.sztaki.hu, szederkenyi@itk.ppke.hu)*
[2]*Department of Electrical Engineering and Information Systems, University of Pannonia, Veszprém, Hungary*
[3]*Department of Mathematics, University of Pannonia, Veszprém, Hungary (e-mail: pitukm@almos.uni-pannon.hu)*
[4]*Faculty of Information Technology and Bionics, Pázmány Péter Catholic University, Budapest, Hungary*

In this talk we introduce a class of delayed kinetic systems derived from mass action type reaction network models. We define the time delayed positive stoichiometric compatibility classes and the notion of complex balanced time delayed kinetic systems. We prove the existence and uniqueness of equilibria within the time delayed positive stoichiometric compatibility classes. We prove the semistability of the equilibria for time delayed complex balanced sytems using an appropriate Lyapunov-Krasovskii functional and LaSalle's invariance principle. As a consequence, we show that every positive complex balanced equilibrium is locally asymptotically stable relative to its positive stoichiometric compatibility class.

[1] Haddad W. M., Chellaboina V., Hui Q., *Nonnegative and Compartmental Dynamical Systems*, Princeton University Press, Princeton, 2010.

[2] Lipták Gy., Hangos K. M., Pituk M., Szederkényi G., Semistability of complex balanced kinetic systems with time delays, *System & Control Letters* **114**:38–43, 2018.