Acta Societatis Mathematicae Latviensis
Abstracts of the 5th Latvian Mathematical Conference, April 6–7, 2004, Daugavpils, Latvia

ATTAINABILITY OF CENTRAL EXPONENTS OF A LINEAR SYSTEM UNDER SMALL IMPULSIVE PERTURBATIONS

ANDREI CAMYSHEV

Institute of Mathematics of Latvian Academy of Sciences and University of Latvia

Akadēmijas laukums 1, LV-1524, Rīga, Latvia

E-mail: camysh@lanet.lv

The report is focused on generalizing classical results by R. Vinograd [1] and Millionshchikov [2] on the best upper and lower estimates (they are the two central exponents) of all Lyapunov characteristic exponents of a linear system

$$\dot{x} = A(t)x, \tag{1}$$

where $x \in \mathbb{R}^n$, $A(t)$ is piecewise continuous and locally of bounded variation for $t \geq t_0$.

It is shown that the upper (lower) central exponent Ω (ω) is attainable under small impulsive perturbations satisfying certain conditions on the measure of impulses. Namely, we say that a function u is suitable if the following inequality holds true for some positive constant C

$$\inf_{s \geq t_0} \sup_{t \geq s} (t-s) e^{-\int_s^t d\tau + du^*(\tau)} \geq C,$$

where $du^*(\tau) = \ln|1 + du(\tau)|$.

Theorem 1. *Let u be suitable piecewise constant, right continuous, and locally of bounded variation for $t \geq t_0$. Then for any $\epsilon > 0$ there is such piecewise continuous $n \times n-$matrix function $B_\epsilon(t)$ $\|B_\epsilon\| < \epsilon$ so that the upper Lyapunov exponent of the perturbed system Λ*

$$\dot{x} = A(t)x,, \quad t \neq \tau_k, \quad x(\tau_k) = x(\tau_k-) + B_\epsilon(\tau_k)x(\tau_k-)du(\tau_k)$$

satisfies the inequality $\Lambda > \Omega - \epsilon$.

REFERENCES

[1] B.F. Bylov, R.E. Vinograd, D.M. Grobman and V.V. Nemyckii. *Theory of Liapunov characteristic numbers.* Moscow, 1966. (In Russian)

[2] V.M. Millionshchikov. A proof of the attainability of the central exponents of linear systems. *Sib. Math. J.*, **10** 1969, 69 – 73.