

# Block diagonally stable matrices

Isabel Braś<sup>1</sup>, Ana Catarina Carapito<sup>2</sup> and Paula Rocha<sup>3</sup>

<sup>1</sup>*University of Aveiro, Portugal*

<sup>2</sup>*University of Beira Interior, Portugal*

<sup>3</sup>*University of Porto, Portugal*

## Abstract

The square matrices  $A_1, \dots, A_N$  are said to be simultaneously stable if there exists a positive definite matrix  $P$  satisfying the Lyapunov inequalities  $A_i^T P + P A_i < 0$ , with  $i = 1, \dots, N$ . In this case,  $P$  is called a common Lyapunov solution (CLS) for the matrices  $A_i$ . The existence problem of a CLS for a set of matrices arises, for instance, in the stability analysis of a switched system, under arbitrary switching. In some situations the matrices  $A_i$  have naturally a block structure, where the correspondent diagonal blocks are themselves simultaneously stable. That is the case where parallel and series interconnected switched systems are in question. In this work, we investigate the existence of a CLS, with block diagonal structure, for matrices  $A_i$  with pre-specified block structure.

## Keywords

Lyapunov equation, Stability, Switched linear systems.

## References

- [1] Braś, I., A.C. Carapito, and P. Rocha. Block diagonally stable switched linear systems. In preparation.