# A NEW CHARACTERIZATION OF M-MATRIX AND APPLICATIONS

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## Abstract

The notion of accretive operator (see [1], [2]) plays an important part in the study of nonlinearsemigroups. According to this notion, we set up in the present study, essential properties of accretivity which allow to connect the set of linear accretive operators defined in a finite dimensional space with the set of M-matrix (see [3]). Such results allow us on one hand to make a link between various notions arising in nonlinear analysis and linear algebra and on the other hand to generalize some preliminaries results obtained in the characterization by accretive matrices of diagonally dominant matrices with positive diagonal entries (see [5], [4]). The previous result allows us to study two distinct kinds of applications :
- the first application concerns the convergence analysis of asynchronous subdomain methods for the solution of nonlinear boundary value problems,
- the second application concerns the Liapounov stability analysis of linear or some particular nonlinear evolution systems.

## References

[1] V. Barbu, Non linear semigroups and differential equations in Banach spaces, Noordhoff international publishing, 1976.

[2] Ph. Benilan, Equation d'évolution dans un espace de Banach quelconque et applications, Ph. D. Orsay, 1972.

[3] A. Berman and R.J. Plemmons, Nonnegative matrices in the mathematical sciences, SIAM, 1994.

[4] L. Giraud and P. Spiteri, Parallel solution of nonlinear boundary values problems, M.2.A.N., 25, 579-606, 1991.

[5] P. Spiteri, Contribution á l'étude de grands systèmes non linéaires- Comportement d'algorithmes itératifs et stabilité de systèmes continus, Ph. D. Besancon, 1984.