On Trotter–Kato type inductive limits in the category of C_0-semigroups

C. Budde [1]

Keywords: C_0-semigroups; Banach inductive limits;Trotter–Kato conditions.

MSC2020 codes: 47D06, 46M10, 46M15, 46M40

We will show that the category of C_0-semigroups possesses inductive limits under certain Trotter–Kato type conditions. Recently, the theory of C_0-semigroups firstly has been approached by A. Ng by means of category theory [2]. We want to jump on the bandwagon and continue the study of this approach. In particular, we want to study a specific construction the category theory of C_0-semigroups, the so-called inductive limits. We will, see that the typical Trotter–Kato approximation conditions appear naturally when constructing the desired limit. Evolution equations in their own right in connection with category already appeared earlier in the work of Liu [1]. Category theory in the framework of functional analysis appears in different areas and also with different perspectives, see for example [2,4].

References

[1] G.-Z. Liu. *Evolution equations and scales of Banach spaces*. Eindhoven: Techn. Univ. Eindhoven, 1989.

[2] P.W. Michor. *Functors and categories of Banach spaces. Tensor products, operator ideals and functors on categories of Banach spaces*, volume 651 of Lect. Notes Math. Springer, Cham, 1978.

[3] A.C.S. Ng. *A categorical approach to operator semigroups.* Semigroup Forum, 102(2):495–516, 2021.

[4] J. Wengenroth. *Derived Functors in Functional Analysis*, volume 1810 of Lecture Notes in Mathematics. Springer-Verlag Berlin Heidelberg New York, 2003.

[1]University of the Free State, Department of Mathematics and Applied Mathematics, South Africa, Bloemfontein. Email: BuddeCJ@ufs.ac.za