

## Report

on the activities associated in 2012 to the project  
PN-II-RU-TE-2011-3-0065 (contract 47/05.10.2011)

### Functors on Module Categories

**Budget: 249.998,77 lei**

#### (A) Activities

The activities were developed as in the initial project in the following way:

#### (I) Functors on module categories

We identified functors which are useful in the study of various module categories, and we studied various commuting properties for these functors.

The main research subject in this direction was the study of some commuting properties associated to the functors Hom and Ext, respectively to obtain various correspondences which are induced by these functors. In particular we studied classical results which can be described via universal properties associated to commuting properties (with respect to direct sums/products) of covariant and contravariant Hom and Ext functors (e.g. modules Ext-small or self-Ext-small), modules  $\Omega_1$ -finitely generated/presented). We finalized the following papers:

1. U. Albrecht, **S. Breaz**, P. Schultz, *Functorial properties of Hom and Ext*, in *Groups and Model Theory*, L. Strungmann (ed.) et al., Contemporary Mathematics, vol . 576 (2012), 1–15.
2. U. Albrecht, **S. Breaz**, P. Schultz: The Ext functor and self-sums, acceptată de *Forum Mathematicum*, DOI: 10.1515/forum-2011-0141.
3. **S. Crivei**, H. Inankıl, M.T. Koşan, G. Olteanu: Correspondences of coclosed submodules, acceptată de *Communications in Algebra*.
4. **Breaz, Simion**: Modules  $M$  such that  $\text{Ext}_R^1(M, -)$  commutes with direct limits, *Algebras and Representation Theory*, 10.1007/s10468-012-9382-y
5. **S. Crivei**, *Essential and retractable Galois connections*, accepte by Journal of Algebra and its Applications.

#### (II) Torsion and cotorsion classes

We studied various aspects concerning perpendicular classes and connections with closure properties with respect some categorial constructions: (filtered) colimits, limits, coprodunts, products etc. The main study was concerted to some deconstructibility properties associated to a cotorsion theory in various categories (e.g. module categories, homotopy categories associated to complexes of modules etc.) and to study Brown representability theorems for homotopy categories. We also studied connections with this kind of properties with various multialgebras categories. The papers we finalized in these directions are the following:

1. **G. C. Modoi:** A representability theorem for some huge abelian categories, *Homology, Homotopy and Applications*, 14(2) (2012), 23–36.

**(B) Conferences, workshops, and research seminars:**

1. **C. Vâlculescu:** *Young Algebraists' Conference 2012, EPFL Lausanne*, June 11-15, 2012

2. **C. Vâlculescu:** *Conferința și școala de vară Poisson 2012, Utrecht, Olanda*, July 23-27, 2012

3. **G.C. Modoi:** vizită de documentare de o zi la București, 23.03 – 24.03.2012

4. **G.C. Modoi:** ICRA 2012, Workshop; Univ. Bielefeld, 06.08 – 11.08.2012.

5. **S. Breaz:** ICRA 2012, Workshop; Univ. Bielefeld, 06.08 – 11.08.2012.

6. **S. Crivei:** ICRA 2012, Conference; Univ. Bielefeld, 06.08 – 11.08.2012., 13.08 – 13.08.2012; Talk: *One-sided exact categories*.

7. **C. Pelea:** *84th Workshop on General Algebra, June 8–10, 2012, Dresden*; Talk: Multialgebras, factor multialgebras and universal algebras

8. **C. Pelea:** *Conference on Universal Algebra and Lattice Theory, June 21–25, 2012, Szeged*; Talk: Term functions in multialgebra theory

9. **S. Breaz:** *Conference on Universal Algebra and Lattice Theory, June 21–25, 2012, Szeged*; Talk: Direct products and homomorphisms