Workshop
“Graph complexes, props and homotopy algebras”.
University of Luxembourg, 8-10 November 2017

Organizer: Sergei Merkulov
Place: room MNO-E06-0615350 (6B)
Speakers and titles:

8th November

10:00 - 11:00  Marko Zivkovic (University of Luxembourg)
"Graph complexes with arbitrary edge types"

11:00 - 12:00 Assar Andersson (University of Luxembourg)
"A family of exotic automorphisms of polyvector fields"

10th November

11:00 - 12:00 Vladimir Dotsenko (Trinity College Dublin)
"Algebraic structures of F-manifolds and pre-Lie algebras"

13:30 - 14:30 Anton Khoroshkin (High School of Economics, Moscow)
"On god-given relations in graded Hopf operads"

14:30 - 15:30 Nikita Markarian (High School of Economics, Moscow)
"Hodge structures on some operads and multizetas"

16:00 - 17:00 Sergei Merkulov (University of Luxembourg)
"Multidirected props and the Grothendieck-Teichmueller group"
Abstracts:

1. Assar Andersson, "A family of exotic automorphisms of polyvector fields"
Using a recently proven Stokes theorem for differential forms with logarithmic singularities we construct an explicit transcendental formula for universal two-parameter family of universal exotic Lie-infinity automorphisms of the Schouten algebra of polyvector fields of any manifold.

2. Vladimir Dotsenko, "Algebraic structures of F-manifolds and pre-Lie algebras"
F-manifolds (or weak Frobenius manifolds) were introduced by Hertling and Manin about 20 years ago. Algebraically, the structure of an F-manifold amounts to a commutative associative product on the tangent bundle of a manifold which is related to the Lie bracket of vector field by an algebraic identity weakening the Poisson identity. I shall explain that the operad controlling this arising algebraic structure (which too many people appeared really mysterious) is in the same relationship to the operad of pre-Lie algebras as the operad of Poisson algebras to the operad of associative algebras. Homotopical computations needed for the proof of this algebraic result exhibit an interesting connection to Merkulov's supergeometric approach to strong homotopy F-manifolds.

3. Anton Khoroshkin, "On god-given relations in graded Hopf operads"
The homology of an operad in topological spaces is a Hopf operad that is an operad in the category of commutative coalgebras. Assuming that (homological) degrees of primitive elements of a Hopf operad coincide we derive many quadratic relations for the generators of an operad as well as relations in the algebra of N-ary operations for each particular N. We will illustrate our results in some known examples and, in particular, we explain why the Hopf operad with one generator of degree 1 has to coincide with the Gerstenhaber operad.
4. Nikita Markarian, "Hodge structures on some operads and multizetas"

Firstly I will discuss the definition of an operad in the category of Hodge-Tate structures, which becomes the Gerstenhaber operad after applying the forgetful functor. To elaborate this definition it is natural to introduce some new operads I will define. Finally, I will show that the mentioned operad gives a cycle in some deformation complex. This cycle may be expressed in terms of multizetas.

5. Sergei Merkulov, "Multidirected props and the Grothendieck-Teichmueller group"

We introduce a new category of multidirected props whose representations (called homotopy algebras with branes) in a graded vector space require a choice of a collection of k linear subspaces, one for each extra direction. The deformation theory of such multidirected props is controlled in some cases by multidirected graphs complexes (in fact differential Lie algebras) introduced recently by Marko Zivkovic. We develop several de Rham field theories for such graph complexes producing their transcendental Maurer-Cartan elements, and show that in some cases gauge equivalences between such MC elements are classified by Drinfeld's associators.

6. Marko Zivkovic, "Graph complexes with arbitrary edge types"

I will introduce the general setting of defining graph complexes with edges decorated by arbitrary dg $S_2$ module, where non-trivial permutation switches the direction of the edge. Those complexes have two differentials, one that comes from the differential on dg $S_2$ module, and the standard one that comes from the edge contraction or vertex splitting. Multi-directed graph complexes and skeleton graph complexes whose edges represent a sequence of edges and 2-valent vertices can be seen as particular examples of this general definition.