Atlantic Association for Research in the Mathematical Sciences
Pacific Institute for the Mathematical Sciences
Memorial University of Newfoundland
Atlantic Algebra Centre
Network of Ontario Lie Theorists

August 12 – 16, 2019

International Workshop

Nonassociative Algebras and Geometry

Abstracts

Bonne Bay Marine Station of Memorial University of Newfoundland

Norris Point, NL

Seidon Alsaody

University of Alberta

alsaody@ualberta.ca

A geometric approach to exceptional Jordan algebras

Exceptional Jordan algebras, known as Albert algebras, are 27-dimensional nonassociative algebras that are key to the description of algebraic groups of type F_4, E_6, and beyond. I will talk about recent work where these algebras are approached in a geometric manner over commutative rings, using certain torsors, and show how the twists by these torsors are interpreted in terms of isotopy of Jordan algebras, octonions, compositions of quadratic forms, and triality.

$\infty\ \infty\ \infty\ \infty\ \infty\ \infty\ \infty\ \infty\ \infty\ \infty$

Ivan Arzhantsev

Higher School of Economics, Moscow

arjantsev@hse.ru

On lie algebras generated by vertical locally nilpotent vector fields

In 1970 in his seminal paper Demazure introduced toric varieties and described the automorphism group $\mathrm{Aut}(X)$ of a complete toric variety X. It follows from this description that $\mathrm{Aut}(X)$ is a linear algebraic group of type A. The latter means that the semisimple part of $\mathrm{Aut}(X)$ is locally isomorphic to the direct product of special linear groups SL.

In this talk we discuss vertical locally nilpotent vector fields on a normal variety endowed with an algebraic torus action. We find a combinatorial criterion for a finite set of such vector fileds to generate a finite-dimensional Lie algebra. Such a Lie algebra turns out to be a Lie algebra of type A. This result provides a generalization of Demazure's theorem to groups of automorphisms acting along torus orbits.

The talk is based on a joint work with Alvaro Liendo and Taras Stasyuk.

Tom Baird

Memorial University of Newfoundland

tbaird@mun.ca

E-polynomials of character varieties associated to a real curve

Given a Riemann surface Σ denote by

$$M_n(\mathbb{F}) := \mathrm{Hom}_\xi(\pi_1(\Sigma), \mathrm{GL}_n(\mathbb{F}))/\mathrm{GL}_n(\mathbb{F})$$

the ξ-twisted character variety for $\xi \in \mathbb{F}$ a n-th root of unity. An anti-holomorphic involution τ on Σ induces an involution on $M_n(\mathbb{F})$ such that the fixed point variety $M_n^\tau(\mathbb{F})$ can be identified with the character variety of "real representations" for the orbifold fundamental group $\pi_1(\Sigma, \tau)$. When $\mathbb{F} = \mathbb{C}$, $M_n(\mathbb{C})$ is a complex symplectic manifold and $M_n^\tau(\mathbb{C})$ embeds as a complex Lagrangian submanifold.

By counting points of $M_n(\mathbb{F}_q)$ for finite fields $\mathbb{F}_q$, Hausel and Rodriguez-Villegas determined the E-polynomial of $M_n(\mathbb{C})$ (a specialization of the mixed Hodge polynomial). I will show how the similar methods are used to calculate a generating function for the E-polynomial of $M_n^\tau(\mathbb{F}_q)$ using the representation theory of $\mathrm{GL}_n(\mathbb{F}_q)$. This is joint work with Michael Lennox Wong.

Yuly Billig

Carleton University

billig@math.carleton.ca

Representations of Lie algebras of vector fields on algebraic varieties

We study a category of representations of the Lie algebras of vector fields on affine algebraic variety X that admit a compatible action of the algebra of polynomial functions on X. We investigate two classes of simple modules in this category: gauge modules and Rudakov modules, and establish a covariant pairing between modules of these two types. We state a conjecture that gauge modules exhaust modules in this category that are finitely generated over the algebra of functions. We give a proof of this conjecture when X is the affine space. This is a joint work with Slava Futorny, Jonathan Nilsson, Andre Zaidan, Colin Ingalls and Amir Nasr.

$\infty \infty \infty \infty \infty \infty \infty \infty \infty \infty$

Yuly Billig

Carleton University

billig@math.carleton.ca

LieAlg Maple package for computations in infinite-dimensional Lie Theory

We will give an overview of LieAlg Maple[1] package for computations in infinite-dimensional graded Lie algebras, representations and vertex algebras. This is a joint work with Matyas Mazzag.

[1]Maple is a trademark of Waterloo Maple Inc.

Adèle Bourgeois

University of Ottawa

abour115@uottawa.ca

Bruhat-Tits theory for the structure of reductive groups over local fields

Let $\mathbb{G}$ be a reductive group defined over a local field F. The Bruhat-Tits building of $\mathbb{G}(F)$, denoted $\mathcal{B}(\mathbb{G}, F)$, has recently been proven essential for understanding the representation theory of $\mathbb{G}(F)$. In this talk, we will discuss how the Bruhat-Tits building is constructed, and see how this geometric object encapsulates the group structure of $\mathbb{G}(F)$, making it an indispensable tool.

$\infty\ \infty\ \infty\ \infty\ \infty\ \infty\ \infty\ \infty\ \infty\ \infty$

Caio De Naday Hornhardt

Memorial University of Newfoundland

cdnh22@mun.ca

Gradings on superinvolution-simple associative superalgebras

We will discuss the classification up to isomorphism of group gradings on finite dimensional superinvolution-simple superalgebras over an algebraically closed field of characteristic different from 2. As an application, this leads to a unified approach to the classification of gradings on the Lie superalgebras of series A, B, C, D, P and Q (some of which were obtained earlier using different methods). This talk is based on joint work with M. Kochetov.

Vyjayanthi Chari

University of California - Riverside, USA

vyjayanthichari@gmail.com

An introduction to cluster algebras and its connections with geometry, combinatorics and representation theory

Cluster Algebras were introduced by Fomin and Zelevinsky and are now a very active area of research and have many interesting connections and unexpected applications. In the first talk, we shall start with he definition of a cluster algebra and discuss well-known results in the case when the algebra is of Dynkin type. In the second lecture we shall discuss connections with categorification and representation theory.

Cristina Draper Fontanals

University of Malaga, Spain

cdf@uma.es

Distinguished affine connections on homogeneous contact manifolds
Part I and Part II

A smooth manifold M is said to be a G-homogeneous space when the Lie group G acts transitively on M. In this mini-course, we will review the relevance of homogeneous spaces in Geometry, and why algebraic tools are essential to study them. We will illustrate with many examples how representation theory will allow to construct geometric structures in such manifolds. A striking result by Ambrose and Singer characterizes the homogeneous semi-Riemannian spaces by the existence of certain affine connection with torsion parallelizing the curvature tensor.

Our main results in this field deal with connections with torsion on homogeneous spaces, mainly on some types of contact manifolds (Sasakian and 3-Sasakian). Nomizu's theorem gives the key to use again representation theory in our search of a *good* invariant affine connection, that is, adapted to the Sasakian geometries in some sense. These ideas come from E. Cartan, who introduced connections with torsion thinking that they could play an important role in gravity, and that the choice of the Levi-Civita connection, which is torsion-free, was not always justified.

Although the Sasakian homogeneous manifolds are not completely classified, an interesting family of examples are the odd-dimensional spheres, viewed as quotients of unitary groups, that is, thought as hypersurfaces of $\mathbb{C}^n$. Here, multiplying the normal vector field by the imaginary unit provides a Killing vector field jointly with some related tensors which help to write the connections provided by Nomizu's theorem as covariant derivatives. As usual, the most interesting examples appear in low dimensions, where it is possible to find affine connections with remarkable properties.

The spheres of dimension $4n + 3$ are also 3-Sasakian manifolds, viewed as quotients of symplectic groups and thought as hypersurfaces of $\mathbb{H}^n$. As the acting group is smaller, the geometry preserved is richer, and the corresponding set of invariant affine connections *with special properties* is very structured. In contrast with Sasakian geometry, 3-Sasakian simply-connected homogeneous manifolds are classified, and, remarkably, they are in bijective correspondence with simple (finite-dimensional) complex Lie algebras. It is surprising that these seemingly different families of manifolds can be studied in exactly the same way. Finally, 3-Sasakian geometry has inspired us to find a new family of Einstein manifolds based on simple symplectic triple systems.

References

[1] C. Draper, A. Garvín and F.J. Palomo, *Invariant affine connections on odd-dimensional spheres*, Ann. Glob. Anal. Geom. **49** (2016), 213–251.

[2] C. Draper, A. Garvín and F.J. Palomo, *Einstein with skew-torsion connections on Berger spheres*, J. Geom. Phys. **134** (2018), 133–141.

[3] C. Draper, M. Ortega and F.J. Palomo, *Affine Connections on 3-Sasakian Homogeneous Manifolds*, Math. Z. (2019). https://doi.org/10.1007/s00209-019-02304-x

[4] C. Draper, *Holonomy on 3-Sasakian homogeneous manifolds versus symplectic triple systems*, Preprint arXiv:1903.07815v1.

Alberto Elduque

University of Zaragoza, Spain

elduque@unizar.es

Graded-simple algebras and loop algebras

The loop algebra construction by Allison, Berman, Faulkner, and Pianzola, describes graded-central-simple algebras with split centroid in terms of central simple algebras graded by a quotient of the original grading group. This construction will be reviewed, and the restriction on the centroid will be removed, at the expense of allowing some deformations (cocycle twists) of the loop algebras.

References

[1] B. Allison, S. Berman, J. Faulkner, and A. Pianzola, *Realization of graded-simple algebras as loop algebras*, Forum Math. **20** (2008), no. 3, 395–432.

[2] A. Elduque, *Graded-simple algebras and cocycle twisted loop algebras*, arXiv: 1807.01041. To appear in Proc. Amer. Math. Soc.

Jörg Feldvoss

University of South Alabama, USA

jfeldvoss@southalabama.edu

Leibniz cohomology

Leibniz cohomology was introduced by Blo(c)h and Loday as a non-commutative analogue of Chevalley-Eilenberg cohomology for Lie algebras. It turned out that Leibniz cohomology works more generally for Leibniz algebras which are a non-(anti)commutative version of Lie algebras. Moreover, many results for Lie algebras have been shown to hold in this more general context.

In my talk I will explain the Leibniz analogues of several vanishing theorems for the Chevalley-Eilenberg cohomology of Lie algebras. In particular, we obtain the second Whitehead lemma for Leibniz algebras and the rigidity of finite-dimensional semi-simple Leibniz algebras in characteristic zero. The latter results were conjectured to be true for quite some time. Another consequence of our results is that contrary to the case of Lie algebras, a finite-dimensional semi-simple non-Lie Leibniz algebra in characteristic zero always has an outer derivation. In particular, the first Whitehead lemma does not hold for non-Lie Leibniz algebras. If time permits, we will also illustrate and complement our results by several examples.

Our main tools are the cohomological analogues of two spectral sequences of Pirashvili for Leibniz homology and a spectral sequence due to Beaudouin. Two of these spectral sequences are Leibniz analogues of the Hochschild-Serre spectral sequence and the third one relates the Leibniz cohomology and the Chevalley-Eilenberg cohomology of a Lie algebra.

This is joint work with Friedrich Wagemann (Université de Nantes, France).

2010 Mathematics Subject Classification: 17A32

Plamen Koshlukov

State University of Campinas, Brazil

plamen@ime.unicamp.br

Gradings on Grassmann algebras and their graded identities

Let E be the Grassmann algebra of an infinite dimensional vector space V over a field of characteristic 0, and let G be the group of order 2. A G-grading on E is homogeneous if V is a graded vector subspace of E. The homogeneous G-gradings on E as well as their graded identities were described by Di Vincenzo and Da Silva. We study non-homogeneous gradings. We consider several cases of such gradings, and describe the corresponding graded identities. It turns out that although the gradings are not homogeneous the graded identities are the same as in the homogeneous cases. We address several open problems concerning non-homogeneous gradings on E. The talk is based on a joint work with A. Araujo.

Karol Koziol

University of Alberta

kkoziol@ualberta.ca

Iwahori-Hecke algebras in the (mod-p) Local Langlands Program

For many years there has been great interest in the representation theory of p-adic Lie groups, due in part to its relationship with arithmetic questions via the Local Langlands Correspondence. When considering representations on vector spaces over the complex numbers, a classical result of Borel and Bernstein shows that the category of representations of a p-adic Lie group G generated by their Iwahori-invariant vectors is equivalent to the category of modules over the Iwahori-Hecke algebra H. This makes the algebra H an extremely useful tool in studying the complex representation theory of G. When the field of coefficients has characteristic p, this equivalence no longer holds; however, Schneider has shown that one can recover an equivalence after passing to derived categories, and upgrading H to a differential graded algebra. I'll survey some of these results, and describe various functorial constructions aimed at helping to understand Schneider's derived equivalence.

Alexei Krasilnikov

University of Brasilia, Brazil

alexei@unb.br

The identities of a Lie algebra viewed as a Lie ring

This is a joint work with Jorge Augusto Gonçalo de Brito.

Let F be a field of characteristic 0 and let M be the Lie algebra of the matrices of the form

$$M = \left\{ \begin{pmatrix} 0 & a_{12} & a_{13} \\ 0 & a_{22} & a_{23} \\ 0 & 0 & 0 \end{pmatrix} \mid a_{ij} \in F \right\}.$$

It follows from a result proved by Bryant and Vaughan-Lee in 1972 that the F-algebra M has a finite basis for its identities (as a Lie algebra over F). On the other hand, in 2009 the speaker proved that, viewed as a Lie ring (that is, as a Lie algebra over $\mathbb{Z}$), M has no any finite basis for its identities. However, these results were existence/nonexistence statements, neither a finite basis of the identities of M viewed as a Lie F-algebra nor an infinite basis of the identities of M viewed as a Lie ring were found.

The aim of my talk is to present explicitly these finite and infinite bases for the identities of M viewed as a Lie F-algebra and a Lie ring, respectively. I will also survey some other results related to the finite basis question for the identities of Lie algebras and rings.

Mitja Mastnak

Saint Mary's University

mmastnak@cs.smu.ca

Formal graded deformations and classification of Hopf algebras

I plan to discuss the theory of formal graded deformations for graded (by non-negative integers) Hopf algberas and how it relates to the lifting method. I will focus on the lack of obstructions in many of the known examples.

I will illustrate some of the tools by describng a recent joint work with G. Garcia and F. Fantino where we use a deformation-theoretic approach to classify all finite dimensional Hopf algebras whose coradical is the dual of the group algebra of a dihedral group (of order divisible by four).

Some connections to the theory of quantum Lie algebras and joint work with I. Angiono and M. Kochetov will also be mentioned.

∞ ∞ ∞ ∞ ∞ ∞ ∞ ∞ ∞ ∞

Joanna Meinel

University of Bonn, Germany
Deutsche Telekom AG

joanna@math.uni-bonn.de

Hochschild cohomology for graded algebras

Hochschild cohomology can be equipped with the structure of a graded Lie algebra via the Gerstenhaber bracket, which is usually hard to compute. We show how to approach this problem for graded algebras. Our methods are illustrated by a family of algebras given as quotients of path algebras of a cyclic quiver. In particular their first Hochschild cohomology is given by commuting copies of truncated Virasoro algebras. This is joint work with Nguyen, Pauwels, Redondo, Solotar.

Svea Nora Mierach

Memorial University of Newfoundland
University of Hamburg, Germany

snmierach@mun.ca

Hochschild cohomology, modular tensor categories and mapping class groups

It has been shown by V. Lyubashenko that the mapping class group of a surface of arbitrary genus and with an arbitrary number of boundary components acts projectively on certain spaces of homomorphisms in a modular tensor category. In this talk, we will construct a cochain complex for every surface such that the mapping class group of the surface acts projectively up to homotopy on this cochain complex and thus acts projectively on the cohomology groups of this cochain complex. In degree zero, this action agrees with Lyubashenko's original action.

This generalizes our previous article Hochschild cohomology and the modular group, where we constructed explicitly a projective action of the modular group, which is the mapping class group of the torus, on the Hochschild cohomology groups of a factorizable ribbon Hopf algebra. The talk is based on joint work with S. Lentner, C. Schweigert and Y. Sommerhuser.

Erhard Neher

University of Ottawa

neher@uottawa.ca

Steinberg groups for Jordan pairs

The talk will give an introduction to Steinberg groups for Jordan pairs, a theory developed in the recent book by Ottmar Loos and the speaker. It will not assume any prior knowledge of Jordan pairs or Steinberg groups.

Steinberg groups originated from Steinbergs presentation of the universal central extension of Chevalley groups over fields. Replacing fields (Steinbergs setting) by rings or rings with involutions one arrives at the definition of linear (type A) and unitary (type B, C, D) Steinberg groups. In favorable circumstances they are again the universal central extension of the elementary linear and elementary unitary groups. Until now, the theory for linear and unitary Steinberg groups and the corresponding classical elementary groups has been developed separately. The talks (and the books) main message is that one can unite the two theories by replacing rings and rings with involutions with Jordan pairs (generalizations of Jordan algebras). At the same time this allows for a simplification and a more concise formulation of the defining relations of Steinberg groups. It also allows one to treat new groups.

∞ ∞ ∞ ∞ ∞ ∞ ∞ ∞ ∞ ∞

Monica Nevins

University of Ottawa

mnevins@uottawa.ca

Branching rules and types for representations of p-adic groups

We give an overview of some interesting questions in the representation theory of p-adic groups, particularly those that relate to so-called types. We then describe recent progress on using the tools of Bruhat-Tits theory towards proving a uniqueness result for types of supercuspidal representations. This is joint work with Peter Latham, Kings College London.

Diogo Diniz Pereira da Silva e Silva[2]

Federal University of Campina Grande, Brazil

diogo@dme.ufcg.edu.br

Embeddings for the Jordan algebra of a bilinear form

Let K be a field of characteristic zero. C. Procesi proved in [3] that a formal inverse of the Cayley-Hamilton Theorem holds, more precisely, he proved that an algebra with trace can be embedded into the algebra of $n \times n$ matrices over a commutative algebra if and only if it satisfies the Cayley-Hamilton identity of degree n. Latter, in [1], A. Berele considered the embedding problem for algebras with trace and involution.

In this talk we discuss the analogous result for a Jordan algebra with a formal trace proved in [2]. Let B_n be the Jordan algebra of a non-degenerate symmetric bilinear form on a vector space of dimension n and let J be a Jordan algebra with trace. The main result in [2] is that there exists an associative and commutative algebra C such that J can be embedded into $B_n \otimes_K C$ if and only if J satisfies all trace identities of B_n. This is obtained from an extension, proved in [2], of the main result of [3]. As a consequence of these results we also prove that the verbal ideal of all trace identities of B_n satisfies the Specht property. This is joint work with *C. Fidelis* and *P. Koshlukov*.

References

[1] A. Berele, *Matrices with Involution and Invariant Theory*, J. Algebra **135 (1)** (1990), 139–164.

[2] C. Fidelis, D. Diniz, P. Koshlukov, *Embeddings for the Jordan algebra of a bilinear form*, Advances in Mathematics **337** (2018), 294–316.

[3] C. Procesi, *A Formal Inverse to the Cayley-Hamilton Theorem*, J. Algebra **107 (1)** (1987), 63–74.

[2]Supported by CNPq, grants 303822/2016-3, 406401/2016-0 and 421129/2018-2

Cameron Ruether

University of Ottawa

cruet042@uottawa.ca

Rost multipliers of lifted Kronecker tensor products

We extend techniques employed by Garibaldi to construct maps from the Cartesian product of symplectic or spin groups into Spin which are liftings of the Kronecker tensor product. We then produce various injections between central quotients induced by those liftings. In particular there are injections into half spin groups. Additionally, we discuss the Rost multipliers of the injections we have constructed.

∞ ∞ ∞ ∞ ∞ ∞ ∞ ∞ ∞ ∞

Ljudmila Sabinina

Autonomous University of the State of Morelos, Mexico

liudmila.sabinina@gmail.com

On the BL-algebras with the identity $J(x, y, zt) = 0$

The correspondence between analytic diassociatve loops and binary Lie algebras as well as the correspondence between analytic Moufang loops and Malcev algebras is well known. We will consider binary Lie algebras satisfying the identity $J(x, y, zt) = 0$, where $J(x, y, z) = x(yz) + z(xy) + y(zx)$, and will present some properties of these algebras. In particular, we will show that Levi and Malcev theorems are valid in our variety of binary Lie algebras. Note, that is not true for all binary Lie algebras. We will discuss the properties of Malcev algebras defined by the same identitiy $J(x, y, zt) = 0$. We will also see how these algebras could be used to solve certain problems in the theory of loops.

My talk is based on joint work with R. Carrillo-Catalan, O. Guajardo, A. Grishkov and M. Rasskazova.

Abdallah Abdul Karim Shihadeh

Memorial University of Newfoundland

aaks47@mun.ca

Graded modules over the simple Lie algebra $\mathfrak{sl}_2(\mathbb{C})$

In this talk we will present some results about the graded modules over the Lie algebra $\mathfrak{sl}_2(\mathbb{C})$. We start with the gradings of the torsion-free $\mathfrak{sl}_2(\mathbb{C})$-modules of rank 1. Then we focus on some new results about the torsion-free $\mathfrak{sl}_2(\mathbb{C})$-modules of rank 2. We construct a new family of torsion-free $\mathbb{Z}_2^2$-graded modules of rank 2. We show that "almost all" of these modules are simple. The remaining, reducible, modules in this family contain a unique maximal proper submodule, which is graded-simple. We also mention a general result about $\mathbb{Z}$-gradings of the simple torsion-free $\mathfrak{sl}_2(\mathbb{C})$-module of finite rank. Finally, we mention some new results about the decomposition of the Pauli graded module $M_\lambda^C \otimes V(2n)$. This is joint work with Yuri Bahturin.

$\infty\ \infty\ \infty\ \infty\ \infty\ \infty\ \infty\ \infty\ \infty\ \infty$

Yorck Sommerhäuser

Memorial University of Newfoundland

sommerh@mun.ca

New examples of Yetter-Drinfel'd Hopf algebras

We describe new examples of semisimple cocommutative Yetter-Drinfel'd Hopf algebras over finite abelian groups in which cores have special properties. In the case where the finite abelian group has prime order, cores are always completely trivial in the sense that both the action and the coaction of the finite abelian group on the core is trivial. As our example shows, this is not a general phenomenon: Although we conjecture that the core is always trivial, it is not always completely trivial in the sense just stated.

The examples that show this fact are eight-dimensional Yetter-Drinfel'd Hopf algebras over an elementary abelian group of order 4. The corresponding Radford biproducts are semisimple Hopf algebras of dimension 32 that are interesting in themselves, because they do not have some standard features of Hopf algebras of prime power dimension. The talk is based on joint work with Yevgenia Kashina.

Irina Sviridova

University of Brasilia, Brazil

I.Sviridova@mat.unb.br

Nil and nilpotency properties in graded rings

We would like to discuss the relations between nil and nilpotency properties in graded rings. More precisely, we consider associative rings, finitely graded by a left (right) cancellative monoid with the unit e. It is clear that the neutral component R_e is a subring of a ring R. This is a natural question in general how properties of R_e are related with properties of the whole ring R.

It is known, for example, that if A_e is a PI-algebra then A is a PI-algebra (an algebra satisfying some non-trivial polynomial identity), where A is an associative algebra over a field, graded by a finite group (see, e.g., [1], [2]).

We are interesting in the question, whether the condition R_e is nil implies that the whole ring R is nil. We present some results concerning to this question. Particularly, we prove that if R_e is nil and weakly commutative in some sense then R is nil. We also mention the nilpotency property and relations between nil and nilpotency properties of R_e and R. We present the corresponding generalization of the Ivanov-Dubnov-Nagata-Higman Theorem [3], [5], [4] for associative algebras over a field with a finite grading by an one-sided cancellative monoid. And we show how our question in the general situation is related with Koethes problem. We also consider some another applications of our results and technique.

The talk is based on a joint work with Antonio Marcos Duarte de França.
The authors are partially supported by CNPq and CAPES.

References

[1] Yu.A. Bahturin, A. Giambruno, D.M. Riley, Group-graded algebras with polynomial identities, Israel J. Math., 104(1998), 145155.

[2] J. Bergen, M. Cohen, Actions of commutative Hopf algebras, Bulletin of the London Math. Soc., 18(1986), no. 2, 159164.

[3] J. Dubnov, V. Ivanov, Sur labaissement du degr des polynmes en affineurs, CR (Doklady) Acad, Sci. USSR 41 (1943), 9698.

[4] G. Higman, On a conjecture of Nagata, Mathematical Proceedings of the Cambridge Ph. Soc., vol. 52, Cambridge Univ Press, 1956, pp. 14.

[5] M. Nagata, On the nilpotency of nil-algebras, Journal of the Math. Soc. of Japan 4 (1952), no. 3-4, 296301.

∞ ∞ ∞ ∞ ∞ ∞ ∞ ∞ ∞ ∞

Felipe Yasumura

State University of Maringá, Brazil

felipeyukihide@gmail.com

Group gradings on finite dimensional incidence algebras

We classify the group gradings on finite-dimensional incidence algebras over a field. Moreover, we investigate the structure of G-graded (D_1, D_2)-bimodules, where G is an abelian group, and D_1 and D_2 are the group algebra of finite subgroups of G. As a consequence, we can provide a more profound structure result concerning the gradings on the incidence algebras.