HARMONIC ANALYSIS ON A FINITE HOMOGENEOUS SPACE

FILIPPO TOLLI

Sommario. This is a joint work with Fabio Scarabotti (Università di Roma "La Sapienza"). We study harmonic analysis on finite homogeneous spaces whose associated permutation representation decomposes with multiplicity. After a careful look at Frobenius reciprocity and transitivity of induction, and the introduction of three types of spherical functions, we develop a theory of Gelfand Tsetlin bases for permutation representations. Then we study several concrete examples on the symmetric groups, generalizing the Gelfand pair of the Johnson scheme; we also consider statistical and probabilistic applications. After that, we consider the composition of two permutation representations, giving a non commutative generalization of the Gelfand pair associated with the ultrametric space; actually, we study the more general notion of crested product. Finally, we consider the exponentiation action, generalizing the decomposition of the Gelfand pair of the Hamming scheme; actually, we study a more general construction that we call wreath product of permutation representations, suggested by the study of finite lamplighter random walks. We give several examples of concrete decompositions of permutation representations and several explicit 'rules' of decomposition.

Riferimenti bibliografici

[1] T. Ceccherini-Silberstein, F. Scarabotti and F. Tolli, *Finite Gelfand pairs and their applications to Probability and Statistics*, J. Math. Sci. (New York), **141**, (2007), no. 2, 1182-1229.

[2] T. Ceccherini-Silberstein, F. Scarabotti and F. Tolli, *Trees, wreath products and finite Gelfand pairs*, Adv. Math. **206** (2006), no. 2, 503–537.

[3] T. Ceccherini-Silberstein, F. Scarabotti and F. Tolli, *Harmonic Analysis on Finite Groups*, Cambridge studies in avdanced mathematics **108** Cambridge University Press, 2008.

[4] F. Scarabotti and F. Tolli, *Spectral analysis of finite Markov chains with spherical symmetries*, Adv. in Appl. Math. **38** (2007), no. 4, 445–481.

[5] F. Scarabotti and F. Tolli, *Harmonic analysis of finite lamplighter random walks*, J. Dyn. Control Syst. **14** (2008), no. 2, 251-282.

Dipartimento di Matematica, Università Roma Tre, Largo San Leonardo Murialdo, 1, 00146 Roma, Italy

E-mail address: `tolli@mat.uniroma3.it`

Invariant real-valued gaussian fields on homogeneous spaces. Existence theorems and explicit constructions. The typical spacing in an invariant field. Density of zeroes for invariant smooth fields on homogeneous spaces. Bibliography. II Does the cerebellum use representations of the Galilei group ?Â This unied theory for real and p-adic groups reinforced his belief that harmonic analysis on a semisimple group was a special thing. At the end of his 1972 lecture series at the Williamstown conference, he told a story which he attributed to Chevalley. The story relates to the time before Genesis when God and his faithful servant, the Devil, were preparing to create the universe. Harmonic Analysis on Quantum Complex Hyperbolic Spaces 7 Remark 1. Let us explain the adjective â€˜finiteâ€™. If f is a finite function, T (f) is an operator with only a finite number of nonzero entries. However, we do not consider all possible finite functions (and, therefore, all operators with finite number of nonzero entries) but only Uq k-finite ones, cf. [5]. It was proved in [3] that Theorem 1. The representation T of D(Hn,m)q,k is faithful.Â [12] Molchanov V.F., Harmonic analysis on homogeneous spaces, Itogi Nauki i Tekhniki, Vol. 59, VINITI, Moscow, 1990, 5â€“144 (English transl.: Encycl. Math. Representation Theory and Harmonic Analysis of Wreath Products of Finite Groups. Harmonic analysis on some homogeneous spaces of fi Representation Theory and Harmonic Analysis of Wreath Products of Finite Groups. Representation Theory and Harmonic Analysis of Wreath Products of Finite Groups. Chapter. Chapter.Â Harmonic analysis on the composition of two permutation representations. In this section we examine the composition of two permutation representations. We give the rule for decomposition into irreducible representations and the formulas for the related spherical matrix coefficients.