LMS Midlands Regional Meeting
and
Workshop on C*-algebras
— Programme —

Nottingham, 6.9.–10.9.2010
14:00–15:00 Erik Christensen, Copenhagen

“Applications of noncommutative geometry to the study of fractal sets”

By Gelfand’s fundamental theorem the study of unital commutative C*-algebras is nothing but the study of compact Hausdorff spaces. We may then think of a non-commutative unital C*-algebra as a “non-commutative” compact Hausdorff space. The challenge is then to express topological or geometrical properties as algebraic structures for the ring of continuous functions on the space. In the talk I will describe how it is possible to describe a non commutative version of a differentiable structure via algebraic concepts, and then afterwards to go back and study fractal sets using these non commutative differentiable concepts on a set which is far from being smooth.

15:15–16:15 Siegfried Echterhoff, Münster

“The classification of noncommutative 2-spheres”
(joint work with Wolfgang Lück, Chris Phillips and Sam Walters)

The noncommutative 2-spheres are crossed products $A_0 times F$ of the non-commutative 2-tori $A_0$ by finite subgroups $F$ of $\text{SL}(2,\mathbb{Z})$. There has been quite some efforts over the last 20 years by various authors to compute the $K$-theory groups and give complete classification of these algebras. Now this problem has been completely solved by a combination of methods varying from the Baum-Connes conjecture for the computation of $K$-theory of (twisted) group algebras to the Elliott programme for the cassification of simple nuclear C*-algebras. As an outcome, we show that all noncommutative 2-spheres corresponding to irrational $\theta$ are AF-algebras (i.e., inductive limits of finite dimensional C*-algebras). In the world of non-commutative spaces this means that irrational non-commutative spheres are totally disconnected.

16:15–16:45 Coffee
16:45–17:45 Ilijas Farah, Toronto

"The complexity of the classification problem of nuclear C*-algebras"
(joint work with Andrew Toms and Asger Tornquist)

Elliott’s classification program of nuclear, simple, separable C*-algebras is one of the central topics in the study of C*-algebras. Kechris’s program of study of relative complexity of classification problems in mathematics is one of the central topics in contemporary descriptive set theory. Combination of these two programs resulted in some intriguing results. For example, classifiable C*-algebras are not classifiable by countable structures.

19:00 Dinner; The Hemsley Restaurant (located on campus)
Workshop on C*-algebras
Tuesday, 7.9.2010; Maths/Physics C27

09:30–10:15 Mikael Rørdam

“Purely infinite C*-algebras arising from crossed products with exact groups”

10:15–10:45 Coffee

10:45–11:30 Francesc Perera

“Monoids of lower semicontinuous functions with applications to the Cuntz semigroup”

11:40–12:25 Ilan Hirshberg

“Rokhlin actions and nuclear dimension”
I will discuss some recent joint work with W. Winter and J. Zacharias, showing that the property of having finite nuclear dimension is preserved under forming crossed products by finite groups or the integers satisfying a generalized Rokhlin property. For integer actions, this generalized Rokhlin property is generic (in the Baire category sense) for automorphisms of Z-absorbing C*-algebras.

14:30–15:15 George Elliott

“A Cuntz semigroup related invariant and its application to AT algebras”
Extending the result of Ciuperca and Elliott that (separable) AI algebras are classified by the Cuntz semigroup (together with a special element of this), if one adjoins to this invariant the metric group associated to each element of the Cuntz semigroup consisting of the group of unitaries of an associated hereditary sub-C*-algebra (with unit adjoined) divided by its commutator subgroup (already used in the proof of the classification theorem for simple AT algebras), then one obtains a classification of arbitrary (not necessarily simple) AT algebras. This is joint work with Alin Ciuperca, Leonel Robert, and Luis Santiago.
15:25–15:55 Leonel Robert

“Classification of inductive limits of 1-dimensional NCCW complexes”

I will discuss a classification result for inductive limits of 1-dimensional non-commutative CW complexes with trivial $K_{1}$-group. The classifying functor $Cu^-$ is defined in terms of the Cuntz semigroup of the unitization of the algebra. For the simple $C^*$-algebras covered by the classification, $Cu$ reduces to the ordered $K_0$-group, the cone of traces, and the pairing between them. As a consequence of the classification, it is shown that the crossed products of $O_2$ by a quasi-free action of $\mathbb{R}$ are all isomorphic for a dense set of positive irrational values of the parameter $\lambda$.

15:55–16:25 Coffee

16:25–16:55 Yasuhiko Sato

“Aperiodic automorphisms of nuclear $C^*$-algebras”

Based on Haagerup’s result for the amenability of nuclear $C^*$-algebras, Christensen, Sinclair, Smith, White, and Winter showed an intertwining argument between two close nuclear $C^*$-algebras. Concerning this result, by using the amenability, we give an intertwining argument between two automorphisms of a nuclear $C^*$-algebra with a unique tracial state.

17:05–17:35 Aaron Tikuisis

“$Cu(C(T, . ))$ as a $C^*$-algebra invariant”

Brown, Perera and Toms demonstrated that for simple, unital, Z-stable, finite $C^*$-algebras, the Cuntz semigroup contains the same information as the Elliott invariant minus the $K_1$ group. I will discuss my result that the Cuntz semigroup of $C(T,A)$ (where $T$ is the circle) contains the same information as the Elliott invariant of $A$, when $A$ is a simple unital, Z-stable ASH algebra. This is a fairly general result, as many important examples of $C^*$-algebras are ASH algebras, and conjecturally, every simple, nuclear, finite, unital $C^*$-algebra is an ASH algebra. The result suggests $Cu(C(T, . ))$ as a candidate as an invariant for clasifying $C^*$-algebras which escape classification by the Elliott invariant (such as certain non-simple algebras along with non-Z-stable simple ones).
Workshop on C*-algebras  
Wednesday, 8.9.2010; Maths/Physics C27

09:30–10:15 Martin Mathieu  
"C*-algebras of local multipliers"  
In joint work with Pere Ara (Barcelona) we study higher local multiplier algebras of separable C*-algebras and, in particular, provide necessary and sufficient conditions for the second local multiplier algebra to agree with the first for certain types of C*-algebras. This, in part, relies on our recently developed sheaf theory for C*-algebras.

10:15–10:45 Coffee

10:45–11:30 Stuart White  
"Near inclusions of C*-algebras"

11:40–12:10 Bhishan Jacelon  
"A simple, self-absorbing, stably projectionless C*-algebra"  
I will describe recent work on a certain C*-algebra which may come to play a role in the classification of simple, nuclear, stably projectionless C*-algebras. We will see how the work of several authors (in particular, a recent classification theorem of L. Robert) can be combined to prove a theorem about (most) crossed products of the Cuntz algebra $O_2$ by quasi-free actions of the real numbers.

12:15 Photo
14:30–15:15 Guihua Gong

“ASH-inductive limits: approximation by Elliott-Thomsen building blocks”

Elliott-Thomsen building blocks are special sub-algebras of finite direct sums of matrix algebras over intervals (with some restriction at the end points). Elliott and Thomsen use such building blocks to realize all the possible Elliott invariants for the case with weakly unperforated $K$-theory and torsion free $K_0$ groups, in particular, to realize all possible tracial state spaces and possible pairings. In this talk, we will present the following results: let $A = \lim(A_n, \phi_{n,m})$ be a unital inductive limit of recursive sub-homogeneous algebras with uniformly bounded dimension of local spectra, then for each $n$, if $m$ is large enough, then $\phi_{n,m} : A_n \to A_m$ can be approximated by a homomorphism $\psi : A_n \to A_m$ which factors through an Elliott-Thomsen building block (with finite $K_1$ group), at level of tracial state spaces. We will also present the classification theorem for unital simple inductive limits of such Elliott-Thomsen building blocks.

15:25–15:55 Allan Sinclair

“Length for C*-algebras”

15:55–16:25 Coffee

16:25–16:55 Simon Wassermann

Title t.b.a.

17:05–17:35 Christina Cerny

“A six-term cyclic exact sequence in KK-theory for the Toeplitz extension of higher rank Cuntz-Pimsner algebras”
09:30–10:15 Jean Renault

“Cartan subalgebras in C*-algebras”

The notion of Cartan subalgebra of a von Neumann algebra is classical and gives an explicit link with the ergodic theory of measured equivalence relations. There is a similar notion for C*-algebras which gives a link with topological dynamics. It is a useful tool to understand the structure theory of particular classes of C*-algebras, for example graph algebras. After a review of this notion, I will present some of its limitations (it cannot accommodate non-Hausdorff groupoids) but also some of its recent successes (the work of K. Thomsen on semi-étale groupoids).

10:15–10:45 Coffee

10:45–11:30 Joachim Cuntz

“Functoriality of ring C*-algebras and related questions”

11:40–12:25 Eberhard Kirchberg

“Spectra of C*-algebras and Extensions”

Some partial results concerning the following questions will be outlined, all related to the study of primitive ideal spaces of amenable C*-algebras and actions of lattices on them:

1) When comes an upper semi-continuous action of Prim(A) on (not necessarily exact) B from a morphism A → M(B) ?

2) Under which circumstances on the actions of a lattice is an exact sequence equivariant semisplit?

3) Suppose that P is a closed point of of a Dini space X, and that X-P is a homeomorphic to Prim(B) of some amenable B. Does there exist amenable A with X homeomorphic to Prim(A) ?

4) Are all coherent Dini spaces Spectra Prim(A) of amenable C*-algebras?
14:30–15:15 Chris Phillips

“Towards the classification of outer actions of finite groups on purely infinite algebras”

UCT Kirchberg algebras (purely infinite simple separable nuclear C*-algebras satisfying the Universal Coefficient Theorem) are known to be determined up to isomorphism by K-theoretic invariants. More recently, a K-theoretic classification has been given for actions of finite groups on such algebras satisfying the Rokhlin property. We describe progress toward such a classification under the much less restrictive condition that the action be pointwise outer, with the best results being possible when the group is cyclic of prime order.

15:15–15:45 Coffee

15:45–16:15 Andrew Hawkins

“Spectral triples on crossed products”

16:25–16:55 Karen Strung

“A Technique to show that certain C*-algebras are TAI after tensoring with a UHF algebra”

I outline a direct proof that if A is a separable simple unital and locally semihomogeneous C*-algebra with two extreme tracial states and U is a UHF algebra, then $A \otimes U$ is tracially approximately interval (TAI). I discuss the possibility of using this novel proof structure to prove the same theorem when A need only be locally subhomogeneous and where $T(A)$ may have any finite number of extreme points, with the aim of leading to classification results for such C*-algebras as Connes’ examples of transformation group C*-algebras of minimal dynamical systems of odd dimensional spheres.

17:05–17:35 Xin Li

“Ring C*-algebras and their K-theory”

We introduce C*-algebras naturally associated with rings. Moreover, we will see how to compute K-theory for these ring C*-algebras in the case of rings which are typically studied in number theory.

19:00 Dinner; Kayal Restaurant (located downtown)
Workshop on C*-algebras  
Friday, 10.9.2010; Chemistry C15

09:30–10:15 David Kerr  
“C*-algebras and finite approximation in dynamics”

10:15–10:45 Coffee

10:45–11:30 Takeshi Katsura  
“Approximate divisibility and the Rokhlin property for non-unital C*-algebras”

11:40–12:25 Ping Ng  
“On certain topological groups associated with operator algebras”

14:30–15:15 Adam Skalski  
“How noncommutative is noncommutative topological entropy?”

The notion of noncommutative topological entropy for automorphisms of (nuclear) C*-algebras was introduced in 1995 by Voiculescu as a generalisation of the topological entropy for continuous transformations of compact spaces. Most methods of computing the Voiculescu entropy are related to finding suitable commutative subsystems of noncommutative dynamical systems, which suggests a straightforward relation between the classical and quantum case. In this talk we will discuss some of the properties of the Voiculescu entropy and present recent examples related to bitstream shifts studied by Neshveyev and Stormer and to endomorphisms of Cuntz algebras which show that the connections between the commutative and noncommutative case are actually quite subtle.

15:15–15:45 Coffee
15:45–16:30 Søren Eilers

“Extensions of graph C*-algebras”

16:40–17:25 Nate Brown

“Dynamical systems associated to finite factors”

To a finite factor we associate a canonical topological space (built out of homomorphisms), which carries a natural action of the outer automorphism group. Quite surprisingly, this space has a “convex-like” structure – so we can define extreme points – and the group action is by “affine” homeomorphisms. This allows us to distinguish these new invariants in certain cases. For example, property (T) factors have the property that the extreme points are a discrete subset; this is not the case for certain free products. We also show that the dynamical systems associated to free group factors are all isomorphic.