1. Gongfest 2: Fedor's revenge

Thursday, 28 February 2013.

Time	Activity	Location	Title
10:30am	Morning tea	39C	
1:00pm	Adam Rennie	67.301	Unbounded unbounded Kasparov products
2:00pm	Dmitriy Zanin	67.301	Singular traces in symmetrically normed operator ideals
3:00pm	Coffee		
3:30pm	Dave Robertson	67.301	Group actions on C^*-correspondences
6:30pm	BBQ	Aidan's	Address will be announced

Friday, 1 March 2013.

Time	Activity	Location	Title
10:00am	Adam Sierakowski	67.301	Strongly purely infinite crossed products
11:00am	Breakout Session	67.301	
12:30am	Lunch		
2:00pm	Alexander Usachev	67.301	Dixmier traces generated by extended limits with additional invariance properties
3:00pm	Coffee		
3:30pm	Bram Mesland	67.301	Gauge theory, spectral triples and the unbounded Kasparov product

2. Abstracts

Bram Mesland: Gauge theory, spectral triples and the unbounded Kasparov product

Abstract: Unbounded KK-cycles with connection can be viewed a fibrations of spectral triples. When a noncommutative spectral triple is fibered, via such a cycle, over a commutative base, a natural setting for gauge theory presents itself. By considering gauge trnasformations that are implemented by fibrewise unitaries in the KK-cycle, the fact that commutative algebras do not possess nontrivial inner automorphisms is conveniently accounted for. Moreover, the connection allows for the distinction between horizontal and vertical differential forms on the spectral triple at hand. We will discuss this formalism for the noncommutative torus, and in the topologically nontrivial setting of the noncommutative 3-sphere. This is joint work with Simon Brain (Trieste) and Walter van Suijlekom (Nijmegen).

Alexander Usachev: Dixmier traces generated by extended limits with additional invariance properties

Abstract: Let l_∞ be the Banach space of all bounded sequences $x = (x_1, x_2, \ldots)$ with the uniform norm. Let $\mathcal{M}_{1,\infty}$ be an ideal of compact operators on an infinite-dimensional Hilbert space H with logarithmic divergence of the partial sums of their singular values.

Originally, J. Dixmier constructed a positive singular trace Tr_ω on $\mathcal{M}_{1,\infty}$ using dilation and translation invariant extended limit ω on l_∞.

There are several natural subclasses of Dixmier traces which are useful in noncommutative geometry. Initially, it was observed by A. Connes, that for any extended limit γ on l_∞ a functional $\omega := \gamma \circ M$ dilation invariant. Here M is a logarithmic Cesàro operator. The class of all Dixmier traces Tr_ω defined by such ω's is termed Connes-Dixmier traces.

Subsequently, various important formulae of noncommutative geometry have been frequently established for yet a smaller subset $\mathcal{D}_M$ of Connes-Dixmier traces, generated by M-invariant extended limit ω, that is when $\omega = \omega \circ M$.

In this talk we discuss the relations between various sublasses of Dixmier traces. In particular, we show that the three classes of Dixmier traces, Connes-Dixmier traces and $\mathcal{D}_M$ pairwise distinct.

This talk based on the joint work with F. Sukochev and D. Zanin.

Dmitriy Zanin: Singular traces in symmetrically normed operator ideals

Abstract: A trace of matrix is known from the basic course on linear algebra — it is a linear functional on the algebra $M_n(\mathbb{C})$ (the algebra of all $n \times n$ matrices) which is invariant with respect to conjugations. In particular, it is unitarily invariant.

Fredholm introduced a notion of trace in the setting of compact operators in the Hilbert space. This notion makes perfect sense on the ideal of nuclear operators. It was proved by Lidskii that classical Fredholm trace can be defined as follows

$$\mathrm{Tr}(A) = \sum_{k=0}^{\infty} \lambda(k, A).$$

Here, $\lambda(k, A)$, $k \geq 0$, is the sequence of all eigenvalues of the operator A.

It was unknown for a long time whether there are any other traces beyond the classical one. The first example was proposed by Dixmier — he introduced traces on Marcinkiewicz ideals of $B(H)$. Dixmier traces are known to be singular — that is, they vanish on every finite rank

operator.

Question 1. Which ideals of the algebra $B(H)$ carry a non-trivial trace?

Let us recall that ideal $\mathcal{I}$ of the algebra $B(H)$ is called symmetrically normed if

(1) $\mathcal{I}$ is equipped with a Banach norm $\|\cdot\|_{\mathcal{I}}$.
(2) If $A \in \mathcal{I}$ and $B \in B(H)$, then

$$\|AB\|_{\mathcal{I}} \leq \|A\|_{\mathcal{I}}\|B\|, \quad \|BA\|_{\mathcal{I}} \leq \|A\|_{\mathcal{I}}\|B\|.$$

All nontrivial ideals of $B(H)$ consist of compact operators.

A **Bounded** functional $\varphi : \mathcal{I} \to \mathbb{C}$ is called trace if $\varphi(AB) = \varphi(BA)$ for all $A \in \mathcal{I}$ and for all $B \in B(H)$.

Our main result follows.

Theorem 2.1. *Let $\mathcal{I} \neq \mathcal{L}_1$ be a symmetrically normed operator ideal. The following conditions are equivalent:*

(1) *There exists an operator $A \in \mathcal{I}$ such that*

$$\lim_{n\to\infty} \frac{1}{n}\|A^{\oplus n}\|_{\mathcal{I}} > 0.$$

(2) *There exists a singular trace on $\mathcal{I}$.*