Lecture 1: What is K-theory and what is it good for?
Lecture 2: Expanders, exact crossed-products, and K-theory for group C^* algebras

Paul Baum
Penn State University

Abstract

Lecture 1

This talk will consist of four points:

1. The basic definition of K-theory
2. A brief history of K-theory
3. Algebraic versus topological K-theory
4. The unity of K-theory

The talk is intended for non-specialists. Only a general mathematical background will be assumed.

Lecture 2

An expander is a sequence of finite graphs $X_1, X_2, X_3, \ldots$ which is efficiently connected. A discrete group G which"contains" an expander in its Cayley graph is a counter-example to the Baum-Connes (BC) conjecture with coefficients. M. Gromov outlined a method for constructing such a group G. Arjantseva and T. Delzant completed the construction. The group so obtained is known as the Gromov group and is the only known example of a non-exact group.

The left side of BC with coefficients "sees" any group as if the group were exact. This talk will indicate how to make a change in the right side of BC with coefficients so that the right side also "sees" any group as if the group were exact. This corrected form of BC with coefficients uses the unique minimal intermediate exact crossed-product.

For exact groups (i.e. all groups except the Gromov group) there is no change in BC with coefficients. In the corrected form of BC with coefficients the Gromov group acting on the coefficient algebra obtained from an expander is not a counter-example. Thus at the present time (April, 2013) there is no known counter-example to the corrected form of BC with coefficients.

The above is joint work with E. Kirchberg and R. Willett. This work is based on — and inspired by — a result of R. Willett and G. Yu.