Mini-course

Graph C*-algebras and symbolic dynamics

April 12, 2013

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Lecture 1: *An introduction to graph C*-algebras.*
April 12, 10:30h.

Lecture 2: *Symbolic dynamics: basic definitions and results*
April 12, 12:00h.

Lecture 3: *Symbolic dynamics and the classification of graph C*-algebras.*
April 12, 15:00h

Abstract. In these lectures, I will give an overview of the interrelations between the theory of symbolic dynamics and the classification of graph C*-algebras. In the first lecture, I will introduce graph C*-algebras, with special emphasis in the case of finite graphs, which is the case that will appear in the applications to symbolic dynamics. I will give some fundamental examples, and sketch some of the relationships between the structure of the graph and the structure of the corresponding graph C*-algebra. I will also define the concept of Leavitt path algebra of a directed graph, which is a natural dense $*$-subalgebra of the graph C*-algebra.

In the second lecture, I will introduce shifts and finite shifts, and I will describe some of the most useful equivalence relations for finite shifts, namely conjugacy, shift equivalence, strong shift equivalence and flow equivalence. For some of these equivalence relations, a computable complete invariant is known. I will describe these invariants, and I will give several examples.

In the third lecture, I will relate the classification of finite shifts with the classification question for graph C*-algebras and for Leavitt path algebras. Rørdam established a classification result for the graph C*-algebras of finite graphs whose adjacency matrices are essential and irreducible. This was a precursor of a very impressive result of Kirchberg and Phillips on the classification of separable, nuclear, purely infinite simple C*-algebras by K-theoretic invariants. The results of Rørdam imply that, for two isomorphic (or just strongly Morita equivalent) graph C*-algebras $C^*(E)$ and $C^*(F)$, the corresponding associated finite shifts are flow equivalent, but that the converse is not true. It is an open question whether this relationship translates exactly to Leavitt path algebras. Time permitting, we will discuss some other recent relationships between the theory of classification of graph algebras and the theory of classification of finite shifts.

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