Frames and Codes: Part I and Part II

Abstract

Suppose that we have a k-tuple of real numbers that we wish to transmit, but because of noise or other factors the recepient is likely to only receive an approximation to the original k-tuple. In this case it is natural to study what steps can be taken to increase the likelihood that the received vector is at least "near" to the original vector. In one model for how such errors in transmission can occur not only are co-ordinates of a vector blurred, but sometimes they are entirely lost, *i.e.,* "erased".

The general approach to this type of problem is to first "encode" the k-tuple as an n-tuple, $n > k$, by considering a linear embedding of R^k into R^n and then transmitting the n-tuple. These problems were studied extensively for binary k-tuples and an extensive theory of binary codes exists. As in the binary case, we will show that for certain pairs, (n, k), there exist embeddings of R^k into R^n that behave exceptionally well.

Using frames to describe these linear maps allows us to connect these problems with classical "packing" problems and the theory of two-graphs.

The analogous problems in the complex case are still open.

Injective Envelopes and the WEP

Abstract

A C^*-subalgebra A of $B(H)$ is said to have a "weak expectation" if there exists a completely positive map from $B(H)$ into the double commutant of the algebra, A'', that is the identity on A. If every faithful representation of a C^*-algebra possesses a weak expectation then the algebra is said to have the "weak expectation property (WEP)". Work of Kirchberg shows that the famous Connes embedding problem is equivalent to determining if certain C^*-algebras have the WEP.

In this talk we present an equivalent reformulation of the existence of weak expectations in terms of the injective envelope. This equivalence suggests a number of test questions about the relationships between "copies" of the injective envelope and the double commutant, and we present some results in this direction. Although a great deal of work has been done on Connes's embedding problem, very little has been done on exploring this connection.