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C*-algebras generated by partial isometries and amenability

If G is a discrete countable group, then the following are equivalent

– G is amenable

– The action of G on a point is amenable

– Every action of G is amenable

– $C^*(G)$ is nuclear

Here we address the question of how to generalize the above list to when G is replaced by an inverse semigroup S. This generalization is motivated by the fact that many C*-algebras are generated by sets of partial isometries closed under adjoint and product, and such a set is necessarily an inverse semigroup. Hence such algebras will be quotients of the universal C*-algebra $C^*(S)$ of some inverse semigroup S. We show that the last three points above are equivalent for an inverse semigroup S when "a point" is replaced by "its spectrum", and propose that these statements furnish a good candidate for the definition of amenability for an inverse semigroup.