FA-presentable structures

Rick Thomas (Leicester)

In Mathematics we are often concerned with "structures"; a structure (in this sense) consists of a set together with a collection of relations. For example, a group consists of a set together with a ternary relation (representing composition), a unary relation (yielding the identity element) and a binary relation (representing the process of taking inverses).

If one is interested in the possibility of performing computation in a structure, a natural approach would be to take some general model of computation (such as a Turing machine). A structure would then be said to be computable if its domain can represented by a set which is accepted by a Turing machine and if there are decision-making Turing machines for each of its relations. However, there have been various ideas put forward to restrict the model of computation used; whilst the range of structures decreases, the computation can become more efficient and certain properties of the structure may become decidable.

One interesting approach was introduced by Khoussainov and Nerode who considered structures whose domain and relations can be checked by finite automata as opposed to Turing machines. Such a structure is said to be "FA-presentable". This was inspired, in part, by the theory of "automatic groups" introduced by Epstein at al; however, the definitions are somewhat different.

We will survey some of what is known about FA-presentable structures, contrasting it with the theory of automatic groups. The talk is intended to be self-contained, in that no prior knowledge of these topics is assumed.