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Constructive Recognition of Classical Groups

The aim of the Matrix Recognition Project is to produce algorithms for computing in matrix groups defined over finite fields. One approach is the divide-and-conquer method which makes use of the Aschbacher classification of subgroups of the general linear group. If an Aschbacher class of a matrix group G can be determined and there a normal subgroup N associated with the class, we can proceed recursively on N and G/N. The base cases of this recursion is, of course, the finite simple groups. Thus, in order to fully exploit the Aschbacher classification, we need to be able to compute in the finite simple groups.

One problem associated with this is constructive recognition. Let G be a group with a set of *standard generators S*, and suppose H is another group with a generating set X such that H is isomorphic to G. Constructive recognition of H involves producing an isomorphism between the two groups by finding images of the standard generating set S in H, and writing these images as words on X. This allows us, for example, to compute conjugacy classes in G and then transfer the results across to H. This is preferable since the degree of H may be much larger than that of G.

In this talk I will outline how the problem of constructive recognition can be solved for an important class of simple groups - the finite classical groups.