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Reflective hyperbolic lattices and Vinberg's Algorithm.

By definition, a hyperbolic lattice is a free Abelian group with an integral inner product of signature $(n, 1)$. A hyperbolic lattice is said to be reflective if the subgroup $O_r(L)$ of its automorphism group generated by all reflections is of finite index. The lattice L is reflective if and only if the fundamental polyhedron P of the group $O_r(L)$ has a finite volume in the Lobachevsky (hyperbolic) space $\mathbb{L}^n$.

There is Vinberg's Algorithm that, given a lattice L, enables one to find recursively all faces of the polyhedron P and determine if there are only finitely many of them. In particular, it enables one to test a given lattice L for reflectivity.

In this talk I present some new methods of classification of arithmetic hyperbolic reflection groups and new results on classification of reflective hyperbolic lattices obtained by these methods. In addition, I present a software implementation of Vinberg's Algorithm for hyperbolic lattices (joint work with Alexander Perepechko).

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