Workshop
Hyperbolic Geometry

Venue：West Waseda Campus 60-303, Waseda University

Program：

September 2nd, Monday

13:30-14:30 : Tomoshige Yukita (Waseda)
14:30-15:00 : Tea Break
15:00-16:00 : Ken'ichi Yoshida (Saitama Univ)
16:00-16:15 : Break
16:15-17:15 : Sinpei Baba (Osaka Univ)

September 3rd, Tuesday

10:45-11:45 : Sumio Yamada (Gakushuin)
11:45-13:30 : Lunch
13:30-14:30 : Katsuhiko Matsuzaki (Waseda)
14:30-15:00 : Tea Break
15:00-16:00 : Jun Murakami (Waseda)
16:00-16:15 : Break
16:15-17:45 : John Parker (Durham Univ)

Title and Abstract :

Tomoshige Yukita : Deformation of 4-dimensional right-angled hyperbolic Coxeter groups.

Abstract : Recently, Kerckhoff-Storm constructed a deformation of a 4-dimensional right-angled hyperbolic Coxeter group. In this talk, we give a new example of a deformation of 4-dimensional right-angled hyperbolic Coxeter groups. By using such deformation of a right-angled Coxeter group, we construct a deformation of a hyperbolic cone-manifold. This is joint work with Gye-Seon Lee, Ludovic Marquis, and Stefano Riolo.

Ken'ichi Yoshida : Degeneration of 3-dimensional hyperbolic cone structures with decreasing cone angles

Abstract : The global rigidity of a 3-dimensional hyperbolic cone manifold is known in the case that the cone angles are at most $¥pi$. The proof of the global rigidity by Kojima is based on the fact that hyperbolic cone structures do not degenerate in deformation with decreasing cone angles at most $¥pi$. In this talk, we will construct hyperbolic cone structures on a link in $T^{2} ¥times I$ explicitly. Then we will obtain an example of degeneration of hyperbolic cone structures with decreasing cone angles less than $2¥pi$.

Shinpei Baba : On PU(2, 1)-quasifuchsian representations

Abstract : I will describe some examples of PU(2, 1)-quasifuchsian representations which are not hyperconvex.

Sumio Yamada: Timelike geometry and generalized de Sitter spaces

Abstract : In 1967, H. Busemann advocated a metric geometry called "timelike space" which differs from the usual one by its satisfying the reverse triangle inequality. It has been also investigated by A.D. Alexandrov and his school, under the name of "chronogeometry" as its well-known example is the Minkowski spacetime. In this talk, we will introduce a class of projective geometries which provides a large number of examples of timelike metric spaces. This is a collaboration with Athanase Papadopoulos of Strasbourg.

Katsuhiko Matsuzaki : Half the critical exponents of hyperbolic discrete groups

Abstract : We consider the phase transition at half the critical exponent of the Poincare series ofdiscrete groups acting isometrically on the hyperbolic space. We will show the following two results and their generalizations:
(1) For a discrete group G of divergence type, the critical exponent of any non-trivial normal subgroup N of G is strictly greater than half of that for G;
(2) For any subgroup H of a free group G, if its critical exponent is greater than half of that for G, then the bottom of the spectrum for the discrete Laplacian on the quotient of a weighted Cayley graph of G can be given in terms of the critical exponent of H.

Jun Murakami : Volumes of hyperbolic and spherical polyhedra

Abstract : I would like to express a method of computing volume for a simple polytope P in three-dimensional hyperbolic space $¥mathbb H^3$. This method combines the combinatorial reduction of P as a trivalent graph $¥Gamma$ by I-H moves aligned with its geometric splitting into generalized tetrahedra. With each decomposition, we associate a potential function $¥Phi$, which is the sum of volumes of the generalized tetrahedra. The volume of P can be expressed through critical values of $¥Phi$. By applying the analytic continuation principle, this method is extended to a polytope in S^3. This is joint work with Alexander Kolpakov.

John Parker : Complex hyperbolic lattices generated by three complex reflections

Abstract : I will survey a joint project with Martin Deraux and Julien Paupert which has its origins in seminal work of Mostow from 1980. We consider groups of complex hyperbolic isometries generated by three complex reflections R_1, R_2, R_3 all of order p, an integer at least 2. Heuristically, such a group is a lattice whenever certain short words in the generators have finite order. The group is (essentially) determined up to conjugation by four of these orders. Our goal is to describe each of the resulting lattices in four different ways: (a) in terms of a fundamental domain, (b) in terms of its arithmetic properties, (c) as the modular group of a differential equation and (d) in the language of algebraic geometry as a ball quotient surface. This is partially complete, but there remain a number of open questions.