Mini-rencontre ANR MoDiff

lundi 11 avril 2022 - mercredi 13 avril 2022

Labri

Programme Scientifique

Etienne Bonnafoux: *Ergodic property of the earthquake flow and the counting of simple closed geodesics*

The asymptotic number of simple closed geodesic on hyperbolic surfaces of length less than L can be computed by studying ergodic properties of the earthquake flow. This flow acts on the moduli space and despite its links to the Teichmüller horocyclic flow, remains not fully understood. I will show how to give an upper bound on its rate of mixing.

Video link
Mireille Bousquet-Mélou: *Enumeration of planar maps*

I will survey the enumeration of families of planar maps, subject to various conditions and/or decorations. The emphasis will be primarily on recursive approaches, then on bijective ones.
The participants are encouraged to stop me with questions.

Video link
Samuel Freedman: *Periodic Points on Veech Surfaces*

A non-square-tiled Veech surface has finitely many periodic points, i.e. points with finite orbit under the whole affine automorphism group. We first present an algorithm that, when given a non-square-tiled Veech surface as input, outputs its set of periodic points. We then describe upcoming work that uses this algorithm to prove that Prym eigenforms in the minimum stratum in genus 2, 3 and 4 do not have periodic points, except for the fixed points of the Prym involution.
Part of the work in this talk is joint with Zawad Chowdury, Samuel Everett and Destine Lee.

Video link
Alessandro Giacchetto: *Geometry of combinatorial moduli spaces*

The Teichmüller space of bordered surfaces can be described via metric ribbon graphs, leading to a natural symplectic structure introduced by Kontsevich in his proof of Witten's conjecture. I will show that many tools of hyperbolic geometry can be adapted to this combinatorial setting, and in particular the existence of Fenchel–Nielsen coordinates that are Darboux. As applications of this set-up, I will present a combinatorial analogue of Mirzakhani's identity, resulting in a completely geometric proof of Witten–Kontsevich recursion, as well as Norbury's recursion for the counting of integral points. Time permitting, I will describe how to count simple closed geodesics in this setting. The talk is based on a joint work with J.E. Andersen, G. Borot, S. Charbonnier, D. Lewański and C. Wheeler.

Video link
Gabriele Mondello: *Spherical and translation surfaces of genus one with 1 conical point*

A spherical surface is a two-dimensional compact oriented manifold endowed with a metric of constant curvature 1 with conical singularities. Its underlying conformal structure determines a Riemann surface with marked points.
Thus the moduli space of spherical surfaces with conical points of assigned angles comes with a real-analytic forgetful map to the moduli space of Riemann surfaces with marked points.
In this talk we will consider the case of surfaces of genus one with 1 conical point: in this case the forgetful map is proper if and only if the angle is not an odd multiple of 2pi.

The study of the forgetful map in the non-proper case leads to studying the moduli space of certain translation surfaces with residue-free poles.
This is joint work with Eremenko-Panov and Eremenko-Gabrielov-Panov.

Video link
Julian Rüth: *Exploring $GL(2,\mathbb{R})$-Orbit Closures with flatsurf*

We present a practical algorithm to approximate the $GL(2, \mathbb{R})$-orbit closure of a translation surface. The algorithm uses the Cylinder Deformation Theorem by A. Wright to construct the orbit closure from decompositions of a surface into cylinders and minimal components. To compute such flow decompositions, we represent a translation surface as an interval exchange transformation and detect a decomposition into cylinders and non-cylinders whose minimality we can certify in practice.

The algorithm has been implemented in the flatsurf software package which is based on SageMath. While the algorithm is only guaranteed to compute a "lower bound" of the orbit closure of a translation surface, it determines orbit closures quickly in practice even for quite complicated surfaces.

Video link
Ivan Yakovlev: *Cylinders in square-tiled surfaces of minimal stratum and enumeration of metric trees*

It is known that the computation of Masur-Veech volumes is equivalent to asymptotic enumeration of square-tiled surfaces with certain geometric constraints. Recently Delecroix, Goujard, Zograf and Zorich used a strategy of grouping surfaces according to their stable graph to express the volumes of principal strata of quadratic differentials in terms of intersection numbers, to study their large genus asymptotics, and to study the asymptotic geometry of square-tiled surfaces.
We apply this strategy to the minimal stratum H(2g-2) of Abelian differentials, which corresponds to grouping the surfaces according to the number of cylinders. Applying the results of Chapuy on unicellular maps, we see that, instead of intersection numbers, we get numbers that count certain metric plane trees. This allows us to generalize the recurrence of Sauvaget for the volumes of minimal strata (obtained via intersection theory) through a purely combinatorial approach. We are also able to study the large genus asymptotic distribution of the number of cylinders.

Video link