### Principales activités

- Recent package for the Bolza surface \[\text{IT19}\].
- Offers several triangulation packages, applications in an unprecedented way.
- The library facilitated the use of geometric algorithms developed within an Open Source Project, has.
- CGAL, Computational Geometry Algorithms Library, remains elusive.
- However, the extension to general hyperbolic surfaces remains elusive.
- The Bolza surface, \((2, 4, 6)\), \([\text{IT16, IT17}]\).
- From a theoretical point of view, discrete differential geometry, a field that provides a basis for a theoretical analysis of discrete objects that recovers the rich theory of their smooth counterparts, treats discrete surfaces as triangular meshes. It is desirable to assume that the triangulation is Delaunay, as many things, such as the discrete Laplacian, become much simpler to compute and to interpret. As a result, Delaunay triangulations have become a central tool in the theoretical study of discrete surfaces.
- Delaunay triangulations in Euclidean space have been extensively studied throughout the 20th century and are still a very active research topic. Their mathematical and algo-arithmic properties are by now well understood (see e.g., a survey book \[\text{AKL13}\]. Consid- ering their importance, it is surprising how little is known about geometric algorithms to robustly compute Delaunay triangulations for hyperbolic surfaces, even relatively simple ones. Recent progress has lead to an algorithm for one of the simplest hyperbolic surfaces, the Bolza surface, which is related to the triangle group \((2, 3, 8)\). \([\text{BTV16, IT17}]\). However, the extension to general hyperbolic surfaces remains elusive.

The Computational Geometry Algorithms Library, CGAL, developed within an Open Source Project, has facilitated the use of geometric algorithms in applications in an un-precedent way. The library offers several triangulation packages, including the recent package for the Bolza surface \[\text{IT19}\].

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### Mission confiée

**Context**

Tesselations of space from repeating motifs have a long and involved history in mathemat- ics, art, engineering, and natural sciences. The mathematical literature has traditionally focused on patterns in Euclidean spaces but the role of hyperbolic geometry in the natural sciences is increasingly recognized. From a theoretical point of view, discrete differential geometry, a field that provides a basis for a theoretical analysis of discrete objects that recovers the rich theory of their smooth counterparts, treats discrete surfaces as triangular meshes. It is desirable to assume that the triangulation is Delaunay, as many things, such as the discrete Laplacian, become much simpler to compute and to interpret. As a result, Delaunay triangulations have become a central tool in the theoretical study of discrete surfaces.

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### Informations générales

- **Thème/Domaine** : Algorithmique, calcul formel et cryptologie
- **Ville** : Villers-lès-Nancy
- **Centre Inria** : CRI Nancy - Grand Est
- **Date de prise de fonction souhaitée** : 2019-10-01
- **Durée de contrat** : 1 an, 4 mois
- **Date limite pour postuler** : 2019-06-05

### Contacts

- **Équipe Inria** : GAMBLE
- **Recruteur** : Teillaud Monique / monique.teillaud@inria.fr

### A propos d’Inria

Inria, l’institut national de recherche dédié aux sciences du numérique, promeut l’excellence scientifique et le transfert pour avoir le plus grand impact. Il emploie 2400 personnes. Ses 200 équipes-projets agiles, en général communes avec de nombreuses entreprises et a accompagné la création de plus de 160 start-up. L’institut s’efforce ainsi de répondre aux enjeux de la transformation numérique de la science, de la société et de l’économie.

### L’essentiel pour réussir

**Application deadline**

May 30, 2019

**How to apply**

Upload your file on jobs.inria.fr in a single pdf or zip file, and send it as well by email to the contact persons. Your file should contain the following documents:

- CV including a description of your research activities (2 pages max) and a short description of what you consider to be your best contributions and why (1 page max and 3 contributions max); the contributions could be theoretical or practical. Web links to the contributions should be provided. Include also a brief description of your scientific and career projects, and your scientific positioning regarding the proposed subject.
- The report(s) from your PhD external review(s), if applicable.
- If you haven’t defended yet, the list of expected members of your PhD committee (if known) and the expected date of defense (the defense, not the manuscript submission).

In addition, at least one recommendation letter from your PhD advisor should be sent directly by their author(s) to the contact persons.

Applications are to be sent as soon as possible.

### Consignes pour postuler

**Sécurité défense**

Ce poste est susceptible d’être affecté dans une zone à régime restrictif (ZRR), telle que définie dans le décret n°2011-1425 relatif à la protection du potentiel scientifique et technique de la nation (PPST). L’autorisation d’accès à une zone est délivrée par le chef
Objectives

Hyperbolic surfaces exhibiting the symmetries of the $(2, 4, 6)$ triangle group are ubiquitous in nature, where they appear as triply-periodic minimal surfaces [ES15]. The aim of this project is to propose and analyze effective algorithms to compute triangulations of such surfaces. Fundamental questions must be addressed to establish the mathematical foundations used to describe triangulations in these spaces. To ensure that our results are as relevant and applicable as they can be, we will focus on recent and active research problems in the natural sciences as test cases for our theory. We plan to make the designed algorithms available for practical use as a new CGAL package.

References


Compétences

Required qualifications

PhD thesis in Mathematics or Computer Science, and strong interest for the other discipline

Language

English is requested

Avantages

- Subsidized meals
- Partial reimbursement of public transport costs
- Leave: 7 weeks of annual leave + 10 extra days off due to RTT (statutory reduction in working hours) + possibility of exceptional leave (sick children, moving home, etc.)
- Possibility of teleworking (after 6 months of employment) and flexible organization of working hours
- Professional equipment available (videoconferencing, loan of computer equipment, etc.)
- Social, cultural and sports events and activities
- Access to vocational training
- Social security coverage

Rémunération

Salary: 2653€ gross/month