2019-01388 - PhD Position F/M A toolbox for hyperbolic surfaces [S]

Type de contrat : CDD de la fonction publique
Niveau de diplôme exigé : Bac + 5 ou équivalent
Fonction : Doctorant

Contexte et atouts du poste

Team
Gamble, INRIA Nancy - Grand Est, LORIA

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See also here

Mission confiée

Context and motivation

Geometric problems are central in many areas of science and engineering. Computational geometry, the study of combinatorial and algorithmic problems in a geometric setting, has tremendous practical applications. Traditionally, the scope of computational geometry has been limited to algorithms on data in the Euclidean space.

However, some results in computer science used combinatorial hyperbolic structures [SST, DL]. Also, hyperbolic surfaces are natural and appear in various fields in physics and material sciences. For instance, the triply periodic minimal surfaces of R3 are hyperbolic.

We have already obtained results about the computation of Delaunay triangulations in hyperbolic spaces [BDT] and on very specific hyperbolic surfaces [IT]. The need of a geometric toolbox for hyperbolic surfaces has become critical to tackle more general hyperbolic surfaces. Some combinatorial constructions on such surfaces have been proposed from a mathematical point of view [Bus]; however the algorithmic and practical properties have hardly been studied.

Principales activités

Objectives

The purpose of this PhD is to explore the geometry of hyperbolic surfaces and provide such a geometric toolbox.

Two main discrete structures have been proposed to describe hyperbolic surfaces: Fenchel-Nielsen coordinates and fundamental polygon with side gluings. These representations are not unique, which leads to research question like: how to compute a good pants decomposition? or how to compute a fundamental domain that is a Voronoi cell? Also, elementary queries associated to the underlying surface can be studied in both situations. A typical question that is both extremely useful and a deep research question is: how to calculate the distance between two given points on an hyperbolic surface?

Many other interesting questions may be considered, so, the candidate will have the opportunity to choose between different possible directions. In each case, the goal will be to present an algorithm, analyze it, and implement it. Considering the potential applications and targeted users, SageMath seems to be a good option for implementations.

References


Compétences

Prerequisites

This PhD thesis involves knowledge from both

- mathematics (in particular: low-dimensional topology and geometry)

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 : 2020-10-01
- Durée de contrat : 2 ans
- Date limite pour postuler : 2019-05-01

Contacts

- Equipe Inria : GAMBLE
- Directeur de thèse : 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 des partenaires académiques, impliquent plus de 3000 scientifiques pour relever les défis des sciences informatiques et mathématiques, souvent à l’interface d’autres disciplines. Inria travaille 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 1st, 2019 (Midnight, Paris time)

How to apply

- Upload your file on jobs.inria.fr in a single pdf or zip file
- And send your file to the two advisors.

Your file should contain the following documents:

- Your CV.
- A cover letter describing your interest in this topic.
- A short (max one page) description of your Master thesis (or equivalent) or of the work in progress if not yet completed.
- Your degree certificates and transcripts for Bachelor and Master (or the last 5 years).
- Master thesis (or equivalent) if it is already completed and publications, if any (it is not expected that you have any). Only the web links to these documents are preferable, if possible.
- In addition, one recommendation letter from the person who supervised(d) your Master thesis (or research project or internship) should be sent directly by its author to the advisors.

Applications are to be sent as soon as possible.

Consignes pour postuler
• and computer science (in particular: algorithms, graph theory, and C++/Python).

Candidates should have a strong expertise in one of those fields and a real interest for the other one.

Languages
French is no compulsory.
English is required.

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

Monthly salary after taxes : around 1596,05€ for 1st and 2nd year. 1678,99€ for 3rd year. (medical insurance included).

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 d’établissement, après avis ministériel favorable, tel que défini dans l’arrêté du 03 juillet 2012, relatif à la PPST. Un avis ministériel défavorable pour un poste affecté dans une ZRR aurait pour conséquence l’annulation du recrutement.

Politique de recrutement :
Dans le cadre de sa politique diversité, tous les postes Inria sont accessibles aux personnes en situation de handicap.

Attention: Les candidatures doivent être déposées en ligne sur le site Inria. Le traitement des candidatures adressées par d’autres canaux n’est pas garanti.