Offer #2024-07467

Post-Doctoral Research Visit F/M Topology optimization of plates and shells fabricated by filament deposition

Contract type : Fixed-term contract

Level of qualifications required : PhD or equivalent

Fonction : Post-Doctoral Research Visit

Level of experience : Recently graduated

Context

This postdoc would be within the MFX team.

The topic is associated to a competitve call, where a jury determines which applicant get the position.

Assignment

The postdoc will be the lead investigator of the proposed topic.

Main activities

Scientific context:

3D printing by filament fabrication makes it possible to combine multiple materials of different properties within a same part. The properties of interest cover for instance flexibility, conductivity, fiber-reinforcement as well as filament which properties vary under external stimulus.

These properties are directly impacted by the orientation of the deposition of the filaments, leading to anisotropic behaviors. Thus, we can envision producing parts with controlled property fields, that deform and react to the environment due to how the filament deposition has structured gradients of properties within their volume [1,2]. Unfortunately, there is currently only few methods available to optimize for and exploit these promising possibilities.

Topic:

We will explore how to use topology optimization methodologies to design parts fabricated with fused filament, using one or multiple materials, where the orientation of the paths drives the final properties of the object. We will consider this problem first for fabricating planar plates, and then for the fabrication of non-planar shells using a robotic 3D printing platform. The optimization framework will build upon our work on phasor fields, allowing to optimize deposition trajectories to obtain the target properties once the objects are fabricated.

[1] Orientable Dense Cyclic Infill for Anisotropic Appearance Fabrication, Xavier Chermain, Cédric Zanni, Jonàs Martínez, Pierre-Alexandre Hugron, and Sylvain Lefebvre

[2] Shrink & Morph: 3D-printed self-shaping shells actuated by a shape memory effect, David Jourdan, Pierre-Alexandre Hugron, Camille Schreck, Jonàs Martínez, Sylvain Lefebvre

Skills

Technical skills and level required :

Exprt in topology optimization and excellent background in Computer Graphics.

Languages :

English

Relational skills :

Excellent communication and ability to work within a research team.

Benefits package

- 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

Remuneration

2788 € gross/month

General Information

- **Theme/Domain** : Interaction and visualization
  Scientific computing (BAP E)
- **Town/city** : Villers lès Nancy
- **Inria Center** : Centre Inria de l'Université de Lorraine
- **Starting date** : 2024-09-01
- **Duration of contract** : 1 year
- **Deadline to apply** : 2024-05-01

Contacts

- **Inria Team** : MFX
- **Recruiter** :
  Lefebvre Sylvain / sylvain.lefebvre@inria.fr

About Inria

Inria is the French national research institute dedicated to digital science and technology. It employs 2,600 people. Its 200 agile project teams, generally run jointly with academic partners, include more than 3,500 scientists and engineers working to meet the challenges of digital technology, often at the interface with other disciplines. The Institute also employs numerous talents in over forty different professions. 900 research support staff contribute to the preparation and development of scientific and entrepreneurial projects that have a worldwide impact.

The keys to success

We seek for hard working, passionate candidates.

> **Warning** : you must enter your e-mail address in order to save your application to Inria. Applications must be submitted online on the Inria website. Processing of applications sent from other channels is not guaranteed.

Instruction to apply

Defence Security :
This position is likely to be situated in a restricted area (ZRR), as defined in Decree No. 2011-1425 relating to the protection of national scientific and technical potential (PPST).Authorisation to enter an area is granted by the director of the unit, following a favourable Ministerial decision, as defined in the decree of 3 July 2012 relating to the PPST. An unfavourable Ministerial decision in respect of a position situated in a ZRR would result in the cancellation of the appointment.

Recruitment Policy :
As part of its diversity policy, all Inria positions are accessible to people with disabilities.