



Offer #2024-07798

Post-Doctoral Research Visit F/M Building a benchmark for sketch-based modeling

Contract type : Fixed-term contract

Level of qualifications required : PhD or equivalent

Fonction : Post-Doctoral Research Visit

Level of experience : Recently graduated

About the research centre or Inria department

The Inria centre at Université Côte d'Azur includes 42 research teams and 9 support services. The center's staff (about 500 people) is made up of scientists of different nationalities, engineers, technicians and administrative staff. The teams are mainly located on the university campuses of Sophia Antipolis and Nice as well as Montpellier, in close collaboration with research and higher education laboratories and establishments (Université Côte d'Azur, CNRS, INRAE, INSERM ...), but also with the regional economic players.

With a presence in the fields of computational neuroscience and biology, data science and modeling, software engineering and certification, as well as collaborative robotics, the Inria Centre at Université Côte d'Azur is a major player in terms of scientific excellence through its results and collaborations at both European and international levels.

Context

Computer Aided Design (CAD) is a multi-billion dollar industry responsible for the digital design of almost all manufactured goods. It leverages parametric modeling, which allows dimensions of a design to be changed, facilitating physically-based optimization and design remixing by non-experts. But CAD's potential is diminished by the difficulty of creating parametric models: in addition to mastering design principles, professionals must learn complex CAD software interfaces.

To promote effective modeling strategies and creative flow, design educators advocate freehand drawing as a preliminary step to parametric modeling. The goal of our research is to convert freehand drawings into parametric CAD models that can be reused in downstream applications. To inform this research, we aim at creating a benchmark of design drawings and corresponding CAD models.

Assignment

Before converting design drawings into CAD models, we must first understand how designers create such drawings. What lines do they draw? How do these lines relate to the intended CAD model? How accurate is the perspective projection in a typical drawing? To answer these questions, we will collect professional drawings and their corresponding CAD models.

Our work focuses on concept sketches that designers draw to explain a shape they have in mind. Designers create these sketches following long-standing principles of perspective drawing, e.g. they employ intermediate construction lines for perspective accuracy. Based on our experience in collecting such drawings [1], we will capture the construction sequence of each drawing using a pen tablet, such that each pen stroke is represented by a polyline with pen pressure and a time stamp. We will complement these drawings with CAD programs representing the same shapes.

[1] [OpenSketch: A Richly-Annotated Dataset of Product Design Sketches](#)
[Yulia Gryaditskaya, Mark Sypesteyn, Jan Willem Hoftijzer, Sylvia Pont, Frédo Durand, Adrien Bousseau](#)
[ACM Transactions on Graphics \(SIGGRAPH Asia Conference Proceedings\) 2019](#)

Main activities

Thanks to cloud-based CAD modeling tools, curated datasets of CAD models have been made public. We will select a set of high-quality models from these datasets. We will gather models with a wide range of complexity, as measured by the number and diversity of CAD operations used. We will then hire professional designers to draw these CAD shapes.

Next, we will align the two types of data, such that drawing strokes are put in correspondence with the CAD instructions that generate the same shape parts. Such aligned data will allow us to study how different CAD operations are drawn and serve as a benchmark for algorithm that aims at segmenting and

interpreting design drawings.

Finally, we will analyze the collected CAD and drawing sequences to inform the design of sketch-based modeling systems. In particular, we will measure statistics about how frequently different CAD operations and drawing techniques are used, as well as correlations between drawing techniques and CAD operations.

Skills

Experience in implementing 3D user interfaces and/or geometry processing algorithms.

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 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
- Contribution to mutual insurance (subject to conditions)

Remuneration

Gross Salary: 2788 € per month

General Information

- **Theme/Domain** : Interaction and visualization
Software engineering (BAP E)
- **Town/city** : Sophia Antipolis
- **Inria Center** : [Centre Inria d'Université Côte d'Azur](#)
- **Starting date** : 2024-10-01
- **Duration of contract** : 2 years
- **Deadline to apply** : 2024-07-23

Contacts

- **Inria Team** : [GRAPHDECO](#)
- **Recruiter** :
Bousseau Adrien / Adrien.Bousseau@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

The candidate should have a Ph.D. in computer graphics or human-computer interaction, with an interest in geometry processing and machine learning. The candidate should also have an interest in developing tools for designers and in interacting with such expert users.

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.