

2019-01327 - PhD Position F/M [GRAPHDECO] Evaluating Error/Uncertainty in Approximate Global Illumination Algorithms

Contract type : Public service fixed-term contract
Level of qualifications required : Graduate degree or equivalent
Fonction : PhD Position

About the research centre or Inria department

The Inria Sophia Antipolis - Méditerranée center counts 37 research teams and 9 support departments. The center's staff (about 600 people including 400 Inria employees) is composed of scientists of different nationalities (250 foreigners of 50 nationalities), engineers, technicians and administrators. 1/3 of the staff are civil servants, the others are contractual. The majority of the research teams at the center are located in Sophia Antipolis and Nice in the Alpes-Maritimes. Six teams are based in Montpellier and a team is hosted by the computer science department of the University of Bologna in Italy. The Center is a member of the University and Institution Community (ComUE) "Université Côte d'Azur (UCA)".

Context

There are currently several very effective global illumination algorithms that manage to simulate the majority of significant visual phenomena (eg [Georgiev12]); however they are far from real time. On the other end of the spectrum, there are real-time global illumination solutions (eg [McGuire17]) that usually achieve very approximate solutions, but at interactive or real-time framerates, and often with remarkable visual quality. These solutions are typically built on light probes or virtual point lights, that can be seen as a sampling of path space.

We will first analyze error in the different steps of these approximate algorithms, possibly modelling the error with statistical tools that handle uncertainty [Smi13]. This will require careful analysis starting with simple configurations, moving up to more complex cases. We will investigate the effect of discretization, both spatial and directional, and quantify the effect on the accumulated error, using statistical methods or alternatively data-driven learning-based methods.

Bibliography

[Georgiev12] Georgiev, I., Krivánek, J., Davidovic, T., & Slusallek, P. (2012). Light transport simulation with vertex connection and merging. *ACM Trans. Graph.*, 31(6), 192-1.

<http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.398.833&rep=rep1&type=pdf>

[McGuire17] McGuire, M., Mara, M., Nowrouzezahrai, D., & Luebke, D. (2017, February). Real-time global illumination using precomputed light field probes. In *Proceedings of the 21st ACM SIGGRAPH Symposium on Interactive 3D Graphics and Games* (p. 2). ACM.

<https://dl.acm.org/citation.cfm?id=3023378>

[Smi13] Ralph C Smith. Uncertainty quantification: theory, implementation, and applications, volume 12. Siam, 2013.

Assignment

Ph.D. student in the context of the ERC FunGraph (fungraph.inria.fr)

Main activities

Ph.D. research: developing new algorithms and mathematical tools for innovative research in the field of computer graphics.

Skills

Good knowledge of Computer Graphics, knowledge of Computer Vision desirable, good knowledge of C++ and OpenGL/GLSL and equivalent.

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

Duration: 36 months

General Information

- **Theme/Domain :** Interaction and visualization
Information system (BAP E)
- **Town/city :** Sophia Antipolis
- **Inria Center :** CRI Sophia Antipolis - Méditerranée
- **Starting date :** 2019-04-01
- **Duration of contract :** 3 years
- **Deadline to apply :** 2019-07-30

Contacts

- **Inria Team :** GRAPHDECO
- **PhD Supervisor :**
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About Inria

Inria, the French national research institute for the digital sciences, promotes scientific excellence and technology transfer to maximise its impact. It employs 2,400 people. Its 200 agile project teams, generally with academic partners, involve more than 3,000 scientists in meeting the challenges of computer science and mathematics, often at the interface of other disciplines. Inria works with many companies and has assisted in the creation of over 160 startups. It strives to meet the challenges of the digital transformation of science, society and the economy.

The keys to success

Masters in Computer Graphics with some experience in research.

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.

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.

Location: Sophia Antipolis, France

Gross Salary per month: 1982€ brut per month (year 1 & 2) and 2085€ brut/month (year 3)