The Laboratory of applied Photonics Devices (EPFL-LAPD) at the EPFL in Lausanne, Switzerland has an opening for a talented and motivated postdoc to develop new optical approaches and computational tools for light-assisted 3D printing.

Post-doctoral Position on Light-based 3D printing

A few words on the project :
A few years back, a promising and relatively fast approach has been developed to 3D print centimetre-scale objects into high-viscosity fluids or even solids in a few tens of seconds with high resolution (<100 µm). The idea, taken up and elaborated in our laboratory, consists of irradiating a photosensitive resin with 2D light patterns from multiple angles. The light exposure produces a 3D energy dose sufficient to solidify the material in the desired geometry without layering as needed using conventional printers. One challenging task is to determine the required light patterns from the desired dose distributions. An interesting aspect of this two-dimensional inverse problem is its close relationship to computed tomography that aims at reconstructing a three-dimensional image from its projections. Under some simplifying assumptions, these two problems – 3D imaging and 3D printing – are in fact very similar, just reversed. It results that we can successfully apply the same 2D-3D transform and use analogous algorithm in some cases. However, this simple model based on Radon transform suppose that the resin bath is perfectly homogeneous and fully transparent which is not always the case in reality. To address this problem, we have recently developed computational tools to improve the patterns generation. Based on the inverse Radon transform, we built a finer physics-informed forward model taking into account different experimental such as the projection pattern positivity (displayed onto the modulator), the light scattering (throughout its propagation inside the resin), photo-polymerization threshold (light-polymer interaction). One can also think of tailoring the algorithm depending on the material and/or the object to be printed. In the meantime, modifying the optical setup might also be an option to both increase and play with the printer's degrees of freedom to eventually achieve higher printing throughputs in terms of speed, resolution and fidelity.

Your mission :
At the crossroad of Optics and Computation, the candidate will be asked to develop and push further the capabilities of our existing and but also future 3D printers. Light-based additive manufacturing is a rather emerging field with many possibilities and potential applications. Different projects are currently in progress in our lab to both understand better the physics at stake and improve the systems accordingly. It is also a multi-disciplinary topic at the intersection of optics and computation for the 3D display, material science and chemistry for the photopolymerization where a lot can be done. The candidate will have the possibility to be part of several projects in the lab as support and mentor of PhD students.

Your Profile :
Ideally, you have a background in computational imaging, optics, inverse problem, 3D display - a doctoral degree/PhD in Physics, Electrical or Mechanical Engineering, or related fields
- expertise and scientific practice in the following areas (the more the better): additive manufacturing, photopolymerization, coding (Matlab, Python), Machine Learning
- sound knowledge in statistics, experience in data analysis
- an independent working style as well as ability to work in teams
- motivation, team spirit and an appetite to learn
- an organized and proactive work attitude

Other responsibilities include mentoring PhD students.

We offer :
You will be part of an inspiring and helpful work environment full of team spirit and enthusiasm. With us, you can expect an enjoyable work climate, flexible work hours and numerous possibilities for further education and personal development. You expand your expertise and bridge your science to industry.
And not to forget: You make your research visible and broaden your network!

Also we offer you (in no particular order):
- Excellent facilities (state of the art cleanrooms, dedicated platform for soft matter processing and microscopy imaging, extensive characterization equipment, powerful computers)
- Many established process flow upon which to build
- A young, dynamic, inter-disciplinary, and international working environment.
- Competitive salary

Start date :
November 2022, or as agreed
The positions are open until filled

Term of employment :
Fixed-term (CDD)

Duration :
1 year, renewable up to a maximum of 4 years