2018-00631 - Learning and graph-based signal processing for video light field compression

Contract type : Public service fixed-term contract  
Renewable contract : Oui  
Level of qualifications required : PhD or equivalent  
Fonction : Post-Doctoral Research Visit  
Level of experience : Up to 3 years

About the research centre or Inria department

Inria, the French National Institute for computer science and applied mathematics, promotes “scientific excellence for technology transfer and society”. Graduates from the world’s top universities, Inria’s 2,700 employees rise to the challenges of digital sciences. With its open, agile model, Inria is able to explore original approaches with its partners in industry and academia and provide an efficient response to the multidisciplinary and application challenges of the digital transformation. Inria is the source of many innovations that add value and create jobs.

Team presentation

Efficient processing, i.e. analysis, storage, access and transmission of visual content, with continuously increasing raw data rates, in environments which are more and more mobile and distributed, remains a key challenge of the years to come. The emergence of new image modalities leads to a sustained need for algorithmic tools allowing efficient compression and communication of large volumes of visual data, of visual features and descriptors extracted for different video processing tasks.

The goal of the project-team is the design of algorithms and practical solutions in the areas of visual data analysis, modeling, representation, compression and communication. Our activities are thus structured around the following inter-dependent axes:

- Analysis and modeling for compact representation and navigation in large volumes of visual data
- Representation and compression of visual data
- Distributed processing and robust communication of visual data

The proposed research is at the frontier of computer vision, signal processing, coding and information theory. In terms of application domains, the project will primarily target networked visual applications such as 3DTV, FTV, camera sensor networks, satellite and medical imaging applications.

More informations : https://www.inria.fr/en/teams/sirocco

Context

The context of this open postdoc position is the ERC advanced grant CLIM - Computational Light Field Imaging.

Assignment

The goal of the postdoc will be to develop methods for efficient compression of static and video light fields. Light fields are densely sampled high-dimensional signals containing information about the light rays interacting with the physical objects in the scene. They yield a very rich description of a 3D scene which enables advanced creation of novel images from a single capture [1][2]. However, Light fields constitute very large volumes of highly redundant data, hence the need to design efficient compression algorithms to enable practical use of this new imaging modality.

Although the ultimate goal is to develop novel compression schemes for dynamic light...
fields (light fields videos), the work will naturally start by developing methods for static light fields and then be extended taking into account the temporal dimension. The work will be at the frontier between signal processing, computer vision, and source coding theory. The candidate will explore methods allowing us to learn local models enabling to best capture the correlation present in the data. In order to do so, concepts of super-pixels and super-rays [3] will be considered as possible supports of local transforms. These local transforms will be adapted to the data characteristics via learning and/or using graphs connecting correlated pixels in the different spatio-angular dimensions [4]. These methods will then be extended considering scene flow estimation [5] to capture correlation in the 3 dimensions, i.e. temporal in addition to spatial and angular. Graph-based transforms will similarly considered to best de-correlate the signal along super-rays and motion trajectories. The goal will also be to explore ways to encode the designed representations using coding tools tailored to its statistical properties.

The position is funded by the ERC advanced grant project CLIM: Computational Light Fields Imaging led by Dr Christine Guillemot at INRIA in Rennes, France

References

Main activities
Research, validation via software implementation, publication of the results

Skills
- PhD degree in signal and image processing
- Solid programming skills (matlab, C/C++)
- Solid mathematical background
- Fluent in English, both written and spoken

Benefits package
- Subsidised catering service
- Partially-reimbursed public transport
- Social security
- Paid leave
- Sports facilities

Remuneration
Gross salary : 2653 euros