** DGA-Inria PhD position at Sophia-Antipolis, France **

Deadline : April 29th 2018.

Contact : Josiane ZERUBIA, Inria-SAM

Application :

For more information and application, please contact before April 29 th , 2018:

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Title: Stochastic Geometry for Multiple Object Detection and Tracking in
High Resolution Multi-Source Data Sets for Wide Area Surveillance
Applications

Abstract:

Unmanned aerial vehicles and low-orbit satellites, including cubesats, are increasingly used for wide area surveillance which results in large amounts of multi-source data (videos) that have to be processed and analyzed. These sensor platforms capture vast ground areas at roughly 2 frames per second. The number of moving objects in such data is typically very high, accounting for up to thousands of objects. Multiple objects tracking has traditionally been a major area of research in the computer vision field, but this type of data poses new, specific, tracking related challenges. The large number of small objects coupled with the reduced frame rate of the video, illumination changes and image registration provide significant sources of

errors. Numerous motion models and state estimation methods like the Kalman filter
or the particle filter have been proposed for object tracking.
Classical trackers such as the Multiple Hypothesis Tracker or the Joint
Probabilistic Data Association Filter have been employed to solve the data association problem between multiple detections. Both approaches work on a set of data association hypothesis. A strong limitation of these methods is that past decisions cannot be updated when new information is available. One way to cope with this problem is to
use a sliding temporal window to perform tracking taking into account both past and future information and hence, removing the causality of the result.
Recently, a new
spatio-temporal marked point process model specifically adapted to the
problem of multiple objects tracking has been developed by Craciun et al. [1]. Craciun
et al. use ellipses to model the objects, boats or cars for instance, adding a non-geometric mark to facilitate the association between objects in different frames.

Nevertheless one important drawback of the above-mentioned model is that constant velocity of the moving objects is a necessary prior hypothesis to deal with the corresponding density function to be optimized.
In this PhD thesis we propose to get rid of this constraint by extending the previous model of Paula Craciun .

[1] P. Craciun, M. Ortner, and J. Zerubia. Joint detection and tracking of
moving objects using spatio-temporal marked point processes. Proc. IEEE Winter Conference
on Applications of Computer Vision, 2015.

Candidate profile:
We encourage applications from outstanding candidates with strong academic backgrounds in Mathematics, Physics, Computer Science, Engineering and related fields. At Inria we seek to increase the number of women in areas where they are underrepresented and therefore explicitly encourage women to apply.
Furthermore, we are committed to increasing the number of individuals with disabilities in its workforce and therefore encourage applications from such qualified individuals.
Important notice: to get PhD funding from DGA it is

necessary to be a
European citizen (EU and associated countries).