3.6 Trends, Issues, and Opportunities in Fusion-related Problems

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This talk discusses some open issues related to the problem of fusing multiple images of different spatial and spectral resolutions.

First, it discusses the inverse problem framework, generally considered to conduct this task. In particular, the choice of the regularization is still a challenging question and can be motivated from different points of view: to ease the computations, to promote spatial or spectral features of the fused image, to ensure physically motivated modeling, to exploit outputs from machine learning techniques. Besides, the question of the need for regularization is also discussed since, from a Bayesian perspective, the maximum a posteriori estimation always leads to a trade-off that might lead to unacceptable solution.

Most of the fusion techniques rely on the prior availability of registered, corrected pairs of images to be fused, and possibly on the technical specification of the sensors. In practice, this availability can be limited.

Some opportunities are also discussed. The traditional use case for fusion consists in fusing a pair of optical images of different spatial and/or spectral resolutions acquired at the same date. However, over applicative scenario of interest can appear. For instance, is there any interest to deal with a pair of images without complementarity in terms of spatial and spectral information? How can we fuse more than two images? Moreover, when the images have been acquired at different time instants, detecting changes between these images can be envisioned as a change detection problem. Another open question is to process non-optical data (e.g., SAR images, LiDAR, database). Finally, the main interest of the fused product is questioned, besides visualization perspectives. For a particular task (e.g., classification, detection, unmixing), is there any interest to fuse before this task? Should we design task-driven fusing schemes?

References

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