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TARGET SIGNATURE-CONSTRAINED MIXED PIXEL CLASSIFICATION (TSCMPC): LCMV CLASSIFIERS

The target abundance-constrained mixed pixel classification that was considered in Chapter 10 imposed ASC and ANC on target abundance fractions. In this case, a linear mixture model is required and the target signature matrix **M** must be also known *a priori*. In this chapter, we consider the target signature-constrained mixed pixel classification which does not need a linear mixture model. Instead, it classifies a mixed pixel by constraining the spectral shapes or vector directions of target signatures rather than target abundance fractions. Such concept was explored in Chapter 4 and referred to as linearly constrained minimum variance (LCMV) approach. It was used to design target signature-constrained subpixel detectors, CEM and TCIMF. A subpixel detector can detect targets, but does not necessarily imply that it can also classify the targets it detected. It may occur that a detector can detect all targets of interest but cannot discriminate one from another. In this case, the detection rate can be as high as 100%, but the classification rate could as low as 0%. In order for LCMV-based detectors to also achieve target classification, they must be implemented one target at a time so that the detected targets can be classified in a separate image. This chapter extends LCMV-based detectors to LCMV classifiers. It develops an approach that expands the capability of the LCMV-based detectors in such a fashion that it can simultaneously detect and classify multiple targets in a single image where different colors are used to highlight distinct types of detected targets. In particular, such color assignment approach also allows us to extend a CEM-based detector in Chapter 4 to a CEM-based classifier. Despite that an LCMV classifier requires the prior knowledge of desired targets, it can take advantage of the unsupervised algorithms presented in Chapter 5 to generate the necessary target knowledge and make its classification unsupervised.