4

TARGET SIGNATURE-CONSTRAINED SUBPIXEL DETECTION: LINEARLY CONSTRAINED MINIMUM VARIANCE (LCMV)

In Chapter 3, we studied partially constrained least squares approaches to target abundance-constrained subpixel detection. One of their practical limitations is the requirement of prior knowledge about the target signature matrix **M**. In reality, such information is very difficult to obtain, if not impossible. It is particularly true for hyperspectral imagery, which may contain many unknown signal sources extracted by high spectral resolution sensors such as HYDICE. These unidentified sources may include interferers, nonstationary background signatures and natural signatures that cannot be visually inspected from an image scene. Under such circumstance, finding a well-represented target signature matrix **M** may not be realistic. In order to resolve this problem, this chapter develops an alternative approach, referred to as a linearly constrained minimum variance (LCMV) approach, which only constrains targets of interest while minimizing the energy of unknown signal sources. Two special versions can be derived from LCMV, which are constrained energy minimization (CEM) filter and target-constrained interference-minimized Filter (TCIMF) where TCIMF can be viewed as an extension of the CEM filter. Interestingly, there is a close relationship among CEM, TCIMF and OSP where all the three operate a same functional form as a matched filter using different levels of target knowledge.