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AUTOMATIC MIXED PIXEL CLASSIFICATIO (AMPC): ANOMALY CLASSIFICATION

In Chapter 13, one type of AMPC, the unsupervised MPC, was considered. It made use of an unsupervised algorithm to generate necessary unsupervised target information required for unsupervised MPC. In this chapter, another type of AMPC, automatic target detection and classification (ATDC) is investigated, which does not require any prior target knowledge. It extends anomaly detection to anomaly classification. A natural approach is to combine an anomaly detector with a classifier to classify the detected anomalies. Unfortunately, it is not that simple. Two issues are needed to address before doing so. Since detected anomalies do not necessarily belong to the same target class, a mechanism is required to discern among these targets. Besides, it also needs the knowledge of target classes for classification. In order to cope with these two problems, an automatic thresholding method and four target discrimination measures are introduced in this chapter. The proposed automatic thresholding method is developed to segment anomalies from image background before target discrimination takes place. It can be implemented automatically. The target discrimination measures are designed based on two criteria, the Mahalanobis distance and matched-filter based distance, which can be used to cluster the detected anomalies into different target classes in an unsupervised manner. The mean of each clustered target class is calculated to generate the required target information for that particular target class to be used for classification. Coupled with the automatic thresholding and a target discrimination measure, anomaly detection can be extended to anomaly classification.