

4.5.2. MINKOWSKI-FUNCTIONAL BASED APPROACH TO DEFECT DETECTION

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Automatically detecting flaws in manufactured parts remains a challenging problem. In this paper, we present a flaw detection method that utilizes Minkowski functionals as features to find defects in radiographic images of aluminum castings. We show how the invariant properties of Minkowski functionals are well-suited to the defect detection problem. We provide a learning approach that permits learning of prototypical Minkowski features using a Markov Random Field and a tri-diagonal inverse covariance matrix that gives a compact representation of reference patches in the image. We present a novel method for combining the area Minkowski feature with the perimeter Minkowski feature that captures the characteristics of each. Results are given for 2D radiographs, but the Minkowski functionals and the approach extends naturally to 3D CT and other modalities.